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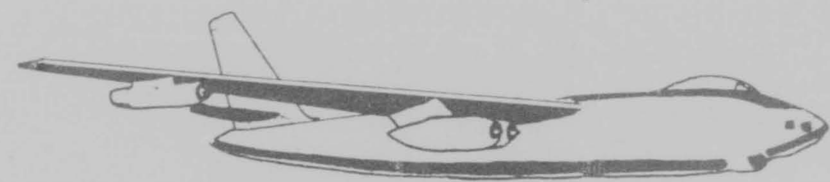

(UNCLASSIFIED)

HISTORY

OF THE

376TH BOMBARDMENT WING(M)

FOR THE MONTH OF

1 NOV. 55 - 31 MAR. 56

BARKSDALE AIR FORCE BASE
LOUISIANA

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HISTORY OF
376TH BOMBARDMENT WING, MEDIUM
1 NOVEMBER 1955 - 31 MARCH 1956

ASSIGNED UNITS

Headquarters, 376th Bombardment Wing, Medium
512th Bombardment Squadron, Medium
513th Bombardment Squadron, Medium
514th Bombardment Squadron, Medium
376th Air Refueling Squadron
376th Field Maintenance Squadron
376th Armament and Electronics Maintenance Squadron
376th Tactical Hospital
376th Periodic Maintenance Squadron

THIS REPORT PREPARED BY:

Major Eugene M. Crook - Historical Officer
M/Sgt. Dunlap Castle - Historical Technician

APPROVED BY:

Stephen D. McElroy
STEPHEN D. McELROY
Colonel USAF

(Second Air Force, Strategic Air Command)

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AUTHORITY

This Historical Report is prepared in accordance with the provisions of the following regulations and manuals:

Air Force Regulation 210-3, 11 March 1955
Air Force Manual 210-1, 1 December 1955
Strategic Air Command Regulation 210-1, 1956
Strategic Air Command Manual 210-1, 1951
Second Air Force Regulation 210-1, 1 July 1954

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Colonel McElroy assumed command of the 376th Bombardment Wing, Medium, on 1 July 1955.

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Biographical Sketch

COLONEL STEPHEN D. McELROY
COMMANDER, 376TH BOMBARDMENT WING, MEDIUM

Colonel Stephen D. McElroy was born in Terryville, Connecticut. He attended high school in Norton, Virginia, and was graduated from Virginia Polytechnic Institute in 1933. He received his M.S. degree in Architectural Engineering at VPI in 1934. Colonel McElroy worked as an engineer with the US Department of Agriculture prior to entering military service.

Colonel McElroy received an infantry commission in the officer's reserve corps in 1933, completed flying school in 1939, and was given a regular commission in 1940. In July 1950, he was promoted to Colonel which he holds as his permanent rank.

His military assignment have included tours as a squadron commander, as chief of Air Force Missions in Guatemala, Deputy for Operations of FEAF Bomber Command, Sixth Air Division Operations Officer, and SAC Director of Personnel.

Colonel McElroy is a Command Pilot, and during World War II, flew 106 combat missions for a total of 641 combat hours. He is also credited with 26 combat missions and 234 combat hours in Korea. His decorations include: the Legion of Merit; the Distinguished Flying Cross, one oak leaf cluster; the Bronze Star; and the Air Medal, three oak leaf clusters; Commendation Ribbon, three oak leaf clusters; and the Cross of the Air Force of Guatemala.

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Biographical Sketch

Colonel Robert T. Calhoun

Deputy Commander, 376th Bombardment Wing, Medium

Colonel Robert T. Calhoun was born in Big Run, Pennsylvania. He attended high school in Columbia, Missouri, and also attended Millard West Point Preparatory School.

Colonel Calhoun entered military service in March 1940, and completed flying training the same year. He was promoted to Colonel in June 1952.

His military assignments have included tours as a squadron and group commander; Director of Materiel, 301st Bombardment Wing, Medium; Director of Materiel, Fourth Air Division; and Director of Materiel, 376th Bombardment Wing, Medium.

During the Korean hostilities Colonel Calhoun flew 48 combat missions, for a total of 472 combat hours. His decorations include the Distinguished Flying Cross, and the Air Medal with two oak-leaf clusters.

Colonel Calhoun became Deputy Commander, 376th Bombardment Wing, Medium, on 2 June 1954.

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Biographical Sketch

Colonel William B. Colson
Director of Operations, 376th Bombardment Wing, Medium

Colonel William B. Colson was born in Conneaut, Ohio. He attended high school in Conneaut, and went to Western Reserve University, Cleveland, Ohio, and Miami University, Oxford, Ohio. He received his B.S. degree in Industrial Management from Miami University in 1947.

Colonel Colson entered military service on 1 January 1941. He was promoted to Colonel on February 20, 1956.

His military assignments have included tours as a group operations officer; Commander of the 53rd Troop Carrier Squadron in the Berlin Airlift; Commander of the 301st Air Refueling Squadron; Commander of the 352nd Bombardment Squadron; and Director of Operations, 301st Bombardment Wing, Medium.

Colonel Colson is a Senior Pilot and during the Korean hostilities flew 27 combat missions for a total of 63 combat hours. He has been awarded the Bronze Star.

Colonel Colson became Director of Operations, 376th Bombardment Wing, Medium, on 3 February 1956.

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CHAPTER I

MISSION

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MISSION

The mission of the 376th Bombardment Wing, Medium, is embodied in two directives, one unclassified, and the other classified secret. The unclassified directive, Second Air Force Regulation Number 23-8, 24 June 1955,[1] sets forth the primary and secondary mission of the 376th Wing, and is augmented by Second Air Force Letter Number 23-5, dated 9 September 1953,[2] but remains currently in effect, and is classified secret.

The mission of the 376th Bombardment Wing, Medium differs from the usual bombardment wing mission of conducting long range bombardment operations, in that the regulation stated specifically:

> As directed by this Headquarters (2AF) and in accordance with policies of higher headquarters, the mission of the 376th Bombardment Wing, Medium is to conduct tests and experiments in the development of tactics, equipment, and procedures for strategic bombardment operations. In addition, a knowledge of strategic bombardment operations will be maintained.[3] (U)

The 376th Wing was also assigned the following responsibilities:

a. Maintain assigned units in a state of readiness to permit immediate operations against enemies of the United States.

b. Be prepared to perform tasks assigned in current emergency plans, related operations orders and existing directives.

c. Train crews and units for the performance of global operations.

d. Equip units for accomplishment of the assigned mission.

e. Support the Air Reserve and National Guard programs in accordance with instructions received from this (2AF) or higher headquarters.

1. 2AF Reg# 23-8, 24 June 1955, Exhibit# 1 .
2. 2AF Ltr# 23-5, 9 September 1953 (S), Exhibit# 2 .
3. 2AF Reg# 23-8, 24 June 1955, Exhibit# 1 .

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f. Perform special missions directed by the Commander, Second Air Force.(U)

This mission was given a detailed augmentation by a classified Second Air Force letter.[4] Because of its importance to the 376th BOMWGM it will be quoted in its entirety.

Mission:

a. To develop and test both tactics and ECM techniques, and as a result of these tests recommend to Headquarters, SAC, requirements for equipment, including that necessary to counter guided missiles, and the adoption of appropriate tactics and techniques by the Command.

b. To develop and maintain capability for performing ECM cover and diversions in support of strategic bombardment operations.

c. To determine the capability of existing electronics equipment for tactical employment by SAC and recommend to Headquarters SAC adaptions and refinements which will increase the capability of existing equipment.

d. To maintain a field laboratory for necessary operational engineering. Laboratory activities will include short-term design and modification of equipment for operational testing.

e. In addition to the above, to maintain a capability in normal strategic bombardment operations.

In Executing This Mission: (S)

a. Close technical liaison will be maintained with appropriate ARDC organizations to assure that necessary short-term design and modification work complements the efforts of ARDC for mutual assistance in the completion of common projects.

b. Liaison with APGC and other agencies will be maintained as determined by Headquarters SAC for participation in such joint projects as may be directed.

c. Special fund requirements necessary to accomplish this mission will be submitted to the Comptroller, this Headquarters (2AF), for processing through Headquarters SAC. Normal fund requirements for this mission should be included in annual budget estimates.

4. 2AF Ltr# 23-5, 9 September 1953, (S) Exhibit# 2 .

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CHAPTER II

PERSONNEL

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PERSONNEL

General Personnel Analysis. Personnel statistics for manning in required specialties, reenlistment rates, and AWOL rates, for wings of the Strategic Air Command are computed on a standardized basis under the SAC Wing Management Control System.* This system was adopted by SAC "to provide a procedure by which the commander and his staff will be aided in determining effectiveness in reaching and maintaining prescribed and implied goals and the efficiency with which available resources are used." Also "to provide information on individual factors affecting the performance of wings so that corrective action can be instituted."(U)

The basis of computation is standardized on the percent of maximum score (100) obtained, irrespective of the scoring table from which the percentage is procured.(U)

Manning in Required Specialties. In the tables listed below the airmen are given two categories, direct and indirect support. This was done to highlight airman manning in the critical direct support skills which included the following career fields:

30 - Radio - Radar Systems 32 - Armament Systems Maintenance
33 - Atomic Weapons 40 - Intricate Equipment Maintenance
42 - Aircraft Accessories Maintenance 43 - Aircraft and Engine Maintenance AFSC - 293X4 - Airborne ECM Operator. (U)

* Reference SAC Technical Pamphlet # 170-1, January 1956, Files Wg Adj Sec, 376 BOMWGM

Manning in Required Specialties. (MIRS)[1] (U)

	Officers Percent	Airmen (Direct) Percent (Support)	Airmen (Indirect) Percent (Support)
November	86.6	78.6	69.0
December	81.6	75.2	67.7
January	81.0	88.8	69.8
February	82.6	81.9	73.7
March	81.9	82.8	72.4
Average	81.74	81.46	69.08

Percent of Maximum Score. (100).

	Officer	Airmen (Dir. Sup)	Airmen (Ind Sup)
November	60	30	10
December	40	20	10
January	40	90	10
February	40	50	10
March	40	60	10
Average	44	50	10 *

Effective Manning in Airmen Career Fields. At the end of the historical reporting period the effective manning in airman career fields considered critical was as shown in the table below: (U)

AFSC	Auth.	Asgd.	Known Losses	Projected Manning
204XX	11	7	1	64%
401XX	3	1	0	33%
423XX	79	53	5	67%
451XX	5	2	0	40%
462XX	34	22	2	65%
534XX	49	22	2	47%
603XX	24	14	1	58%
702XX	94	56	3	60%
732XX	36	24	2	67%
901XX	11	7	0	63%

* In the scoring system for airmen MIRS all percentages 74.8 and below are rated 10 which accounted for the identical figures

1. SAC Managements Control System Reports for November 1955, December 1955, January 1956, February 1956, and March 1956; on file D/P, 376 BOMB GM.

Officers. Manning in required specialties (MIRS) for officers showed a slight regression in December from the November figures and then held constant for the remainder of the five-month period of this report. The large percentage drop of 20 points of the maximum score (60 to 40) was caused by the variation of the scoring table. The November figure of 86.6 fell in the 86.0 to 87.9 bracket, or 60 points; the December figure of 81.6 was two brackets below, in the 80.0 to 82.9 bracket, or 40 points. (U)

Airmen in Direct Support. The MIRS for direct support airmen in November and December showed regression in most organizations of the wing due to discharges, transfers, and assignment of unskilled replacement. In January, there was a sharp increase to 88.8 percent, an increase of 13.6 percent over the previous month. This increase was attributed to proper re-classification procedures and a change in T/O which deleted 156 airmen direct support T/O spaces. These spaces had been filled by a cadre which had been transferred to the 341st Bombardment Wing (M) at Abilene Air Force Base, Abilene, Texas. The authorization change was reflected in the January Unit Manning Document. The decrease in February was attributed to transfers and a low reenlistment rate for the month. For March, the MIRS figures increased 0.9 percent from 81.9 percent to 82.8 percent. (U)

Airmen in Indirect Support. The MIRS for airmen in indirect support remained constant throughout the historical reporting period, at ten percent of the maximum score. There was a variation of six percent between the December low of 67.7 percent, and the February high of 73.7 percent. This deviation did not affect the percent of maximum score as all percentages of 74.8 and below are rated at ten percent. The average monthly percentage for airmen in indirect support was 69.08. (U)

Personnel Gains and Losses. The consolidated figures for gains and losses for officers and airmen for the period are listed in the table below. (U)

Gains and Losses[2]

	Officers		Airmen	
	Gains	Losses	Gains	Losses
November	8	19	29	197
December	4	14	67	71
January	10	17	8	113
February	10	10	37	73
March	7	17	33	125
Total	42	77	183	585
Average	8.4	15.4	30.6	117

With the exception of the month of February, losses of officers exceeded the gains each month. For airmen, losses exceeded the gains for each month of the period. (U)

Personnel Manning. The manning tables listed below are consolidated for the reporting period. (U)

Officer Manning [3]

	Auth.	Asgd.	Effective Asgd. and MIRS	Percent
November	456	406	369	80.9
December	456	397	372	81.6
January	453	390	360	79.5
February	453	390	367	81.0
March	453	379	362	79.91
Average		392.4	366	80.58

2. IBID
3. IBID

Airmen Manning

Direct Support

	Auth.	Asgd.	Effective Asgd.	Number MIRS	Percent MIRS
November	1247	1391	1081	940	78.6
December	1247	1300	1028	904	75.2
January	1108	1230	1053	944	88.8
February	1108	1196	1042	868	81.9
March	1108	1109	1020	917	82.8
Average		1229.4	1044.8	914.6	81.46

Indirect Support

	Auth.	Asgd.	Effective Asgd.	Number MIRS	Percent MIRS
November	588	444	388	341	69.0
December	588	451	372	343	67.7
January	569	486	379	362	69.8
February	569	487	454	394	73.7
March	569	482	460	394	74.2
Average		470	410.6	366.8	69.08

AWOL- Rate per 1000 - The Wing scores for the AWOL rate per 1000 were based on consolidated data for all units of the wing. The scores are listed in the table below: (U)

AWOL Rate Per 1000[5]

	Number	Percent	Percent of Max. of Score
November	4	1.85	100
December	4	0.27	100
January	4	0.19	100
February	4	1.93	100
March	4	2.03	100

The apparent discrepancy in the above table as shown by the number of AWOL's being the same each month with the percentages different for each period, and the percent of maximum score being the same is explained as follows:* (U)

The scores are computed by dividing the total number going AWOL by the mean strength figures of the wing and multiplying that value by 1000. As figures vary due to a number of different factors, the percentages

4. IBID
5. IBID
*. References SAC Tech Pamphlet #170-1, January 1956, Files Wg. Adj. Sec, 376 BOMWGM.

vary. Under the scoring system for AWOL rates, the percentage zero to 2.3 percent, rates 100 percent of the maximum score. The highest figure for the five-month period was 2.03 percent for March; therefore every month rated 100 percent of the maximum score. (U)

Combat Crew Status

November: B-47 Crews.[6] There was a gain of one co-pilot in November, but this gain was off-set by the loss of one aircraft commander, two co-pilots, and one observer. Crew member changes involved four aircraft commanders, three co-pilots, and one observer. (S)

In November 1955, there were three new crews formed. These crews were coded "IN" (incomplete, non-combat ready). Three crews were upgraded; two non-combat ready (N) crews to combat ready (R), and one combat ready (R) crew to lead crew (L). Five crews were disbanded; three combat ready crews, and two "IN" crews. (C)

Officer manning in AFSC's 1234B (Pilot, B-47) and 1245 (Pilot, AOB), remained critically short. There were 132 authorized in November, 107 were assigned with an anticipated loss of 13 during the period 1 December 1955, to 1 March 1956. The officer manning in AFSC 1525B (Aircraft Observer Navigator B-47) was becoming critical in November due to anticipated losses. There were 75 authorized and 63 assigned with an anticipated loss of ten during the period 1 December 1955, to 1 March 1956. (C)

The average number of combat-ready lead crews assigned during November 1955, was 37. A total of 813 hours (excluding test flight time) was flown for an average of 22 hours per crew. (S)

6. Bombardment Air Training Rpt., November 1955 (RCS: 3 - SAC - T12) 376 BOMWGM, on file D/O, O&T, 376 BOMWGM.

November: KC-97 Crews[7] During November, the following crew members were gained; six pilots, one navigator, two engineers, three radio operators, and eight assistant boom operators. The following crew members were lost; four aircraft commanders, two pilots, one navigator, one engineer, one radio operator, two boom operators, and four assistant boom operators. The net losses for the month were: four aircraft commanders, and two boom operators. Changes in crew members involved; two navigators, one engineer, three radio operators, and four assistnat boom operators. (S)

One new crew was formed in November. That crew was coded "IN" (non-bombat ready, with one or more crew members incomplete.) One combat ready (T) crew dissolved 16 November, and one "M" (all crew members checked out, but not considered combat ready) crew was upgraded to a "T" rating on 30 November. There were two standardization crews. Three non-combat ready crews were capable of emergency deployment.(C)

The average number of combat ready crews assigned during November was 20. A total of 396 hours (excluding test flights) was flown for an average of 22.0 hours per crew (excluding the two standardization crews.) (S)

December : B-47 Crews[8] There was a net loss of one aircraft commander, two co-pilots, and one observer in December, and only one observer was gained. Changes involving crew members comprised three commanders, and three co-pilots. There was one "IN" (incomplete) crew formed on 1 December 1956. One combat ready (R) crew was up-graded to a lead (L)

7. Refueling Air Training Rpt., November 1955 (RCS: 4 SAC-T12)
8. Bomb Air Trng Rpt., December 1955 (RCS: 3-SAC-T12, 376 BOMWGM, Exhibit# 3 .

crew. One select (S) crew was transferred and two "IN" crews were disbanded. One select crew (S35) was designated the wing standardization crew, and three select crews (S11,S16,S70) were designated squadron standardization crews.(S)

Officer manning in AFSC's 1234B and 1245 remained critically short in December. Manning in AFSC 1525C 1525B (Observer) was becoming critical due to anticipated losses. There were 75 authorized with 55 assigned, with an anticipated loss of eight during the period 1 January 1956 to 1 February 1956. Supply Officers, AFSC 6426 were becoming critical due to pending loss of seven supply officers. There were 11 authorized, with ten assigned. There were only four electronics officers (AFSC 3054) assigned as against nine authorized, with no known inputs.(S)

The average number of combat ready/lead crews assigned was 36 in December. A total of 743 hours (excluding test flight time) was flown for an average of 21 hours per crew. (S)

December, KC-97 Crews.[9] Gains of crew members in December were one aircraft commander, one navigator and one radio operator. Those gains were more than off-set by the losses which consisted of; one aircraft commander, five navigators, one engineer, one radio operator, one boom operators. The changes in crew members were; two aircraft commanders, one pilot, two navigators, and one engineer. There were no new crews formed in December, nor was there any change in status of crews. Two non-combat ready crews were capable of deploying in event of an emergency.

9. Refule Air Trng Rpt., December 1955 (RCS: 4-SAC-T12), 376 BOMBGM, Exhibit # 7 .

The average number of combat crews assigned was 18 during the month of December. A total of 266 hours (excluding test hops) was flown for an average of 14.8 hours per crew (excluding two standardization crews.) (S)

January,[10] February,[11] March,[12] 1956, B-47 Crews. The status of combat crew personnel for January, February, and March will be consolidated as the period coincides with the first training quarter of 1956. Where there are pertinent coments for one particular month it will be so noted.

The combat crew member gains for the three months were one aircraft commander, three co-pilots, and two observers. The losses were five aircraft commanders, nine co-pilots and six observers, which created a heavy balance on the debit side. Crew members changes involved three aircraft commanders, 12 co-pilots, and six observers. There were three "IN" crews formed; 15 January 1956, 20 January 1956, and 6 March 1956. (S) The changes pertaining to status of crews were:

(1) IN 42 to N42, Upgraded (Feb)
(2) IN 61 to N61, Upgraded (Feb)
(3) R15 to L15, Upgraded (Mar)
(4) L42 to IN42, Regressed (Jan)
(5) L78 to R78, Regressed (Jan)
(6) L51 to R51, Regressed (Feb)
(7) L68 to R68, Regressed (Feb)
(8) N61 to IN61, Regressed (Mar)
(9) IN12 to Disbanded (Jan)
(10) In13, Disbanded (Jan)

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10. Bomb Air Trng. Rpt., January 1956 (RCS;3-SAC-T12), 376 BOMWGM, Exhibit# 4 .
11. Bomb Air Trng. Rpt., February 1956 (RCS:3-SAC-T12) 376 BOMWGM, Exhibit# 5 .
12. Bomb Air Trng. Rpt., March 1956 (RCS:3-SAC-T12) 376 BOMWGM, Exhibit# 6 .

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(11) R85, Disbanded (Jan)
(12) In58, Disbanded (Feb)
(13) In88, Disbanded (Feb)
(14) R77, Disbanded (Mar)
(15) L05, Transferred (Mar)

The wing standardization crew was S09, and crews S11, S16 and S70 comprised the squadron standardization crews.(S)

Officer manning for the three months in AFSC's 1234B and 1245 showed an increase. At the end of the period (31 March 1956) of 132 authorized, 93 were assigned with a projected gain of seven for a projected manning of 75.9 percent. Of the 100 assigned and/or projected, 28 were not qualified in tactical aircraft and at the end of March were undergoing formal training. (C)

The Manning in AFSC's 7321/24 (Personnel Officer had remained critical during the entire period with nine authorized and four assigned. Anticipated input for that career field was three compared with a projected loss of one. (C)

In the armament career field (AFSC 3216/3234/3200/3254/3244), manning was projected to reach the critical stage shortly after the end of the reporting period. With 12 authorized, nine were assigned with a projected loss of three for a projected manning of 50 percent.

Officer manning in the aircraft maintenance career field was also due to become critically short. With 21 authorized, 17 were assigned with a projected loss of five as compared to an input of one. That would reduce the effective manning to 61.9 percent.(C)

The average number of combat ready/lead crews assigned during January was 35. A total of 795 hours (excluding test flight time) was flown for an average of 30 hours per crew. For March, the average number of combat ready/lead and select crews assigned was

33. A total of 1327 hours (excluding test flight time) was flown for an average of 40.2 hours per crew.(S)

January, KC-97 Crews.[13] In January, the gains were again out-numbered by the losses. The gains were three pilots and one radio operator; as against the losses of two aircraft commanders, one pilot, four navigators, two flight engineers, one radio operator, two boom operators, ten assistant boom operators, and six radio operators. Two "IM" crews were upgraded to combat ready (T) status effective 1 January 1956. One combat ready crew was disbanded effective 10 January 1956. Two crews (T-02 and T-06) were designated squadron standardization crews for the month of January.(C)

The average number of "IM" crew members available during January (excluding boom operators) was 10.3. A total of 264.5 hours was flown by those crew members for an average of 26 hours, each crew. Fourteen boom operators were not flown during January pending approval or disapproval of the payment of flying pay for boom operators assigned in excess of 1.5 manning authorization. That decision was still pending at the end of January. The average number of combat ready crews assigned during January (excluding the two standardization crews) was 18. A total of 499 hours (excluding the test hops) was flown for an average of 26 hours per crew (excluding the two standardization crews).(S)

In January, the 376th Air Refueling Squadron was confronted by a critical personnel problem in regards to navigators that would exist prior to the month of May. Of the 28 navigators assigned in January, ten would leave the squadron for various reasons. Those reasons would include two who would be discharged, four who were qualified and had

13. Refuel Air Trng Rpt - January 1956 (RCS:4-SAC-112), 376 BOMWGM, Exhibit#8 .

applied for pilot training, three going to upgrading school, and one for a permanent change of station. Unless adequate replacements could be assigned and trained before May, three combat ready crews and three "IM" crews would be dissolved for lack of navigators.(S)

February - KC-97 Crews.[14] The gains were outnumbered by the losses again in February, with the exception of pilots where two were gained as against one loss. Other gains included one radio operator and one boom operator, but losses were one navigator, two radio operators, and four boom operators. The crew member changes were; one aircraft commander, two pilots, two navigators, and one engineer. There were no new crews formed nor any changes in crew status. The two squadron standardization crews remained the same. The average number of "IM" crew members available for training for the entire month was 23. A total of 1023 hours was flown by those crew members for an average of 44.5 hours per man. Of the 22 other non-checked - out crew members available for only a portion of the month, the pro-rata total hours required was 205. Flying accomplished by those personnel totaled 207 hours. The average number of combat ready crews assigned during February (excluding the two standardization crews) was 18. A total of 571.25 hours (excluding test hops) was flown for an average of 30.05 (excluding the two standardization crews).(S)

The shortage of navigators replacement was still critical in February, to the point that if any transfers were made it would result in crew regression.(S)

14. Refuel Air Trng. Rpt., February 1956 (RCS:4-SAC-T12), 376 BOMWGM Exhibit#9 .

March, KC-97 Crews.[15] The gains and losses in March were still unbalanced. Crew members gained were eight pilots, three radio operators, and two boom operators. The losses totaled; two aircraft commanders, three pilots, five navigators, four flight engineers, three radio operators, and eight boom operators. Crew member changes in March involved three aircraft commanders, four pilots, nine navigators, six flight engineers, seven radio operators, two boom operators and ten assistant boom operators. One new "IM" crew was formed effective 29 March 1956. Changes in crew status were :(C)

(1)	M21	Upgraded to T21	(1 Jan 56)
(2)	M27	Upgraded to T27	(1 Jan 56)
(3)	T13	Dissolved	(10 Jan 56)
(4)	T19	Dissolved	(1 Mar 56)

The two squadron standardization crews remained the same for March.

The average number of combat ready crews assigned during March (excluding the two standardization crews) was 18. A total of 818 hours (excluding test hops) was flown for an average of 45.30 hours per crew (excluding the two standardization crews).(S)

The shortage of navigator replacements mentioned above was still critical at the end of March.(U)

15. Refuel Air Trng Rpt., March 1956 (RCS:4-SAC-T12), 376 BOMWGM Exhibit# 10.

Changes in Key Personnel (U)

Between the beginning of this historical reporting period (1 November 1955), and the end of the period (31 March 1956), there were certain changes in positions and personnel. The Chief of Plans and the Chief of Bombardment were not shown on the March roster, while added were the Director of Safety, the Deputy Director of Test and Tactics, and the Maintenance Control Officer.

The personnel changes were as follows:

Directorate of Operations. Colonel Robert J. Leimbacher, Director, was transferred to the 301st Bombardment Wing (M) in February 1956, and Colonel William B. Colson of that wing became the Director of Operations of the 376th Bombardment Wing (M).

Directorate of Materiel. Colonel Felix A. Kalinski, Director, resigned from the Air Force during January 1956, and was succeeded by Lt. Colonel Robert S. Milner, who had been Commander of the 513th Bombardment Squadron (376th Bmg (M)).

Directorate of Countermeasures, Test and Tactics. In March 1956, Lt. Colonel Richard G. Hall, Director, was succeeded by Lt. Colonel John C. Peck who had recently arrived from an overseas assignment. Colonel Peck was placed on temporary duty at advanced flying school at Wichita, Kansas. This was reflected in the roster of 31 March 1956, which listed Colonel Hall as Deputy Director and Acting Director.

Directorate of Comptroller. The Director of Comptroller, Major Richard K. Cunliffe, was transferred overseas in January 1956, and Lt. Colonel Richard W. Stillwagon, reporting from Ramey Air Force Base, Puerto Rico, assumed duty as Comptroller.

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512th Bombardment Squadron. The Squadron Commander, Lt. Colonel John Luts, was transferred to Abilene Air Force Base, Abilene, Texas, and was succeeded by Major Dudley V. Brand, formerly the operations officer of the squadron.

513th Bombardment Squadron. When Lt. Colonel Robert S. Milner became the Director of Materiel in January 1956, as mentioned previously, his duties as Commander of the Squadron were assumed by the Operations Officer, Major George T. Grammes.

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Roster of Key Personnel
1 November 1955

Wing Commander	McElroy, Stephen D.	Colonel
Deputy Commander	Calhoun, Robert T.	Colonel
Dir. Of Operations	Leibbacher, Robert J.	Colonel
Dir. of Materiel	Kalinski, Felix A.	Colonel
Dir. of Personnel	Torma, Joseph J.	Lt. Colonel
Dir. of Test and Tactics	Hall, Richard C.	Lt. Colonel
Dir. of Comptroller	Cunliffe, Richard K.	Major
Chief of Plans	Hall, James H.	Lt. Colonel
Chief of Maintenance	Holman, Averill F.	Lt. Colonel
Chief of Intelligence	Kolpin, Shirley A.	Lt. Colonel
Chief of Bombardment	Plascak, Nick	Major
Wing Adjutant	Murphy, William H.	Major

Commanders of Assigned Units

Hq. Sq. Sec.	Fairbanks, Russell C.	Major
376th Tac. Hosp.	Dugan, Charles C.	Major
512th Bomb Sq.	Luts, John	Lt. Colonel
513th Bomb Sq.	Milner, Robert S.	Lt. Colonel
514th Bomb Sq.	Brendle, George R.	Lt. Colonel
376th Air Ref. Maint. Sq.	Lack, Wendell D.	Lt. Colonel
376th Per. Maint. Sq.	Lamb, Chester R.	Major
376th Fld. Maint. Sq.	Hunt, Seaborn M.	Major
376th A&E Maint. Sq.	Matthews, Edward R.	Lt. Colonel

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Roster of Key Personnel
31 March 1956

Wing Commander	McElroy, Stephen D.	Colonel
Deputy Commander	Calhoun, Robert F.	Colonel
Wing Adjutant	Murphy, William H.	Major
Dir. of Operations	Colson, William E.	Colonel
Dir. of Intelligence	Kolpin, Shirley A.	Lt. Colonel
Dir. of Materiel	Milner, Robert S.	Lt. Colonel
Chief of Maint.	Holmand, Averill	Lt. Colonel
Maint. Control Officer	Carlisle, Joe L.	Major
Dir. of Safety	Kelleher, James F.	Major
Dir. of Comptroller	Stillwagon, Richard W.	Lt. Colonel
Dir. of Personnel	Torma, Joseph J.	Lt. Colonel
Dir. of Test and Tactics	Peck, Joseph J.	Lt. Colonel
Dep. Dir.(Acting Dir.)	Hall, Richard G.	Lt. Colonel

Commanders of Assigned Units

Hq. Sq. Sec.	Fairbanks, Russell C.Jr.	Major
512th Bomb Sq.	Brand, Dudley V.	Major
513th Bomb Sq.	Grammas, George T.	Lt. Colonel
514th Bomb Sq.	Brendle, George R.	Lt. Colonel
376th Air Ref. Sq.	Lack, Wendell D.	Lt. Colonel
376th A&E Maint. Sq.	Matthews, Edward E.	Lt. Colonel
376th Per. Maint Sq.	Lamb, Chester A.	Major
376th Field Maint Sq.	Hunt, Seaborn M.	Major
376th Tac. Hospital	Dugan, Charles C.	Major

CHAPTER III
OPERATIONS

OPERATIONS

This chapter will consist of two parts under the heading of Operations; and Countermeasures, Tests, and Tactics. The part on Operations will include the training flights as a composite phase of the operating accomplishment of the wing mission. Projects of the Directorate of Countermeasures, Tests and Tactics are included as part of the Operations Chapter because all phases of DCTT are an integral part of the primary mission of the wing, and all the flight tests required are performed as part of the operational activities of the 376th Bombardment Wing, Medium.(UNCL)

OPERATIONS

All flights of the 376 Bombardment Wing, Medium, flown both as training flights and missions directed by higher headquarters, were assigned code names. There were certain exceptions, which will be described later. The following are brief summaries of the coded missions and other flying operations:(UNCL)

These descriptions are not necessarily in chronological order of the five-months of November 1955, through March 1956, which comprise this historical report. (UNCL)

Texas League (2AF Ops Ord 501-55).[1] (S) This exercise was designed as a realistic test to be conducted of the every-day capability of the air defense system of the North American continent; to detect, identify, and intercept an air attack upon the North American continent. The exact mission was; (a) to launch simulated aggressor attacks against North American targets as specified in the operations order,

1. 2AF Ops Ord 300-55 (Texas League) (S), on file Plans, D/O. 376 BOMWGM.

and (b), test certain strategic concepts, procedures and tactics.(S)

Post Hole (2AF Ops Ord 300-55), (C)[2]

This exercise had as its mission: To accomplish a simulated radar bombing evaluation mission against a "Bravo" type target. The objectives of this evaluation were:(C)

a. To determine the current SAC bombing capability against airfield target utilizing only target material based on 15-year old photography.(C)

b. To exercise and appraise wing staff and aircrew capability to plan and execute assigned mission.(U)

c. To exercise and appraise wing and reconnaissance technical squadron photo interpreter's capability to score impact points from radar scope photography.(U)

d. To exercise and appraise wing photo interpreter's ability to determine yield and height of burst from simulated AN/ASH-4 photography.(U)

Tail Gate (SAC Ops Ord 400-56). (S)[3]

This exercise had as an objective to execute the loading phase of Fourth Air Division Deployment Plan and perform a unit simulated combat mission(USCM) with realistic advance notification of execution. This exercise was held in conjunction with an inspection by the SAC Inspection General.(C)

Snow Bank (376 Ops Ord 35-56).(C)[4]

This exercise had as its mission: To accomplish a radar, simulated bombing, evaluation mission against a "Bravo" type target located near

2. 2AF Ops Ord 300-55, (Post Hole), on file, Plans, D/O, 376 BOMWGM.
3. SAC Ops Ord 400-56, (Tailgate), on file, Plans, D/O, 376 BOMWGM.
4. 376 Ops Ord, 35-56 (Snow Bank), on file, Plans, D/O, 376 BOMWGM.

near Rhinelander, Wisconsin. It also was to exercise the intercept capability of the 35th Air Division in the Memphis and Knoxville, Tennessee areas.(U)

Big Wind (4AD Ops Ord 23-56). (S)[5]

In this operation a requirement existed to conduct USCM and Cold Weather exercise for Fourth Air Division units. The USCM was conducted by 301st and 376th Bombardment Wings, Medium, and the Cold Weather exercise with the 301st and 376th Air Refueling Squadrons. The wing had a concept consisting of a multiple-wave strike effort employing forces launched from home station and incorporating: (S)

a. Two pre-strike Air Refuelings. (S)

b. A strike on targets in Northern and Central France.(C)

c. A post-strike staging at Lakenheath in the United Kingdom.(S)

The 376th Bombardment Wing, Medium, had an additional mission when the 4AD B-47 aircraft re-deployed from Lakenheath, England, to Barksdale AF Base. This mission was to conduct electronic jamming and chaff dispensing during the re-deployment for the purpose of providing ECM training for units of the Eastern Air Defense Force. (S)

Big Snow, Little Snow, and Big River. *

These were electronic countermeasure missions for proficiency training under the provisions of Supplement 8, SAC Regulation 50-8.(U)

Miscellaneous operations and exercise included Sea Horse and Winter Wind for the 376th Air Refueling Squadron; Standard Evaluation

5. 4AD Ops Ord 23-56 (Big Wind) (S), on file O&T, I/O, 376 BOMWM.
*. The section on countermeasure, tests and tactics describes the flight test missions embodied in the SAC-U30 reports for November, December, 1955, and January, February and March 1956. Exhibits 11, 12, 13,14,15.

SECRET

Squadron (SES) evaluations; and tests and tactics missions. Other flying hours included ferrying air-craft to and from modification depots; ferry flights for IRAN (inspect and repair as necessary); and certain passenger flights.

B-47 Aircraft.(U)

(S) The hours flown during the five-month period by the B-47 aircraft of the 376th BOMWGM performing missions ordered by higher headquarters were:[6]

Electronics Countermeasures	
Ferrying aircraft-modification depots	364.15
SES Evaluation	152.30
Exercise Texas League	279.60
Exercise Post Hole	265.50
5X Time. (Flying Time Staff Officers, & non-combat ready crew members)	164.00
Exercise Snow Bank	848.00
Exercise Tail Gate	197.05
Exercise Big Wing	153.45
	765.45

During the month of November 1955, 33 aircraft days were lost due to double drag angle cracks. This resulted in the loss of 11 scheduled sorties. In addition, nine scheduled sorties were lost due to a stand-down for maintenance required for Exercise Texas League.(U)

Crew M42 did not accomplish one visual RBS and one visual release due to the observer being placed in duty not involving flying (DNIF) status for the last three weeks of the training quarter. Crew M46 did not complete the night celestial requirement since one navigation leg was not scored due to a camera malfunction.(U)

During the month of December, 15 aircraft days were lost due to double drag angle, cracks. Nine sorties were lost due to postponement

6. Flying hours obtained from Bomb Air Trng Rpts (RCS:3-SAC-T12) for November and December 1955, and January, February, March 1956, Exhibits 3,4,5,6, and files OT, D/O,376 BOMWGM.

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of the Texas League mission. There were 17 sorties lost due to alerts ordered by higher headquarters. A requirement levied to pick-up wing tanks at Marietta, Georgia resulted in the loss of 16 training sorties. Concentration was directed during December primarily in the training of non-combat ready crews in areas such as transition and 51-19 training, for the crews future upgrading.(U)

During January 1956, ten aircraft sorties of 6.5 hours each were lost due to local weather conditions.(U)

During February, a Command effort was made to insure that an average of at least 75 hours flying time per "IN" crew member was accomplished by the end of the quarter ending 31 March 1956. That training had been given priority over all other training.(U)

During the month of March, 12 aircraft sorties 6.5 hours each were lost due to local weather conditions.(U)

The 376 Bombardment Wing, Medium accomplished 94.7 percent of SAC Regulation 50-8 minimum training requirements during the quarter ending 31 March 1956. One-hundred percent was not accomplished due to the emphasis placed during the last half of the quarter on SAC Regulation 51-19 training of 17 available "IN" crew members.(U)

<u>KC-97 Aircraft</u>.

(S) The hours flown during the five-month period by the KC-97 aircraft of the 376 BOMWGM performing missions ordered by higher headquarters were: *

Ferrying Flights (IRAN)	40.60
Exercise Sea Horse	33.35

*. Statistics on flying hours obtained from Refueling Air Training Rpts, (RCS:4-SAC-T12) for November, 1955, on file 376 ARS, 376 BOMWGM; December 1955, Exhibit 7; January 1956, Exhibit 8; February 1956, Exhibit 9; March 1956, Exhibit 10.

Tests and Tactics Missions	131.05
Passenger Flights	282.20
Exercise Winter Wind	51.55
Exercise Texas League	30.05
Higher Headquarters Flights	1138.30
Exercise Tail Gate	85.30
Exercise Big Wind	572.45

During November three non-combat ready (M) were available for training.(S) A total of 113 hours were flown for an average of 37.7 hours per crew. Four sorties for a total of 13 hours were flown as "5X" time in training non-combat ready crew personnel.[7] (U)

During December, the 376th Air Refueling Squadron was unable to fly seven sorties, scheduled for a total of 37 hours, because of weather conditions. Nine sorties for training mission were not flown because of alert exercises. Also, during December, two non-combat ready crews (M-21 and M-27) were capable of deploying in event of an emergency. Two non-combat ready (M) crews were available for training during the month. One crew flew a total of 33 hours and the other a total of 34 hours.[8] (U)

Pilot proficiency training was low in December due to 24 hours lost to weather and EWP alerts; ten hours lost because of re-scheduling for higher headquarters missions; and four hours lost because of an air abort. Only five pilots in initial checkout training were available during the month; the remainder were attending MTD's. Three of the five available pilots completed SAC Regulation 51-19 requirements and the other two were 75 percent complete. Concentration of flying training for December was placed on non-combat ready crew

7. Ref Air Trng Rpt - November, on file 376 ARS, 376 BOMWGM.
8. Ref Air Trng Rpt - December, Exhibit 7.

training, progress toward initial checkout of crew members not assigned to crews, and upgrading of co-pilots and assistant boom operators.[9] (U)

During January 1956, two training sorties, scheduled for a total of ten hours, were not flown because of Fourth Air Division alert exercises. There were no training missions lost because of local weather conditions.[10] (U)

During February 1956, one sortie scheduled for five hours was lost due to local weather conditions. Thirty air refueling sorties were scheduled with receivers of 70th Strategic Reconnaissance Wing from Little Rock, Arkansas, with a total of 11 ineffective due either to receivers cancellation or abort. Thirteen sorties scheduled for Operation Tail Gate were not flown due to weather. The 376th Air Refueling had completed 77 percent of the combat ready crew quarterly training requirements as of 29 February[11] 1956, with completion of 100 percent on 31 March 1956. (U)

In the month of March 1956, 15 training sorties scheduled for eight hours duration were lost due to weather conditions. During the quarter ending 31 March 1956, there were 23 SAC Regulation 51-19 status crew members available for flying. These crew members flew a total of 2284 hours for an average of 99.30 hours per man.[12] (U)

9. IBID
10. Ref Air Trng Rpt - January, Exhibit 8.
11. Ref Air Trng Rpt - February, Exhibit 9.
12. Ref Air Trng Rpt - March, Exhibit # 10.

COUNTERMEASURES, TESTS AND TACTICS

The Directorate of Countermeasures, Tests and Tactics (DCTT), 376th BOMWGM, was charged with an important part in implementing the mission of the wing. To this Directorate was assigned the responsibility of developing and testing both tactics and electronic countermeasure techniques. Also, maintain a field laboratory for necessary operational engineering. Laboratory activities would include short-term design and modification of equipment for operational testing. The Directorate would also determine the capability of existing electronics equipment for tactical employment by SAC and recommend adaptions and refinements which would increase the capability of existing equipment.[13] (S)

A summary of the projects undertaken and carried out by DCTT for the five-months period of this historical reporting period is given below:

Test Project Number IX, "Development of an Unattended Communications Jammer."[14] (S)

This project was initiated 2 June 1953. In March it was 54 per cent complete with an estimated date of completion for March 1957.

The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously

13. 2AF Reg # 23-8, 24 June 1955, Mission of 376 BOMWGM; 2AF Ltr # 23-5, 9 September 1953, Classified Mission of 376 BOMWGM (secret). Exhibits # 1 and # 2 .
14. Rpt, 376 BOMWGM to 2AF, subj: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), 9 December 1955; hereafter cited as SAC-U30-November, Exhibit # 11

searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position, and the receiver re-cycles for normal search. The transmitter is modulated from two sources, a noise generator and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer; thus preventing the possibility of more than one jammer occupying the same frequency simultaneously.[15] (S)

In February, Strategic Air Command directed that the project would be designated in the future as Test Project 34.[16] (U)

A detailed account of the tests on Project IX (new number 34) will be found as exhibits in the appendix to this historical report.[17] (U)

15. IBID
16. Rpt, 376 BOMWGM to 2AF, subj: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), 7 March 1956; hereafter cited as SAC-U30-February, Exhibit # 14 .
17. SAC-U30-November, Exhibit # 11 ; Rpt, 376 BOMWGM to 2AF, subj: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), 10 January 1956, hereafter cited as SAC-U30-December, Exhibit # 12 ; Rpt, 376 BOMWGM to 2AF, subj: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), 9 February 1956, hereafter cited as SAC-U30-January, Exhibit # 13 ; SAC-U30-February, Exhibit # 14 ; Rpt, 376 BOMWGM to 2AF, subj: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), 9 April 1956, hereafter cited as SAC-U30-March, Exhibit # 15 .

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At the end of March, tests had been scheduled during the period 3 through 5 April that included using a Navy destroyer located 200 miles off-shore in the Gulf of Mexico as a ground station or victim signal.[18] (S) Two KC-97 aircraft would be used, one acting as the simulated fighter and the other as the simulated bomber carrying the search-and-lock-on jammer. (S)

As modifications were made, additional flight tests would be conducted to determine their effect. If the flight tests did not indicate a need for modifications, the jammer would be completed by adding identification and sequential devices. Final flight testing of the jamming system would be conducted when those devices had been added. (U)

Test Project Number 6, "Minimum Performance Standards of ECM Equipments and Installations."[19] (C)

This project was initiated in May 1952 on a continuous basis. It had been discontinued when difficulties occurred with the "Blue Cradle" and the QRC-27 (t) was installed and tested in the "Blue Cradle". No action was taken on this project while the 376 BOMWGM was TDY overseas from July to October 1955, but had been reinstated in December 1955.[20]

The project directive was brought up-to-date to provide minimum performance, maintenance and inspection standards for ECM systems on hand in the 376th and other SAC wings. Equipment to be studied and

18. SAC-U30-March, Exhibit # 15 .
19. SAC-U30-December, Exhibit # 12 . SAC-U30-January, Exhibit # 13 .
20. SAC-U30-December, Exhibit # 12 .

order of precedence were as follows.[21] (C)

1. ECM antennas and RF cabling systems
2. AN/ALT - 8
3. AN/ALT - 6
4. AN/ALT - 7
5. AN/APS - 54
6. AN/APT - 9
7. AN/ALA - 10
8. AN/ALE - 1

Tests were begun in January, but in March, additional work on the project was held in abeyance pending receipt of a new Headquarters, Strategic Air Command directive which would set down new guide lines for test accomplishments.[22] (C)

Test Project Number 28, "Development of an Unattended Random Pulse Jammer."[23] (S)

This project was initiated on 1 November 1954.

The jammer being designed under this test project is an unattended, sweeping, random pulsed, S-band transmitter. Purpose of the jammer is to delay early warning radar detection of jet aircraft by creating a multitude of random spots on the radar scope. It is not expected that the spots created will resemble the arc-like returns from normal radar pluses, ncr is it proposed to synchronize the jammer with the radar pulse recurrance rate. From experience

21. SAC-U30-January, Exhibit # 13 .
22. SAC-U30-March, Exhibit # 16 .
23. SAC-U30-November, Exhibit # 11 .

and observation of early warning radars, it has been found that at long ranges such radars "paint" jet type aircraft, as the B-47, either very poorly or not at all. The paints do not occur on every sweep of the radar and generally appear as small paint echoes. These fleeting echoes are used by the radar operator to plot aircraft positioned by means of dead reckoning for considerable distance beyond the range where normal target returns are obtained. It is believed that by creating random un-synchronized pulses on the radar scope, the marginal paints can be masked and detection of jet aircraft delayed for a considerable distance.[24] (S)

A jamming transmitter for producing random pulses was constructed together with other equipment necessary for tests. Flight tests were made in January and February 1956, with encouraging results. The project however was cancelled by Headquarters, SAC in February 1956.[25] A final report covering details of the jamming transmitter, tests flown, and tests results would be prepared and submitted at a later date. (U)

Test Project Number 33, "Personal Radio Alert Equipment."[26] (U)

This project was initiated on 6 May 1956.

The SAC mission requires immediate availability of key personnel when alert conditions exist. Purpose of this project was to determine a feasible method of quickly alerting specific groups of individuals through the use of radio. Under this plan each individual would be equipped with a small radio receiver that could

24. IBID
25. SAC-U30-February, Exhibit # 14.
26. SAC-U30-November, Exhibit # 11.

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conveniently be carried in a shirt pocket. This receiver would be turned to a specified frequency upon which an alert signal could be broadcast.[27] (S)

During November and December, laboratory tests and experiments were made on different types of receivers and transmitters.[28] In January and February field tests were made with a modified Regency receiver which gave only marginal performance, but results showed such a system would be feasible.[29] (U)

The project was cancelled in February by Headquarters, SAC. A final report was prepared with details of tests and results obtained. This final report is included in the appendix of this historical report as a supporting document.[30] (U)

Auxiliary Test Project Number 18 (Changed to Test Project Number 35 in February.) "Development of a VHF Communications Jammer Using Incredutors."[31] (S)

This project was initiated on 1 April 1954.

The purpose of this project was to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which allow it to be swept through the VHF frequency band and lock-on any frequency to which an

27. SAC-U30- November, Exhibit # 11; SAC-U30-December, Exhibit# 12.
28. IBID
29. SAC-U30-January, Exhibit# 13; SAC-U30-February, Exhibit#14.
30. Final Report, Test Proj# 33, March 1956, Exhibit#16.
31. SAC-U30-November, Exhibit#11.

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associated receiver is tuned. If frequency of the receiver is changed, the transmitter will automatically shift frequency to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver.[32] (S)

The estimated date of completion of this project is April 1957. An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a flyback time of 100 milliseconds, allowing five complete scans per-second. Lock-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus there was no reason to continue jamming. If there were only one signal in the swept band, it would be jammed for three-second periods at intervals of 200 milliseconds.[33] (S)

A problem anticipated on this project, and on other projects using equipment in the VHF band, is a suitable antenna for use on B-47 and other high speed aircraft. The AS-321/APT-13 antenna is being investigated for possible use at VHF frequencies. This antenna, normally a part of the AN/APT-13 system, is a stub constructed of wire mesh covered with a fiberglass plastic and is designed to mount in a standard AB-109 antenna mount. Normal and X-Ray photographs were taken of these antennas to determine their inner construction. (S)

32. IBID
33. SAC-U30-March, Exhibit #15.

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Three of these antennas were installed on a B-47 aircraft to test their aerodynamic performance. One antenna has been installed on each bomb bay door and one near the camera compartment. The antennas will remain on the aircraft during its normal flying schedule and will be removed, re-examined and X-Rayed after several flight hours to see if any structural defects have occurred. A fourth antenna is being tested in the laboratory for frequency response, band width, and standing wave ratio. Preliminary checks indicate that some type of matching device will be required so the antenna will present the proper load over the entire desired frequency range.[34](S)

Auxiliary Test Number 28 (Re-named Test Project Number 36) "S-band RF Systems" (S).[35]

This project was initiated on 1 November 1954. There is no estimated date of completion as the project is intended as a continual survey and investigation of latest techniques and RF systems.(S)

In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated.[36](S)

34. SAC-U30-March, reference incl 2&3, Exhibit #15.
35. SAC-U30-November, Exhibit #11.
36. IBID

A T-402/ALT-6 transmitter has been modified to allow the magnetron oscillator tube and tuning mechanism to be operated remotely from the transmitter case. In this manner the transmitter may be mounted in its normal position while the magnetron is installed very close to the antenna. The remote unit was constructed and tested in the laboratory to insure the magnetron would be adequately cooled through the remote cooling fluid lines. After laboratory tests were completed, the unit was mounted in the wheel-well of an aircraft in the position normally used to mount the right horn antenna. A 12-inch piece of flexible waveguide was used between the magnetron and antenna mount. A normal AN/ALT-6 installation was made in the left ATO compartment using a QRC-27 (T) transmission line and AT-528 horn antenna.[37] (S)

A B-47E aircraft Blue Cradle installation was completed wherein six AN/ALT-6 transmitters each feed RF output into a waveguide approximately 28-inches long, including a 900 H-plane bend, and radiate through apertures in the bomb bay doors. For comparison purposes, another B-47E Blue Cradle installation was made wherein four AN/ALT-6 transmitters each feed RF output through QRS-27 (t) transmission systems and radiate from QRS-27 (t) antennas installed in AB-109 antenna receptacles on the bombay doors.[38] (C)

Two flight tests were flown during March 1956, using the instal-

37. IBID
38. SAC-030-March, Exhibit #15.

lations described. These tests were flown 8 and 16 March 1956, at approximately 34,000 feet altitude against the AN/FPS-10 radar at Bartlesville, Oklahoma. Four transmitters were operated on slow sweep (20 megacycles/second) in each aircraft with frequency limits of 2700 to 3100 megacycles. On the aircraft having the waveguide installation, two of the transmitters were carried as back-up equipment in case of malfunctions. Each aircraft was to fly from an IP 200 miles east of Bartlesville to a point 200 miles west of Bartlesville; thence a west-to-east tangential run 100 miles north of Bartlesville; thence an east-to-west tangential run 150 miles north of Bartlesville; and finally a west-to-east tangential run 50 miles north of Bartlesville. This course was chosen so tests could be compared to previous tests using the helix, diamond, and QRS-27 (t) antennas.[39] (S)

Very little information was obtained from the 8 March 1956 test due to various difficulties and equipment failures.[40] (S)

The 16 March 1956, mission was a re-run of the 8 March mission, with no equipment malfunctions other than inoperative IFF on the waveguide-equipped aircraft. This required that the ground station operators compute a D/R track for a good portion of the mission. Although results of this test were encouraging, it is felt the amount of testing is insufficient as yet to make any definite conclusions. Also it is believed the waveguide installation can be further improved to increase its effectiveness. Laboratory measurements are being

39. SAC-U30-March, Exhibit# 15.
40. Difficulties and equipment failures referred to are listed on page 7, SAC-U30, Exhibit# 15.

made with the waveguide sections terminated in a simulated bomb bay door ground plans to determine the material best suited for a termination cover. Teflon, fiberglass, and other materials are to be tested as aperture covers to minimize reflections in the waveguide.[41] (C)

At the end of March, plans were being made for additional flight tests to be scheduled for further comparison and evaluation.[42] (C)

Auxiliary Test Project Number 45 (Re-named Test Project Number 37) "AN/ALQ-3 Suitability Test".[43] (S)

This project was initiated on 2 May 1955. The estimated date of completion is October 1956.

Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 S-band search-and-lock-on jamming system. At the end of March, five complete AN/ALQ-3 systems had been delivered to the 376th Bombardment Wing (M) for use on these tests. A total of 47 equipments are scheduled for delivery to the Wing; at the end of March, 16 systems had been delivered.[44] (S)

During November, three flight tests were scheduled. The first one aborted because of equipment failure after takeoff. Post-flight inspection of the equipment showed that 6083 vacuum tube (V-4017 regulator tube) in power supply number two had failed apparently having lost vacuum. Also, the coil of relay K-4001 in power supply number two had opened and prevented plate voltage from being applied to the receiver. These troubles were corrected and system number two operated successfully on the second scheduled test. The third flight test was aborted because of failure of both systems one and

41. SAC-U30-March, Exhibit# 15.
42. IBID
43. SAC-U30-November, Exhibit# 11.
44. SAC-U30-March, Exhibit#15.

two, and the lack of spare parts to make them operative.[45]

Two flights were scheduled during December to be run against an MSQ-2 tracking at Dallas RBS, Texas. System number 2 was installed on a KC-97F and pre-flighted. During the pre-flight it was noticed the noise modulation had disappeared. The equipment was returned to the laboratory and inspection revealed the modulator tube had been running very hot, which resulted in cold solder-joints on the cathode and grind-ring assemblies. Further investigation showed that overheating was due to an intermittent power connection to the modulator and magnetron cooling fan. The flight test was aborted due to lack of spare parts. The second flight test scheduled for December was aborted due to continuing difficulties encountered with both systems and the indication of the manufacturer that a modification would be necessary.[46] (S)

Three flight tests were scheduled for the AN/ALQ-3 during February, two against Dallas RBS, and one against Little Rock RBS. Both Dallas missions were aborted due to aircraft troubles and the Little Rock mission was cancelled due to replacement radar equipment in use at the site during the overhaul of the permanent radar. The B-47 Blue Cradle installations of the AN/ALQ- 3 was completed in

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45. SAC-U30-November, Exhibit #11.
46. SAC-U30-December, Exhibit #12.

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Two B47E Blue Cradles had been modified for installation of the AN/ALQ-3. Modification consisted of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes had been necessary, only the addition described above.[48] (U)

Three flight tests were conducted during March with the AN/ALQ-3 installed in a B-47E aircraft and flown against a single precision tracking radar of the MSQ-2 type at Dallas, Texas RBS site. Purpose of tests was to determine protection afforded a single AN/ALQ-3 equipped B-47 from a precision tracking radar at various ranges and altitudes within the reliable operating range of the radar. In addition, the radar susceptibility to jamming as a function of its mode of operation (fully automatic, aided range, with and without smoothing) was investigated.[49] (S)

Of the three flight tests, only two were successful.* The other was unsatisfactory because of transmitter magnetron multiple-moding at the tracking radar frequency. This resulted in no jamming power on the radar frequency, and consequently allowed the radar to track aircraft throughout the mission.[50] (C)

Auxiliary Test Project Number 46 (Changed to Test Project Number 38, February 1956), "AN/ALQ-7 Suitability Test". (S)

48. SAC-U30-March, Exhibit#15.
49. SAC-U30-March, Exhibit#15.
*. Results of the test flights given in detail in SAC-U30-March, in Appendix, Exhibit#15.

This project was initiated on 1 August 1955. The estimated date of completion is 20 April 1956.

Purpose of this project was to test and evaluate tactical use of the AN/ALQ-7 as an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width, and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7,500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyses the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter used two klystrons to cover the frequency range and has a power output up to 400 watts.[51](S)

The aircraft used for test missions was the RB-47E with the AN/ALQ-7 installed in Section 43, station 1099 to 1166. Both receiving and transmitting antennas are mounted on the bottom of the aircraft.[52](C)

Missions were flown using the AN/ALQ-7 during November, December 1955, and January, February and March 1956.* Results of

51. SAC-U30-November, Exhibit#11.
52. SAC-U30-March, Exhibit#15.
*. Missions given in detail in SAC-U30-reports for November, December, January, February, and March, in appendix respectively as Exhibits# 11,12,13,14,15.

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missions against the M-33 precision tracking radar indicated the AN/ALQ-7 was capable of initiating a receiver lock-on and transmitter jamming condition out to maximum range or radar, which was 100,000 yards or 50 nautical miles. It would continue to provide jamming of the M-33 beyond maximum range of the radar provided the aircraft was illuminated by the radar.(S)

On those previous missions, jamming intensity varied considerably between missions, but varied only a little during any one mission. On three of the missions the radar operators could track aircraft part of the time through the jamming, but at other times encountered considerable difficulty in maintaining correct radar range. Skill of the range operator greatly influenced quality and accuracy of the tracking data. On another mission, intensity of the AN/ALQ-7 jamming signal was such that operators could not track the aircraft. Attempts were made to try confusing the AN/ALQ-7 by changing the radar frequency through jamming. The AN/ALQ-7 was able to follow those frequency changes about 90 percent of the time.[53]

A great deal of trouble had been experienced from malfunctions of the AN/ALQ-7 equipment. Those had occurred in various components of the system, and undoubtedly some of the failures could be attributed to faulty initial installation of components. A great number of the AN/ALQ-7 components are sub-miniture type; including tubes, connectors and wiring, and can be considered rather delicate. Indications at the

53. SAC-U30-March, Exhibit#15.

present time, however, are that the troubles encountered are due in part to design characteristics which lead to failure of various components of the system.

During March 1956, only one system, made up of two AN/ALQ-7 systems available had been operational at any one time. That poor operating record cannot be due to lack of experienced maintenance personnel as one field engineer and one field technician representing the manufacturer, both thoroughly familiar with the equipment, have made every effort to keep the systems operating. Due to the great number of system malfunctions which had repeatedly occurred in the AN/ALQ-7 since the beginning of the test project, the Directorate of Countermeasures, Tests and Tactics concluded that the system in its present design was not stable enough for practical use in the field.

The DCTT recommended, on the basis of test results obtained, to SAC that the AN/ALQ-7 not be considered for procurement in its present state. This recommendation was based on the general unreliability of the equipment and not on its jamming effectiveness against precision tracking ground-based and airborne radars.[54] (C)

Auxiliary Test Project Number 47 (Project changed in February to Test Project Number 40), "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters."(C)

This project was initiated on 14 September 1955, with an estimated date of completion scheduled for September 1956.

54. SAC-U30- March, Exhibit#15.

The purpose of this project was to design testing and calibration-equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means.[55] (C)

A sweep limit measuring device was constructed using seven S-band transmitter cavities. Preliminary tests were made on this device, and it was taken to Wright Air Development Center (WADC) Dayton, Ohio, for evaluation inFebruary 1956. No information had been received from WADC at the end of March on the results of the evaluation.[56] (C)

While the cavity device was being examined at WADC, work continued in investigating other possible methods of measuring various characteristics of the S-band jammer, such as measuring transmitter frequency by observing the hot spots caused by standing waves on a lamp filament. When a lamp such as an ordinary light bulb is excited by the RF output from a jamming transmitter, it had been observed that the filament, was lighted at certain points, depending on the transmitter frequency. As the frequency was changed, the hot spots on the lamp filament moved in accordance with the frequency change. If such a device was found to give consistant indications, it could be used not only for measuring frequency, but also to give a visual measurement of sweep-width and sweep-rate.[57]

55. SAC-U30-November, Exhibit#11.
56. SAC-U30-March, Exhibit#15.
57. SAC-U30-February, Exhibit#14.

Further results on this project will be given in the next historical report.

Auxiliary Test Project Number 48, Airborne Tape Recorder. (S)

This project was initiated on 4 October 1955.

The purpose of this project was to investigate the potential of the AN/APS-54 airborne warning receiver to collect automatically crude information on type, location and numbers of enemy air warning defense radar received enroute by regular B-47 aircraft during combat. Data collected by the AN/APS-54 will be recorded on a type recorder referenced as to aircraft position time. A playback of the tape with the flight log will be used to attempt spotting radar installations along the route flown. An airborne tape recorder (Nadar IV) having eight channels and tape for four hours of recording is being used for the test.

The Nadar IV recorder was installed, ground tested in a KC-97 aircraft and flown on a two-hour flight during December 1955. Signals received on an AN/APR-4 receiver and crew voice signals were recorded. During the flight the one ampere AC fuse blew and was replaced. The recorder operated for two hours until the recorder drive motor burned up, which terminated the test. The North American Aviation Corporation was contacted to obtain a replacement.[59] (S)

No work was done on this test project during January 1956, due to the lack of a replacement drive motor. A North American Aviation Company engineer arrived at Barksdale AFB on 30 January 1956, and brought a replacement drive motor for repair of the Nadar recorder. The engineer replaced the drive motor and adjusted the recorder. The recorder

59. SAC-U30-December, Exhibit #12.

was flown in a KC-97 aircraft on 16 February and used to record signals from the AN/APR-4 receiver. No malfunctions occurred on this flight, but the drive motor heated considerably when operated for extended periods. After the test flight the recorder was returned to North American Aviation Company. The engineer agreed to have a transcription of the recording made on a standard quarter-inch tape for the 376th BOMWGM. A transcription was necessary because the Radar recorder used wide tape which was not compatible with the standard quarter-inch tape commonly used on most recorders.[60] (C)

This project was cancelled in February 1956, by direction of Headquarters, SAC. A final report covering all tests and test results will be prepared by LCTT.

Auxiliary Test Project Number 49 (Changed in February 1956 to Test Project Number 390,"Flight Test of QRS-18 (t)".(S)[61]

This project was initiated on 15 August 1955. The estimated date of completion is June 1956.

The purpose of this project was to test tactical suitability of the QRS-18 (t). Essentially, the QRS-18 (t) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of one, two, or four percent of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variables up to 2000 CPS. (S)[62]

60. SAC-U30-February, Exhibit#14.
61. IBID
62. SAC-U30-January, Exhibit#13.

Flight tests were flown each month from November 1955, through March 1956. In the two flight tests in January, eight runs were made, all of which used three transmitters operated at jamming rates of either 800 to 1000 or 400 to 600 hits per second. One percent sweep units were used in all transmitters, and both narrow and wide noise modulation and CW operation were used. Jamming results on all runs were very poor. The best jamming condition obtained was occasional condition "three" at ranges of 100 to 140 miles from the ground station where the 800 to 1000 hit per second jamming rate was used. When the 400 to 600 hit per second rate was used, no condition better than"one" was obtained at any range. Type of modulation used appeared to have no effect on jamming conditions.(S)

The Directorate (DCTT) concluded that although the AN/ALT-7 is apparently capable of successfully spot jamming VHF communications, the narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of the ECM receiver make this very difficult. The use of CV-253/ALR tuning units in the receiver may enable closer setting-on; however, these could not be obtained for the test so the TN-17/APR-4 units will be used.[63] (S)

The two spot jamming tests scheduled for March in RC-97 aircraft were cancelled due to aircraft maintenance difficulties. Four sweep jamming flight tests using three QRS-18 (t) modified transmitters in a B-47 cradle installation are scheduled for 3,10, 18 and 26 April 1956. A second B-47 aircraft having VHF radio installation will be

63. SAC-U30-January, Exhibit#13.

used as a simulated fighter. Test procedures will be the same as used on sweep jamming test run which used KC-97 aircraft. If similar results are obtained, these flights will complete sweep jamming tests.[64] (U)

Four flight tests of spot jamming against VHF communications are scheduled to be run in connection with Project "Bus Stop" during April 1956, using a Phase V aircraft from the 68th Bombardment Wing. Since information to be obtained from these flight tests is the same as required for the spot jamming portion of Test Project 39 (Aux. Test Proj. 49), these tests will be coordinated with Test Project Number 39.[65] (U)

Test Project Number 32, "Cell Support Tests". (S)

This project was initiated on 17 February 1955. There is no estimated date of completion as under current directives this project was established on a continuous basis.

The purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying, and interceptor radars.[66] (S)

A variety of missions were flown on this test project during the months of November, December 1955, and January, February, and March 1956. The monthly status of this project is given in detail in the appendix to this historical report; therefore, this narrative will include only sufficient summaries of missions of this project to describe its scope and diversification.[*] (U)

64. SAC-U30-November- Exhibit#11.
65. SAC-U30-March- Exhibit#15.
66. SAC-U30-November-Exhibit#11.
* . SAC-U30-Reports, Exhibit#11,12,13,14,15.

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A mission was flown by the 376 BOMBWG on 3 November 1955, using six aircraft in a broad front formation with 20 nautical miles lateral separation between aircraft. Two runs were made against the AN/FPS-10 radar at Bartlesville, Oklahoma. Each run extended from an IP 200 nautical miles east of Bartlesville to a point 200 nautical miles west of Bartlesville and a return over a reciprocal course. On the first run, each aircraft used four AN/ALT-6 and two AN/ALT-8 transmitters all set for a slow sweep speed of 20 megacycles per second. On the second run, each aircraft used four AN/ALT-6 transmitters on slow speed and two AN/ALT-8 transmitters on a fast speed of 1200 megacycles per second. The mission was designed as a controlled test to determine the amount and type of jamming and number of "skin paints" received by the ground radar when the equipment configurations and bomber formation described are used. Preliminary evaluation indicated good jamming and very few "skin paints"; however, due to an airborne equipment failure rate of about 25 percent, no firm comparison of the two runs could be made. It is planned to re-run this mission at a future date.[67] (S)

A mission was flown on 10 November 1955, using six aircraft in a broad front formation with 20 nautical miles lateral separation between aircraft. The RR-20U chaff was dropped by each aircraft at a rate of one unit every three minutes from an IP of 200 nautical miles east of Bartlesville to a point 200 nautical west of Bartlesville. No chaff

67. SAC-U30-November, Exhibit# 11.

was dropped on a reciprocal return to the IP. This mission was designed as a controlled test to determine if the ground radar could track the dispersed formation when dropping chaff at a random rate. A track chart submitted by the ground radar * indicated that an inadequate track was maintained on the formation. A mission report on results of this test will be prepared.[68] (C)

A mission (Mission 31) was set up as a ground test and conducted 21, 22, and 23 March, 1956 to determine the amount and type of jamming which a single AN/ALT-6A jamming transmitter could cause the AN/FPS-10 S-band radar location at Duncanville, Texas. The AN/ALT-6A is the latest model of this equipment and contains several operating characteristics not included in earlier models. This ground test was conducted to aid in determining which equipment settings should be used on subsequent airborne tests of the AN/ALT-A against the AN/FPS-10. The AN/ALT-6A, transmitter was operated in an AN/GPQ-T1 radar training set van which was towed by truck from Barksdale AFB to Duncanville and parked approximately one mile from the radar site.

Spot jamming and various combinations of slow and fast sweep jamming were tried to determine amount and type of jamming caused the AN/FPS-10 radar. The raw data from this test was being collected and reduced at the end of the historical reporting period on 31 March 1956.[69] (C)

Two five aircraft ECM support missions were scheduled against the

*. Inclosure 1, SAC-U30-November, Exhibit #11.
68. SAC-U30-November, Exhibit #11.
69. SAC-U30-March, Exhibit #15.

FPS-10 radar at Kirksville, Missouri. These missions were designated to utilize a minimum number of aircraft which would accurately reflect a normal tactical mission. Both missions were cancelled due to weather. Additional tests could not be scheduled because of higher headquarters commitments. A five aircraft support mission, as well as a number of single aircraft Phase III capability test missions, were scheduled for April 1956.[70]

70. SAC-U30-March, Exhibit #15.

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CHAPTER IV

MAINTENANCE

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Maintenance

Possessed Aircraft

The average possessed aircraft of the 376th Bombardment Wing, Medium, for the months of November and December 1955, and January, February, and March 1956, was 59.4 aircraft. The largest number of possessed aircraft was 61 for the months of December 1955, and February 1956, while the lowest number was 57 for the month of November 1955. The average in-commission rate for the period was 85.26 percent, with a high of 88.63 percent for March, 1956, and a low of 82.84 percent for January, 1956. The total hours flown for the period was 9016, with an average of 1803.20 hours per month. The highest monthly total was March 1956, with 2545.05 hours flown, and the lowest was 1416.10 hours for December, 1955. The average hours flown per possessed aircraft was 28. 262, with a high of 42.25 for March, 1956, and a low of 23.57 for December, 1955. The monthly aircraft out of commission for parts (AOCP) average rate was 4.226 percent. The highest percentage rate was 8.11 for December 1955, and the lowest was 2.633 percent for January 1956.(C)

The following is a "breakdown" of the preceeding paragraph for B-47 and KC-97 aircraft:[6]

1. 376BOMWGM Maintenance Report for November 1955, hereafter cited as 376 Main Rpt - November, Exhibit#17.
2. 376BOMWGM Maintenance Report for December 1955, hereafter cited as 376 Main Rpt - December, Exhibit#18.
3. 376BOMWGM Maintenance Report, for January 1956, hereafter cited as 376 Main Rpt - January, Exhibit#19.
4. 376BOMWGM Maintenance Report, for February 1956, hereafter cited as 376 Main Rpt - February, Exhibit#20.
5. 376BOMWGM Maintenance Report of March 1956, hereafter cited as 376 Main Rpt - March, Exhibit#21.
6. Maintenance Reports, Exhibits 17,18,19,20 & 21.

B-47 Aircraft

The 376 Bombardment Wing, Medium had an average of 40.8 B-47 aircraft possessed for the five-month period, with a high of 42 aircraft possessed in February 1956, and a low of 39 aircraft possessed in November 1955. The monthly average in-commission rate was 85.862 percent with March 1956, having the high rate of 84.49 percent and January 1956, low with 82.53 percent. There was a total of 5,987.60 hours flown for a monthly average of 1197.52 hours. The month of March showed the most flying with 1619 hours, and January showed the least flying with 1031.15 hours. The monthly average was 28.866 hours per possessed aircraft. The monthly average AOCP rate for the B-47 aircraft for the period was 3.184 percent with the highest rate in March with 6.21 percent, and the lowest rate in December with zero percent.(U)

KC-97 Aircraft

There was an average of 18.7 KC-97 aircraft possessed by the 376th Bombardment Wing, Medium, for the five-months historical reporting period. There was very little fluctuation for the period as the lowest number possessed was 18 for the months of November and January, and the other three months, December, February, and March were constant at 19 aircraft each month. The average in-commission rate was 82.13 percent, with a range from 74.26 percent in February, to 87.78 percent in March. There was a total of 3027.6 hours flown for the period with a monthly average of 605.52 hours. The average number of hours flown per month was 32.378 for each possessed aircraft. The monthly average AOCP rate for the KC-97 aircraft was 5.088 percent, with the highest rate in

December at 8.11 percent, and the lowest rate in January with 3.03 percent.(S)

Maintenance Man-hours.

During the five-month period (November 1955 through March 1956) of this historical report there were 1,168,102.65 man-hours assigned with 786,431.9 man-hours available for work. The monthly average was 233,620.52 man-hours assigned, with an average of 157,266.38 man-hours available for work. There was a total of 60,356.2 man-hours expended on overtime, with a monthly average of 12,071.24 man-hours. Of the total man-hours available there were 324,500.2 hours expended on "direct time" for a monthly average of 64,900.04 hours. There were 387,613.1 man-hours spent on "Productive Indirect Codes," with a monthly average of 77,522.62 hours. There were also 74,342.1 man-hours, a monthly average of 14,868.42 hours, of the available time expended on "Non-Productive" work. Of the total man-hours assigned there were 439, 694.6 hours, a monthly average of 87,932.92 hours spent on "Absent Codes."(U)

Aborts and Malfunctions.

During the five-months period, there were 83 aborts for B-47 aircraft of the 376 Bombardment Wing, Medium, for a monthly average of 16.6 aborts. At the same time there were 64 malfunctions, averaging 12.8 per month.(C)

The comparable figures for KC-97 aircraft of the Wing were 31 aborts and five malfunctions, averaging 6.2 aborts and one malfunction per month respectively.(C)

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Engine Changes:

A total of 32 engines were changed on B-47 aircraft during the period, with a monthly average of 6.4 changes. The monthly average engine time at change was 314.2 hours. There were 17 engine changes made on KC-97 aircraft for the same period with a monthly average of 3.4 changes. The monthly average engine time at change was 601.2 hours.(C)

Technical Order Compliance.

From 1 November 1955 through 31 March 1956 there was a total of 1354 technical orders accomplished on B-47 aircraft and 203 accomplished on KC-97 aircraft. The monthly average was 270.8 technical orders accomplished on B-47 aircraft and 40.6 accomplished on KC-97 aircraft.(C)

Supply Liaison.

The total cannibalizations for the five-month period was 239, with 143 cannibalizations for B-47 aircraft and 96 for KC-97 aircraft. The monthly average was 28.6 cannibalizations for B-47 aircraft, and 19.2 for KC-97. (C)

There were 60 major line items that were AOCP during the period, for a monthly average of 12. The highest number was in February with 26, with three in the month of November 1955, being the low figure.(U)

Quality Control Unit.

The Quality Control Unit of the 376 Bombardment Wing, Medium, during the five-months period inspected 46 aircraft processed through the Periodic Maintenance docks, of which 36 were B-47 aircraft and ten were KC-97 aircraft. The unit also performed flight (in-commission) line inspections on 47 B-47 aircraft and 21 KC-97 aircraft for the same period. There were, for the period, 59 engine installations inspected. The unit also supervised test flights of 54 B-47, 42 KC-97, and 24 C-124 aircraft during the five months.(C)

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APPENDIX

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SUPPORTING DOCUMENTS

Exhibit Number	Descriptions
1	2AF Reg# 23-8, 24 June 1955.(U)
2	2AF Ltr# 23-5, 9 September 1953.(S)
3	Bomb Air Trng Rpt., December 1955, (RCS: 3-SAC-T12), 376 BOMWGM.(S)
4	Bomb Air Trng Rpt., January 1956, (RCS:3-SAC-T12), 376 BOMWGM.(S)
5	Bomb Air Trng Rpt., February 1956 (RCS:3-SAC-T12), 376 BOMWGM.(S)
6	Bomb Air Trng Rpt., March 1956, (RCS:3-SAC-T12), BOMWGM.(S)
7	Refuel Air Trng Rpt, December 1955, (RCS:4-SAC-T12), 376 BOMWGM.(S)
8	Refuel Air Trng, Rpt, January 1956, (RCS:4-SAC-T12), 376 BOMWGM.(S)
9	Refuel Air Trng, Rpt, February 1956, (RCS:4-SAC-T12), 376 BOMWGM.(S)
10	Refuel Air Trng, Rpt, March 1956, (RCS:4-SAC-T12), 376 BOMWGM.(S)
11	Rpt. 376 BOMWGM to 2AF, sub; The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30), for November 1955, dated 9 December 1955.(S)
12	Rpt 376 BOMWGM to 2AF, sub: The 376th Bombardment Wing, Medium, Test and Development Program (RCS:SAC-U30), for December 1955, dated 10 January 1956.(S)

Exhibit Number	Description
13	Rpt 376 BOMWGM to 2AF, sub: The 376th Bombardment Wing, Medium, Test and Development Program (RCS:SAC-U30), for January 1956, dated 9 February 1956.(S)
14	Rpt 376 BOMWGM to 2AF, sub: The 376th Bombardment Wing, Medium Test and Development Program (RCS: SAC-U30), for February 1956, dated 7 March 1956.(S)
15	Rpt 376 BOMWGM to 2AF, sub: The 376th Bombardment Wing, Medium Test and Development Program (RCS:SAC-U30) for March 1956, dated 9 April 1956.(S)
16	Final Report, Test Project #33 March 1956, 376th Bombardment Wing, Medium.(U)
17	Maintenance Report, 376 BOMWGM November 1955.(U)
18	Maintenance Report, 376 BOMWGM December 1955.(U)
19	Maintenance Report, 376 BOMWGM January 1956.(U)
20	Maintenance Report, 376 BOMWGM February 1956. (U)
21	Maintenance Report, 376 BOMWGM March 1956.(U)

1

SECOND AF REGULATION)
NUMBER 23-8)

HEADQUARTERS SECOND AIR FORCE
Barksdale Air Force Base, La
24 June 1955

ORGANIZATION-FIELD

Mission of the 376th Bombardment Wing, Medium
(Supersedes 2AFR 23-8, 11 Sep 53)

1. PURPOSE. To state the mission of the 376th Bombardment Wing, Medium.

2. MISSION. As directed by this Headquarters and in accordance with policies of higher headquarters, the mission of the 376th Bombardment Wing, Medium is to conduct tests and experiments in the development of tactics, equipment, and procedures for strategic bombardment operations. In addition, a knowledge of strategic bombardment operations will be maintained.

3. RESPONSIBILITIES. The 376th Bombardment Wing, Medium will:

a. Maintain assigned units in a state of readiness to permit immediate operations against enemies of the United States.

b. Be prepared to perform tasks assigned in current emergency plans, related operations orders and existing directives.

c. Train crews and units for the performance of global operations.

d. Equip units for accomplishment of the assigned mission.

e. Support the Air Reserve and National Guard programs in accordance with instructions received from this or higher headquarters.

f. Perform special missions directed by the Commander, Second Air Force.

BY ORDER OF THE COMMANDER:

W. B. OFFUTT
Colonel, USAF
Chief of Staff

OFFICIAL:

John C. Machovec
JOHN C. MACHOVEC
Major, USAF
Deputy Adjutant

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HEADQUARTERS SECOND AIR FORCE
Barksdale Air Force Base, La

SECOND AF LETTER)

NUMBER 23-5) 9 september 1953 2

ORGANIZATION * FIELD

Classified Mission of the 376th Bombardment Wing, Medium
(Supersedes 2AFL 24-1, 31 Mar 53)
(Effective until 1 Oct 54 unless sooner rescinded or superseded)

1. PURPOSE. To augment the provisions of Second AF Regulation 23-8 by stating the secret mission of the 376th Bombardment Wing, Medium.

2. MISSION:

a. To develop and test both tactics and ECM techniques, and as a result of these tests recommend to Headquarters SAC, requirements for equipment, including that necessary to counter guided missiles, and the adoption of appropriate tactics and techniques by the Command.

b. To develop and maintain capability for performing ECM cover and diversions in support of strategic bombardment operations.

c. To determine the capability of existing electronics equipment for tactical employment by SAC and recommend to Headquarters SAC adaptions and refinements which will increase the capability of existing equipment.

d. To maintain a field laboratory for necessary operational engineering. Laboratory activities will include short-term design and modification of equipment for operational testing.

e. In addition to the above, to maintain a capability in normal strategic bombardment operations.

3. IN EXECUTING THIS MISSION:

a. Close technical liaison will be maintained appropriate ARDC organizations to assure that necessary short-term design and modification work complements the efforts of ARDC for mutual assistance in the completion of common projects.

b. Liaison with APGC and other agencies willbe maintained as determined by Headquarters SAC for participation in such joint projects as may be directed.

c. Special fund requirements necessary to accomplish this mission will be submitted to the Comptroller, this Headquarters, for processing through Headquarters SAC. Normal fund requirements for this mission should be included in annual budget estimates.

SECRET

BY ORDER OF THE COMMANDER:

KENNETH O. SANBORN
Colonel, USAF
Chief of Staff

/s/t/ FORREST A. BRANDT
Lt.Colonel, USAF

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HEADQUARTERS
376TH BOMBARMDNET WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

3

Section J

Air Training Report for the Month of December, 1955 - RCS: 3-SAC-T12

I concur with the remarks of the Wing Commander.

M A Preston
M. A. PRESTON
Brigadier General, USAF
Commander

6-99-4

SECRET

6-52-7

Secret

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana
WING CENTER

CLASSIFICATION: SECRET
AUTH: COMBOMWGM, 376TH
INITIALS:
6 January 1956

WING COMMANDER'S REMARKS

PART V

Bombardment Air Training Report for Month of December 1955
(RCS: 3-SAC-T12)

PART V.

6. Wing Commander's Remarks - Part V.

a. Hours flown performing missions ordered by higher headquarters:

(1)	ECM Tests	52:15
(2)	Ferrying aircraft to and from Modification Depot	97:25
(3)	Exercise "Texas League"	265:50
(4)	Exercise "Post Hole"	164:00
	TOTAL	579:25

b. Weather or local conditions affecting training:

(1) None.

c. Directives imposed by AMC or SAC on aircraft:

(1) None.

d. Combat crew member gains or losses:

(1) Gains: 1 observer.

(2) Losses: 1 Aircraft Commander
2 Co-pilots
2 Observers

e. Crew member changes:

(1) Three Aircraft Commander's.

(2) Three Co-pilots

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f. New Crews:

(1) LN 61 formed, 1 December 1955

g. Crew Status Changes:

(1) R46 to L46, Upgraded.

(2) S43, Transferred.

(3) LN 19, Disbanded.

(4) LN 87, Disbanded.

h. Standardization Crews:

(1) S35, Wing Standardization Crew.

(2) S11, S16, and S70 are Squadron Standardization Crews.

i. Additional Materiel and Personnel Problems:

(1) Officer manning in AFSC'S 1234B and 1245, remains critically short. At present of 132 authorized, 100 are assigned with an anticipated loss of 9 within the next three months.

(2) Officer manning in AFSC 1525B is now becoming critical due to anticipated losses. At present of 75 authorized, 55 are assigned with an anticipated loss of 8 during the period 1 January 1956 to 1 February 1956.

(3) Officer manning in AFSC 6424, this field is becoming critical due to pending loss of 7 supply officers. At present of 11 authorized, 10 are assigned.

(4) Officer manning in AFSC 3054. At present of 9 authorized 4 are assigned, with no known inputs.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for December 1955

(5) Effective manning in airman career fields which are considered critical are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	%MANNED
43270	8	0	0	0
42152	15	8	2	40
42172	4	0	0	0
53430/50/70/	49	25	5	41
60310/30/50/70/	23	11	1	43
64 XXX	75	56	12	59
73231/51/	21	6	0	29
70230/50/70/	93	49	0	53

(6) During the month of December, 15 aircraft days were lost due to double drag angle cracks. Nine (9) sorties were lost due to postponement of the "Texas League" mission. There were 17 sorties lost due to alerts ordered by higher headquarters. The requirement levied to pick-up wing tanks at Marietta, Georgia, resulted in the lost of 16 training sorties.

(7) The accomplishment percentage rate of items programmed were hampered due to conditions explained in preceeding paragraph. However, concentration was directed primarily in the training of non-combat ready crews in area's such as transition and 51-19 training, for the crews future upgrading.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for December 1955

j. SAC Minimum Training Requirements not accomplished:

(1) Not applicable.

k. Non-Combat Ready Crews Capable of Deploying

(1) None

l. Non-Combat Ready Crew Training:

(1) Fourty-seven (47) sorties for a total of 242 hours were flown as 5X time in training non-combat ready crew personnel. The following non-combat ready crews are estimated to be combat ready on dates indicated:

(a) IN 12 Pending disbandment, transfer of AC.

(b) IN 13 Pending disbandment, transfer of AD and Pilot

(c) IN 58 1 July 1956

(d) IN 59 1 June 1956

(e) IN 60 1 July 1956

(f) IN 61 1 March 1956

(g) IN 86 1 May 1956

m. Field Training Operations:

(1) Test of facilities: None

(2) Exercise: None.

(3) Maneuvers: None.

n. Special Training Month Remarks:

ITEMS	PROG	ACCOMP	PERCENTAGE
Flying Hours	1025	985	96
Sorties	171	212	123.9
Transition	144	136	94.4

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for December 1955

ITEM	PROG	ACCOMP	PERCENTAGE
Radar RBS	139	54	37.4
Visual RBS	41	6	14.6
Night Cel	45	5	11.1
Big Snow	12	0	0
Little Snow	12	0	0
Big River	14	0	0
Grid	57	44	77.1
Radar Rendezvous	37	10	27
Wet Hook-ups			
#6000	180	63	35
#40000	10	12	120
Dry Contact	280	312	111
Long Range Cruise	36	12	33.3
Formation	60	83	138
Cell	30	35	116
Gunnery	11	1	9

c. Comments or Recommendations of the Wing Commander:

(1) The average number of combat ready/lead crews assigned during December was 36. A total of 743 hours (excluding test flight time) was flown for an average of 21 hours per crew.

(2) The average number of assigned aircraft during December was 52. The average number of aircraft in IRAN modification during December was 6. The average number of possessed aircraft was 42.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for December 1955

(3) Reference 2AF message DOTG 2628, dated 14 June 1955 Subject: Report of Injuries Sustained due to Judo:

(1) None.

(4) Reference 2AF message DOTR 5816, dated 26 August 1955: Subject Restricted Refuelings:

(1) None.

(5) Reference 2AF message DOTB 12376, dated 12 December 1955; Subject: Proposed Annex 1 to SAC Regulation 51-20:

(1) ECM activity programmed for this reporting period was not accomplished in compliance with above referenced message.

For and in the absence of

STEPHEN D. MC ELROY
Colonel, USAF
Commander

Col, USAF

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of January, 1956 - RCS: 3-SAC-T12

I concur with the remarks of the Wing Commander.

M. A. Preston
M. A. PRESTON
Brigadier General, USAF
Commander

6-483-4

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6-160-7

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

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AUTH: COMBOMWGM,376TH
INITIALS: [signature]
9 February 1956

WING COMMANDER'S REMARKS

PART V

Bombardment Air Training Report for Month of January 1956
(RCS: 3-SAC-T12)

PART V.

6. Wing Commander's Remarks - Part V.

a. Hours flown performing missions ordered by higher headquarters:

(1)	ECM Tests	92:15
(2)	Ferrying aircraft to and from Modification Depot	18:40
(3)	SHS Evaluation	104:10
	TOTAL	224:05

b. Weather of local conditions affecting training:

(1) Ten (10) aircraft sorties of 6.5 hours each were lost due to local weather conditions.

c. Directives imposed by AMC or SAC on aircraft:

(1) None.

d. Combat crew member gains or losses:

(1) Gains: 1 Aircraft Commander
2 Observers

(2) Losses: 1 Aircraft Commander
2 Co-pilots
1 Observer

e. Crew member changes:

(1) Two Aircraft Commanders.

(2) Five Co-Pilots.

(3) Four Observers.

4-6-1202

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for January 1956

f. New Crews:

(1) IN 21 formed, 15 January 1956

(2) IN 88 formed, 20 January 1956

g. Crew Status Changes:

(1) IN 12, Disbanded.

(2) IN 13, Disbanded.

(3) R-85, Disbanded.

(4) L78 to R78, Progressed.

(5) L42 to N42, Progressed

h. Standardization Crews:

(1) S09, Wing Standardization Crew.

(2) S11, S16, and S70 are Squadron Standardization Crews.

i. Additional Materiel and Personnel Problems:

(1) Officer manning in AFSC's 1234B and 1245, remain critically short. At present of 132 authorized, 95 are assigned with an anticipated loss of eight within the next three months.

(2) Officer manning in AFSC 1525B will become critical within the next few months due to anticipated losses, at present of 75 authorized, 65 are assigned with an anticipated loss of 8 compared to a pending gain of 2.

(3) Officer manning in AFSC's 7321/24 has become critically short with 9 authorized and 6 assigned. The anticipated input into this field is 2 with a projected loss of 2.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for January 1956

(4) Effective manning in airman career fields which are considered critical are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MAN
433XX	90	65	2	70
462XX	34	25	3	65
534XX	49	25	0	51
603XX	24	10	0	42
641XX	75	57	4	70
702XX	90	60	6	60
732XX	36	21	1	56

j. SAC Minimum Training Requirements not Accomplished:

(1) Not applicable.

k. Non-Combat Ready Crews capable of Deploying

(1) This paragraph rescinded per Second Air Force message DOTC 3432, 23 January 1956.

l. Non-Combat Ready Crew Training:

(1) Fourty (40) sorties for a total of 207 hours were flown as 5X time in training non-combat ready crew personnel. The following non-combat ready crews are estimated to be combat ready on dates indicated:

(a) IN 21 1 June 1956

(b) IN 42 1 April 1956

(c) IN 58 1 June 1956

(d) IN 59 1 July 1956

(e) IN 60 1 July 1956

(f) IN 61 1 March 1956

(g) IN 86 1 May 1956

(h) IN 88 1 June 1956

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for January 1956

m. Field Training Operations

(1) Test of facilities: None

(2) Exercise: None

(3) Maneuvers: None.

n. Special Training Month Remarks:

(1) Not applicable.

o. Comments or Recommendations of the Wing Commander:

(1) The average number of combat ready/lead crews assigned during January was 35. A total of 795 hours (excluding test flight time) was flown for an average of 23 hours per crew.

(2) The average number of assigned aircraft during January was 51. The average number of aircraft in IRAN modificat. during January was 9. The average number of possessed aircraft was 39.6.

(3) Reference Part V, SAC Form 184D as pertains to Big River Runs; those runs reported non scorable were due to poor photography:

NCA			SKA			
ATT	SCORABLE	NON-SCORABLE	ATT	ACC	UNSAT.	NON-SCO.
10	4	6	7	1	3	3

(4) Reference 2AF message DOTG 2628, dated 14 June 1955, Subject: Report of Injuries Sustained due to Judo:

(a) None.

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(5) Reference 2AF message DOTM 5816, dated 26 August 1955; Subject: Restricted Refuelings:

(a) None.

Stephen D. McElroy
STEPHEN D. MC ELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of February, 1956 - RCS: 3-SAC-T12

I concur with the remarks of the Wing Commander.

M A Preston
M. A. PRESTON
Brigadier General, USAF
Commander

5

6-831-4

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6-268-7

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base

CLASSIFICATION: SECRET
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INITIALS: [signature]
9 March 1956

WING COMMANDER'S REMARKS

PART V

Bombardment Air Training Report for Month of February 1956
(RCS: 3-SAC-T12)

PART V.

6. Wing Commander's Remarks - Part V.

a. Hours flown performing missions ordered by higher headquarters:

(1)	ECM Tests	23:25
(2)	Ferrying aircraft to and from Modification Depot	13:05
(3)	Operation "Snow Bank"	197:05
(4)	Operation "Tail Gate"	153:45
	TOTAL	387:20

b. Weather or local conditions affecting training:

(1) None.

c. Directives imposed by AMC or SAC on aircraft:

(1) None.

d. Combat crew member gains or losses:

(1) Gains: 3 CO-Pilots

(2) Losses: 2 Aircraft Commanders
3 Co-Pilots
2 Observers

e. Crew member changes:

(1) One Aircraft Commander

(2) Two Co-Pilots

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for February 1956

f. New Crews:

(1) None.

g. Crew Status Changes:

(1) IN 42 to N 42 , Upgraded.

(2) IN 61 to N 61, Upgraded.

(3) L51 to R51, Regressed.

(4) L68 to R68, Regressed.

(5) IN 58, Disbanded.

(6) IN 88, Disbanded.

h. Standardization Crews:

(1) S09, Wing Standardization Crew.

(2) S11, S16, and S70 are Squadron Standardization Crews.

i. Additional Materiel and Personnel Problems:

(1) Officer manning in AFSC's 1234B and 1245, remain critically short. At present of 132 authorized, 100 are assigned with an anticipated loss of five (5) compared to a pending gain of two (2). Of the 100 presently assigned, 21 are not qualified in tactical aircraft and are undergoing formal training.

(2) Officer manning in AFSC's 7321/24 has further declined to the critical stage with nine authorized and three assigned. Anticipated input into this field is two compared with a projected loss of one.

(3) Effective manning in airman career fields which are considered critical and directly effect training are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
462XX	34	21	1	59%
641XX	74	55	2	71%
702XX	93	46	5	44%

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for February 1956

(4) The AOCP rate for February climbed to 5.90 compared to 3.26 for January. The increase in AOCP rate was due primarily to the issue of faulty fuel booster pumps, stock number 4839-TF 5 2 400-6 and 4839-TF-57300-7. These pumps had been overhauled by Bruest Metal Processing Corporation, Independence, Kansas. A total of 16 pumps were received during February 1956. An emergency unsatisfactory report was submitted on this item.

j. SAC Minimum Training Requirements not Accomplished:

(1) Not applicable.

k. Non-Combat Ready Crews Capable of Deploying:

(1) This paragraph rescinded per Second Air Force message DOTC 3432, 23 January 1956.

l. Non-Combat Ready Crew Training:

(1) Twenty-seven (27) sorties for a total of 125 hours were flown as 5X time in training Staff personnel and non-combat ready crew personnel. During the month of February, 12 crew members assigned to "IN" Crews were available to fly. These members flew a total of 276 hours for an average of 23 hours per crew member. The following non-combat ready crews are estimated to be combat ready on dates indicated:

(a) N42 1 May 1956

(b) N61 1 April 1956

(c) IN 21 1 June 1956

(d) IN57 1 July 1956

(e) IN 60 1 July 1956

(f) IN 86 1 May 1956

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for February 1956

m. Field Training Operations:

(1) Test of Facilities: None.

(2) Exercise: None.

(3) Maneuvers: None.

n. Special Training Month Remarks.

(1) Not applicable.

o. Comments or Recommendations of the Wing Commander:

(1) The average number of combat ready/lead crews assigned during February was 34. A total of 1005 hours (excluding test flight time) was flown for an average of 30 hours per crew.

(2) The average number of assigned aircraft during February was 51. The average number of aircraft in IRAN modificatio during February was 10. The average number of possessed aircraft was 42.2.

(3) Reference paragraph 1.(1) above: A Command effort is being made to insure that an average of at least 75 hours flying time per IN Crew member is accomplished by the end of the current quarter. This training has been given priority over all other training.

(4) Reference 2AF message DOTG 2628, 14 June 1955, Subject: Report of Injuries Sustained due to Judo:

(a) None.

(5) Reference 2AF message DOTR 5816, 26 August 1955, Subject: Restricted Refuelings:

(a) None.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for February 1956

STEPHEN D. MC ELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of March, 1956 - RCS: 3-SAC-T12

I concur with the remarks of the Wing Commander.

M. A. Preston
M. A. PRESTON
Brigadier General, USAF
Commander

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6-360-7

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Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMBOMWGM, 376TH
INITIALS Murphey
5 Apr 56

WING COMMANDER'S REMARKS

PART V

Bombardment Air Training Report for First Training Quarter of 1956
January, February, March
(RCSP 3-SAC-T12)

PART V.

6. Wing Commander's Remarks - Part V.

a. Hours flown performing missions ordered by higher headquarters:

(1)	ECM Tests	196:55
(2)	Ferrying aircraft to and from Modification Depot	37:45
(3)	SES Evaluation	104:10
(4)	Operation "Snow Bank"	197:05
(5)	Operation "Tail Gate"	153:45
(6)	Operation "Big Wind"	765:45
	Total	1455:25

b. Weather or local conditions affecting training:

(1) During the month of January ten (10) aircraft sorties of 6.5 hours each were lost due to local weather conditions. During the month of March twelve (12) aircraft sorties of 6.5 hours each were lost due to local weather conditions.

c. Directives imposed by AMC or SAC on aircraft:

(1) None

d. Combat crew member gains or losses:

(1) Gains: 1 Aircraft Commander

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Wing Commander's Remarks, 376th Wing Air Training Report for First Training Quarter 1956 (Jan, Feb, and Mar)

3 Co-Pilots

2 Observers

(2) Losses: 5 Aircraft Commanders

9 Co-Pilots

6 Observers

e. Crew member changes:

(1) 3 Aircraft Commanders

(2) 12 Co-Pilots

(3) 6 Observers

f. New Crews:

(1) IN 21 formed, 15 January 1956

(2) IN 88 formed, 20 January 1956

(3) IN 62 formed, 6 March 1956

g. Crew Status Changes:

(1) IN 42 to N42, Upgraded (Feb)

(2) IN 61 to N61, Upgraded (Feb)

(3) R 15 to L 15, Upgraded (Mar)

(4) L 42 to IN 42, Regressed (Jan)

(5) L 78 to R 78, Regressed (Jan)

(6) L 51 to R 51, Regressed (Feb)

(7) L 68 to R 68, Regressed (Feb)

(8) N 61 to IN 61, Regressed (Mar)

(9) IN 12, Disbanded (Jan)

(10) IN 13, Disbanded (Jan)

(11) R 85, Disbanded (Jan)

(12) IN 58, Disbanded (Feb)

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Wing Commander's Remarks, 376th Wing Air Training Report for First Training Quarter 1956 (Jan, Feb, and Mar)

(13) IN 88, Disbanded (Feb)

(14) R 77, Disbanded (Mar)

(15) L 05, Transferred (Mar)

h. Standardization Crews:

(1) S09, Wing Standardization Crew.

(2) S11, S16, and S70 are Squadron Standardization Crews.

i. Additional Materiel and Personnel Problems:

(1) Officer manning in AFSC's 1234B and 1245 has shown an increase during the quarter. At the present of the 132 authorized, 93 are assigned with a projected gain of seven for a projected manning of 75.9 percent. Of the 100 presently assiged and/or projected, 28 are not qualified in tactical aircraft and are undergoing formal training.

(2) Officer manning in AFSC's 7321/24 has remained critical during the entire quarter with nine authorized and four assigned. Anticipated input for this field is three compared with a projected loss of one

(3) Officer manning in the armament career field (3216/3234/32000/3244/3254) is projected to reach the critical stage in the near future. At the present of twelve authorized, nine are assigned with a projected loss of three for a projected manning of 50 percent.

(4) Officer manning in the aircraft maintenance career

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field is due to become critically short. At the present of the 21 authorized, 17 are assigned with a projected loss of fice as compared to an input of one. This will reduce the effective manning to 61.9 percent.

(5) Effective manning in airman career fields considered critical are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
204XX	11	7	1	64%
401XX	3	1	0	33%
423XX	79	53	5	67%
451XX	5	2	0	40%
462XX	34	22	2	65%
534XX	49	22	2	47%
603XX	24	14	1	58%
702XX	94	56	3	60%
732XX	36	24	2	67%
901XX	11	7	0	63%

(6) The AOCP rate for March climbed to 6.21 compared to 5.90 for February and 3.26 for January. The increase in AOCP rate was due primarily to the shortage of the following items.

(a) BST Harness, class 05-D, stock number 6119-988868863.

(b) Booster Pump, class 03-13, stock number 4939-TF57300-21.

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(c) Directional Gyro Indicator, class 05C, stock number 6040-652191.

(d) Engine Strut, Class 01F, stock number 1AF8-7-3657-227.

j. SAC Minimum Training Requirment not Accomplished:

(1) The unit accomplished 94.7% of 50-8 minimum training requirements. One-hundred percent was not accomplished due to the emphasis placed during the last half of the quarter on 51-19 training of 17 available "IN" Crew members.

k. Non-Combat Ready Crews Capable of Deploying:

(1) This paragraph rescinded per Second Air Force message DOTC 3432, 23 January 1956.

l. Non-Combat Ready Crew Training:

(1) Eighty-one (81) sorties for a total of 406 hours were flown as SX time in training Staff personnel and non-combat ready crew personnel. During this quarter 17 crew members assigned to "IN" Crews were available for flying. These members flew a total of 1527 hours for an average of 89 hours per crew member. In addition to the above there were three (3) "IN" Crew members available for the last month of the quarter. They flew a total of 100 hours for an average of thirty-three (33) hours per man. The following non-combat ready crews are estimated to be combat ready on dates indicated:

(a) IN 21, 1 July 1956

(b) IN 59, 1 August 1956

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for First Training Quarter 1956 (Jan, Feb, and Mar)

(c) IN 62, 15 May 1956

(d) IN 61, 1 May 1956

(e) IN 60, 1 August 1956

(f) IN 86, 1 May 1956

m. Field Training Operations:

(1) Test of Facilities: None.

(2) Exercise: None.

(3) Maneuvers: None.

n. Special Training Month Remarks:

(1) Not applicable

o. Comments or Recommendation of the Wing Commander:

(1) The average number of combat ready/lead and select crews assigned during March was 33. A total of 1327 hours (excluding test flight time) was flown for a n average of 40.3 hours per crew.

a The average number of combat ready/lead and select crews assigned during the quarter was 34. A total of 3055 hours (excluding test flight time) was flown this quarter for an average of 90 hours per crew.

(2) The average number of assigned aircraft during March was 51. The average number of aircraft in IRAN Modification during March was 10. The average number of possessed aircraft was 39.9.

a. The average number of assigned aircraft during the quarter was 51. The average number of aircraft in IRAN modification this quarter was 10. The average number of possessed aircraft this quarter was 40.6.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training For First Training Quarter 1956 (Jan, Feb, and Mar)

(3) Reference paragraph c.(3); of 3-SAC-T12 for February 1956:

(a) The average number of flying hours accomplished by "IM" Crew members at the end of this quarter is 89 hours per crew member.

(4) Reference SAC message DOTRS 4518, 18 January 1956 and Second Air Force message DCRM 3174, dated 19 March 1956 The above mentioned messages require that the third month's report be consolidated to include all changes and or deletions and yet be prepared in final form not later than the seventh calendar day of each month. This time interval does not allow for confirmation messages of training accomplished in the latter part of the previous month to be received from Bomb Ranges and ADC radar sites. In the case of Big River runs, radar film is mailed to the 2ND Reconnaissance Technical Squadron unprocessed. Film must then be processed, scored and forwarded to 376th Bombardment Wing prior to being entered on the Air Training Report. As a result, all ECM and visual bombing activity not confirmed by the third calendar day of the fourth month, following the quarter, is lost. It is recommended that the suspense date for the Air Training Report be re-established to the 12th calendar day of the month, as stated in above referenced SAC message. In event the suspense

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for First Training Quarter 1956 (Jan, Feb, and Mar)

can not be adjusted, it is recommended that the procedure for supplemental reports be re-instated for the last month of each quarter.

(5) Reference Second Air Force message DOTG 2628, 14 June 1955, Subject: Report of Injuries Sustained Due to Judo:

(a) None.

(6) Reference Second Air Force Message DOTR 5616, 26 August 1955, Subject: Restricted Refuelings:

(a) None.

For and in the absence of
Robert T. Calhoun Col USAF

STEPHEN D. MC ELROY
Colonel, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of December, 1955

(RCS: 4-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

M. A. Preston
M. A. PRESTON
Brigadier General, USAF
Commander

7

6-90-4 SECRET 6-51-7

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CLASSIFICATION: SECRET
AUTH: CONDR 376TH BOMBWG
INITIALS: [illegible]
DATE [illegible]

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of December 1955
(RCS: 4-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

For use in the absence of
STEPHEN D. McELROY Col, USAF
Colonel, USAF
Commander

6-35-7

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the Month of December 1955
(RCS: 4-SAC-T12

PART III

6. Squadron Commander's Remarks - PART III

a. Hours flown performing missions ordered by Higher Headquarters:

(1)	Four sorties for IRAN ferry flights	5:50
(2)	Two Test & Tactics flights	12:00
(3)	Eleven sorties 2AF Ops Order 501-55 (Texas League)	30:05
(4)	Sixteen sorties for cargo and passenger flights	79:35
(5)	Total hours flown on Higher Headquarters flights	127:30

b. Weather or local conditions affecting training:

(1) Training missions not flown because of weather:
7 sorties, scheduled for a total of 37:00 hours.

(2) Training missions not flown because of alert exercises:
9 sorties scheduled for a total of 49:00 hours.

(3) Totals: 16 sorties and 86:00 hours

c. Restrictive Directives:

(1) Negative.

d. Combat crew member gains and losses:

(1) Crew members gained:

(a) One Aircraft Commander.

(b) One Navigator.

(c) One Radio Operator.

Secret

Secret

PART III - 376th BW (H), Squadron Commander's remarks for the month of December 1955

(2) Crew members lost:

(a) One Aircraft Commander

(b) Five Navigators

(c) One Engineer

(d) One Radio Operator

(e) One Boom Operator

(f) Two Assistant Boom Operators.

e. Crew member changes:

(1) Two Aircraft Commanders

(2) One Pilot

(3) Two Navigators

(4) One Engineer

f. New crews:

(1) None

g. Crew status changes:

(1) None

h. Standardization crews:

(1) T-02

(2) T-06

i. Additional material and personnel problems:

(1) The outstanding maintenance difficulties encountered during the month of December were as follows:

(a) Major AOCP items consisted of a propeller, exhaust stack elbows, nose wheel steering metering valves, propeller synchronizer, fuel secondary valve, A-1 pump selector valves and fittings and exciter regulators.

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PART III - 376th BW (M), Squadron Commander's remarks for the month of December 1955

(b) The AOCP rate for the month was 6.78 as compared to 4.93 for November.

j. SAC minimum training requirements not accomplished:

(1) None

k. Non-combat ready crews capable of deploying:

(1) Two crews - M-21 and M-27 are capable of deploying in event of an emergency.

l. Noncombat ready crew training:

(1) Two noncombat ready, (M) crews were available for training during the month of December. One crew flew a total of 33 hours and the other a total of 34 hours; average noncombat ready crew flying was 33.5 hours.

(2) SX and IM crew flying accounted for 11 sorties and a total of 69:25 hours.

(3) Estimate of date noncombat ready crews will be combat ready.

(a) M-21 - 1 Jan 56

(b) M-27 - 1 Jan 56

(c) IM-31 - 31 Mar 56

(d) IM-32 - 1 June 56

(e) IM-33 - 1 May 56

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PART III - 376th BW (M), Squadron Commander's remarks for the month of December 1955

m. Special training month remarks.

(1) Analysis of special training month accomplishments:

ITEM	PROGRAMMED	ACCOMPLISHED	PER CENT
Flying time	378	417	111
Sorties	75	80	107
Transition and pilot proficiency	90	59	66
Navigation	48	55	114
Grid	7	7	100
Night Celestial	12	3	25
Day Celestial	11	16	146
Radar Legs	18	29	160
Radar Approaches	23	29	126
Rendezvous	35	23	66
Total Hook-ups	490	662	136
Dry	350	531	152
Wet	140	131	97

(2) The original program for December was based on a total of 460 hours. Due to time lost for weather and EWP alert exercised (Par 6b), a revised flying hour estimate of 378 hours was submitted on 10 Dec.

(3) Revision of higher headquarters missions during the month necessitated diverting a number of scheduled night navigation sorties and rescheduling these as day flights to meet requested take-off times.

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Secret

(4) Analysis of the programmed missions as compared to the missions flown shows a considerable change in types of sorties flown. Training accomplishments trended toward more day training especially in navigation and air refueling, as compelled by requested take-off times and availability.

(5) Pilot proficiency training was low due to 24 hours lost to weather and EWP alerts, 10 hours lost because of rescheduling for higher headquarters missions, and 4 hours lost because of an air abort. Only five pilots in initial checkout training were available during the month; the remainder were attending MTD's. Three of the five available pilots completed 51-19 requirements and the other two are 75 percent complete.

(6) In accordance with the revised flying hours programmed as of 10 Dec, reference (2) above, 35 refueling missions were scheduled, however only 23 rendezvous were obtained because of 9 aborts and in a number of instances lack of receiver requirements for such training.

n. Comments or recommendations of the Squadron Commander:

(1) The average number of combat crews assigned during December was 18. A total of 266 hours (excluding test hops) was flown for an average of 14.8 hours per crew (excluding two standardization crews).

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PART III - 376th [illegible] (M), Squadron Commander's remarks for the month of December 1955

(2) The average number of aircraft possessed by the squadron during December was 18.4. The average time flown per aircraft was 22.7 hours.

(3) Concentration of flying training was placed on non-combat ready crew training, progress toward initial checkout of crew members not assigned to crews, and upgrading of assistant boom operators and co-pilots.

Wendell D Lack
WENDELL D LACK
LTCOL, USAF
Commander

Secret

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of January, 1956

(RCS: 4-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders. Reference para 6L3. Authority has been received to fly all boom operators.

M. A. PRESTON
Brigadier General, USAF
Commander

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6-461-7

Secret

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMDR 376TH BOMBWGM
INITIALS: ________
Date: 9 March 1956

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of February 1956
(RCS: 4-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

Stephen D. McElroy
STEPHEN D. MC ELROY
Colonel, USAF
Commander

Secret 6-249-7

Secret

376th AIR REFUELING SQUADRON
376th Bombardment Wing, Medium
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the Month of February 1956
(RCS: 4-SAC-T12)

PART III

6. Squadron Commander's Remarks - PART III

a. Hours flown performing missions ordered by Higher Headquarters:

(1) Three sorties for IRAN ferry flights 5:05

(2) Two Test and Tactics flights 16:30

(3) Four cargo and passenger flights 19:25

(4) Twenty sorties for SAC Ops Order 400-56 (Tailgate) 85:30

(5) Total hours flown on Higher Headquarters flights 126:30

b. Weather and local conditions affecting training:

(1) One sortie scheduled for five (5) hours was lost due to weather.

(2) Out of 30 air refueling sorties scheduled with receivers 70 SRW from Little Rock, a total of 11 were ineffective due to receivers cancellation or abort.

(3) Thirteen sorties scheduled for operation Tailgate were not flown due to weather

c. Restricitive directives:

(1) None

d. Combat crew member gains and losses:

(1) Crew members gained:

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PART III - 376 - BW (M), Squadron Commander's remarks for the month of February 1956

(a) Two Pilots

(b) One Radio Operator

(c) One Boom Operator

(2) Crew members lost:

(a) One Pilot

(b) One Navigator

(c) Two Radio Operators

(d) Four Boom Operators

e. Crew member changes:

(1) One Aircraft Commander

(2) Two Pilots

(3) Two Navigators

(4) One Engineer

f. New crews:

(1) None

g. Crew status changes:

(1) None

h. Standardization crews:

(1) T-02

(2) T-06

i. Additional materiel and personnel problems:

(1) The outstanding maintenance difficulties encountered during the month of February were as follows:

(a) Four aircraft had engine changes.

(b) Seven aircraft were out of commission an average of five days each for propeller cuff and dome modification. (TO 3H1 - 11 - 502)

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PART III - 376 - BW (M), Squadron Commander's remarks for the months of February 1956

(c) Two aircraft were out of commission for most of the month. One for a rudder boost actuator and the other for a throttle control bracket and wing flap motor.

(d) The AOCP rate for February was 2:00 compared to 3:03 for January.

j. SAC minimum training accomplishments not completed:

(1) None

k. Non-combat ready crews capable of deploying in an emergency:

(1) None

l. Non-combat ready crew training:

(1) No N status crews assigned

(2) The average number of IM crew members available for training for the entire month was 23. A total of 1023 hours was flown by these crew members for an average of 44.5 hours per man.

(3) Of the twenty-two (22) other non-checked-out crew members available for only a portion of the month, the pro-rata total hours required was 205. Flying accomplished by these personnel totalled 207 hours.

(4) Estimate of date non-combat ready crews will be combat ready:

(a) IM-31 1 May 56

(b) IM-32 1 Jun 56

(c) IM-33 1 May 56

m. Special Training Month remarks:

Secret

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PART III - 376 - BW (M), Squadron Commander's remarks for the month of February 1956

(1) None

n. Comments or recommendations of the Squadron Commander:

(1) The average number of combat ready crews assigned during February (excluding the two standardization crews) was eighteen. A total of 571:25 hours ([illegible]) (excluding test hops) was flown for an average of 30:05 hours per crew (excluding the two standardization crews).

(2) The average number of aircraft possessed by the squadron during January was eighteen. The average time flown per aircraft was 31:45 hours.

(3) The shortage of navigator replacements mentioned in the January T-12 report is still critical. If any transfers are made crew regression will result

(4) Present pending transfers from the squadron include four majors who hold key positions. Loss of these officers will greatly reduce the experience level of the organization. No experienced replacements are available as of this date.

(5) The Squadron has completed 77% of the combat ready crew quarterly training requirements as of 29 February 1956.

Wendell D Lack

WENDELL D LACK
Lt Colonel, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of February, 1956

(RCS: A-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

M. A. Preston
M. A. PRESTON
Brigadier General, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMDR 376THBOMBWGM
INITIALS: Murphy
DATE: 9 February 1956

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of January 1956
(RCS: 4-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

Stephen J. McElroy
STEPHEN J. MC ELROY
Colonel, USAF
Commander

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4-6-1203

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376TH AIR REFUELING SQUADRON
376th Bombardment Wing, Medium
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the Month of January 1956
(RCS: 4-SAC-T12)

PART III

6. Squadron Commander's Remarks - PART III

a. Hours flown performing missions ordered by Higher Headquarters:

(1) Three sorties for IRAN and ferry flights 5:00

(2) Five Test & Tactics flights 25:05

(3) Ten cargo and passenger flights 52:05

(4) Total hours flown on Higher Headquarters flights 82:10

b. Weather or local conditions affecting training:

(1) Training missions not flown because of weather:

(a) None

(2) Training missions not flown because of 4AD alert exercises:

Two sorties, scheduled for a total of 10:00 hours.

(3) Totals: Two sorties and 10:00 hours.

c. Restrictive directives:

(1) None

d. Combat crew member gains and losses:

(1) Crew members gained:

(a) Three Pilots

(b) One Radio Operator

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PART III - 376 - BW (M), Squadron Commander's remarks for the month of January 1956

(2) Crew members lost:

(a) Two Aircraft Commanders

(b) One Pilot

(c) Four Navigators

(d) Two Flight Engineers

(e) One Radio Operator

(f) Two Boom Operators

(g) Four assistant Boom Operators

e. Crew member changes:

(1) Two Aircraft Commanders

(2) Two Pilots

(3) Six Navigators

(4) Five Engineers

(5) Two Boom Operators

(6) Ten Assistant Boom Operators

(7) Six Radio Operators

f. New Crews:

(1) None

g. Crew Status changes:

(1) [illegible]-21 to T-21 effective 1 Jan 56

(2) [illegible]-27 to T-27 effective 1 Jan 56

(3) T-13 dissolved effective 10 Jan 56

h. Standardization crews:

(1) T-02

(2) T-06

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PART III - 376 -BW (M) Squadron's Remarks for the Month of January 1956

i. Additional material and personnel problems

(1) The outstanding maintenance difficulties encountered during the month of January were as follows:

(a) Four aircraft had engine changes.

(b) One aircraft has been ACCP for the greater part of the month for a rudder boost actuator.

(c) Two aircraft have one AR pump removed and are RMPE.

(d) Propeller cuff and dome modification (T.O. 3H1-11-502) has kept an average of five aircraft out of commission all month for T.O. compliance.

(e) The ACCP for January was 3.03 as compared to 6.76 for December.

j. SAC minimum training accomplishments not completed:

(1) None.

k. Non-combat ready crews capable of deploying in an emergency:

(1) None.

l. Non-combat ready crew training:

(1) None - no N crews assigned

(2) The average number of L crew members available during January (excluding boom operators) was 10.3. A total of 264.5 hours was flown by these crew members for an average of 26 hours each crew.

(3) Fourteen boom operators were not flown during January pending approval or disapproval of the payment of flying pay for boom operators assigned in excess of 1.5 manning authorization. This decision is still pending.

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PART III - 376 - B (C), Squadron Commander's remarks for the month of
January 1956

1 (4) Estimate of date non-combat ready crews will be combat ready:

(a) IM 31 31 Mar 56

(b) IM 32 1 Jun 56

(c) IM 33 1 May 56

m. Special training month remarks:

(1) None

n, Comments or recommendations of the Squadron Commander:

(1) The average number of combat ready ctews assigned during January (excluding the two standardization crews) was 1[illegible]. A total of 499 hours (excluding test hops) was flown for an average of 26 hours per crew (excluding the two standardization crews).

(2) The average number of aircraft possessed by the squadron during January was 19.0 The average time flown per aircraft was 29 hours.

(3) A very critical personnel problem will exist in the Squadron prior to May in regards to navigators. Of the twenty eight navigators presently assigned, ten will leave the squadron for various reasons including two navigators discharged, four navigators are qualified and have applied for pilot training three to upgrading school and one PCS. Unless adequat replacements can be assigned and trained before May, thee combat ready crews and three IM crew will be dissolved for lack of navigators.

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PART III - 376 - BW (M), Squadron Commander's remarks for the month of January 1956

(4) The Squadron has completed 43% of the combat ready crew quarterly training requirements as of 31 Jan 56.

WENDELL D L[illegible]CK
LTCOL, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of March, 1956.

(RCS: 4-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

M. A. Preston
M. A. PRESTON
Brigadier General, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMDR 376TH BOMWGM
INITIALS: [signature]
Date: 5 April 1956

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of March 1956
(RCS: 4-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

Forward in the absence of

[signature] Col USAF
STEPHEN D. MC ELROY
Colonel, USAF
Commander

Secret

Cont

376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the month of March 1956
(RCS: 4-SAC-T-12)

PART III

6. Squadron Commander's Remarks - PART III

a. Hours flown performing missions ordered by higher headquarters:

(1)	10 sorties for [illegible] ferry flights	17:25
(2)	7 sorties for Test & Tactics	41:35
(3)	1[illegible] sorties for cargo & passengers	[illegible]:30
(4)	20 sorties SAC Ops. Order 400-56 (Tail Gate). (Feb)	[illegible]:30
(5)	70 sorties for 2AF Ops. Order 23-56 (Big Wind). (Mar)	572:45
(6)	Total hours flown on Higher Headquarters flights.	802:45

b. Weather and local conditions affecting training:

(1) 15 sorties scheduled for 8 hours duration were lost due to wx.

(2) 11 of 30 scheduled sorties with the 70th SRW were ineffective due to receiver cancellations in Feb. after tanker were airborne.

c. Restrictive Directives

(1) None

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PART III - 376 - BW(M), Squadron Commanders remarks for the month of March 1956

h. Standardization Crews

(1) T-02

(2) T-06

i. Additional Material & Personnel Problems:

(1) The AOCP rate for March was 4.01 compared to 2.00 for February and 3.03 for January.

j. SAC Minimum training accomplishment not completed:

(1) None

k. Non-Combat ready crews capable of deploying in an emergency.

(1) None

l. Non-Combat ready crew training

(1) No M status crews assigned

(2) 51-19 Status Personnel:

(a) During the quarter ending 31 Mar 56 there were 23 51-19 status crew members available to fly. These crew members flew a total of 2284 hours an average of 99:30 per man.

(b) In addition to the above, 27 51-19 crew members were available only during a portion of the month of March. These crew members flew a pro-rated average of 30 hours per man.

(3) Estimate of date Non-Combat ready crews will be combat ready

(a) IM-31 1 May 56

(b) IM-32 1 Jun 56

(c) IM-33 1 May 56

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PART III - 376 - BW (M) Squadron Commanders remarks for the month of March 1956

d. Crew member gains and losses

(1) Crew members gained

(a) Eight Pilots

(b) Three Radio Operators

(c) Two Boom Operators

(2) Crew members lost

(a) Two Aircraft Commanders

(b) Three Pilots

(c) Five Navigators

(d) Four Flight Engineers

(e) Three Radio Operators

(f) Eight Boom Operators

e. Crew Member Changes

(1) Three Aircraft Commanders

(2) Four Pilots

(3) Nine Navigators

(4) Six Flight Engineers

(5) Seven Radio Operators

(6) Two Boom Operators

(7) Ten Assistant Boom Operators

f. New Crews

(1) IM-34 29 Mar 56

g. Crew Status Changes

(1) M-21 to T-21 1 Jan 56

(2) M-27 to T-27 1 Jan 56

(3) T-13 Dissolved 10 Jan 56

(4) T-19 Dissolved 1 Mar 56

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PART III 376 BW (M) Squadron Commanders remarks for the month of March 1956

(d) [illegible]-34 1 Aug 56

m. Special training month remarks:

(1) None

n. Comments or recommendations of the squadron commander:

(1) The average number of combat ready crews assigned during March (Excluding the two Standarization crews) was 1[illegible]. A total of [illegible]10:00 hours (Excluding test Hops) was flown for an average of 4[illegible]:30 per crew (Excluding the two Standarization Crews).

(2) The average number of aircraft possessed by the squadron during March was 1[illegible]. The average time flown per aircraft was 4[illegible]:30

(3) The shortage of navigator replacements mentioned in the January and February T-12 Report is still critical.

(4) Present pending transfers from the squadron include three Majors who hold key positions. Loss of these officers will greatly reduce the experience level of the organization. No experienced replacements are available at this date.

(5) The squadron has completed 100% of the combat ready crew quarterly training requirements as of 31 Mar 56.

Wendell D Lack

WENDELL D LACK
Lt Colonel, USAF
Commander

Secret

Classification: SECRET
Auth: COMDR 376BOMWG M
Initials: Murphy
Date: 14 Dec 55

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT 9 December 1955

SUBJECT: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30)

TO: Commander
Second Air Force
Barksdale Air Force Base
Louisiana

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 30 November 1955. Each succeeding paragraph deals with individual project progress.

2. Test Project Number 1X, "Development of an Unattended Communications Jammer".

a. Date initiated: 2 June 1953.

b. Percentage complete: 47%.

c. Hours flown: None.

d. Present status:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to the normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used

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for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously.

(2) To minimize tracking difficulties in the first model, all circuits were designed to tune one half the required band. If the equipment proves satisfactory, the tuning range will be extended to cover the entire band from 100 to 156 megacycles. Present tracking errors for all circuits appear to be satisfactory over the range covered.

(3) Miniaturization of the intermediate frequency amplifier was completed and the unit bench tested. A sensitivity of one-half microvolt was obtained with a band pass of approximately 130 kilocycles. The sensitivity was measured with a TS-497/B signal generator and Heathkit oscilloscope. The receiver front end was not connected for this initial test, but the complete receiver will be tested during December.

(4) The scan rate of the receiver has not yet been determined due to lack of a suitable drive motor. A motor of the type required has been ordered and should be received during December.

(5) The identification device has been designed but will not be used in the first model because there is no suitable modulation transformer. This circuit will not be required to test the search and lock-on principle and can be added later

3. Test Project Number 28, "Development of an Unattended Random Pulse Jammer".

a. Date initiated: 1 November 1954.

b. Percentage complete: 45%.

c. Hours flown: None.

d. Present status:

(1) The jammer being designed under this test project is an unattended, sweeping, random pulsed, S-band transmitter. Purpose of the jammer is to delay early warning radar system detection of jet aircraft by creating a multitude of random spots on the radar scope. It is not expected that the spots created

will resemble the arc-like returns from normal radar pulses, nor is it proposed to synchronize the jammer with the radar pulse recurrence rate. From experience and observation of early warning radars, it has been found that at long ranges such radars paint jet type aircraft, as the B-47, either very poorly or not at all. The paints do not occur on every sweep of the radar and generally appear as small point echoes. These fleeting echoes are used by the radar operator to plot aircraft position by means of dead reckoning for considerable distance beyond the range where normal target returns are obtained. It is believed that by creating random un-synchronized pulses on the radar scope, the marginal paints can be masked and detection of jet aircraft delayed for considerable distance.

(2) A jamming transmitter for producing random pulses is being constructed from an AN/APT-16 jamming transmitter. Standard AN/APT-16 parts are being used insofar as possible. An AN/APT-16 modulator has been modified to produce random pulses from zero to 10,000 pulses per second. A gas noise tube furnishes random pulses to trigger a multi-vibrator which, in turn, controls a blocking oscillator. Random pulses from the blocking oscillator are amplified and applied to a hard tube modulator. The multi-vibrator in the circuit is necessary in order to allow the charging condenser in the modulator to charge to maximum voltage for each pulse. An AN/APT-16 power supply and transmitter are being modified for use with the pulse jammer. The present AN/APT-16 CW magnetron will be used for pulsed operation.

(3) Work continued on completing and perfecting operation of the random pulse generator. To obtain high pulse rates in excess of 10,000 pps, several blocking oscillator circuits were tried with the final adoption of a positive voltage, non-synchronous blocking oscillator. Noise pulses from the noise generator provide premature triggering of the blocking oscillator. This creates pulse jitter at a random rate. The amplitude of noise injected into the blocking oscillator determines the amount of pulse jitter. The PP-915/APT-16 power supply has been modified to provide necessary plate, screen grid, and grid voltages to the hard tube modulator. Chassis layout for the prototype model of the RF section of the jammer is now under construction. It was intended originally that QK-283A or QK-387 magnetrons would be used with this system; however, these types are no longer available so the RF section is being constructed to use a QK-459/ALT-8 magnetron. As a preliminary test,

a QK-284A magnetron on a breadboard layout was connected to the modulator and pulsed at approximately 4000 pps. Operation appeared to be satisfactory, although there was some multi-moding due to the high VSWR of the antenna system used for the test. It is expected that the jamming system will be ready for flight tests by next month.

4. Test Project Number 33, "Personal Radio Alert Equipment".

a. Date initiated: 6 May 1955.

b. Percentage complete: 23%.

c. Hours flown: N/A.

d. Present status:

(1) The SAC mission requires immediate availability of key personnel and early availability of many other personnel when alert conditions exist. Purpose of this project is to determine a feasible method of quickly alerting specific groups of individuals through use of radio. Under this plan each individual would be equipped with a small radio receiver that could conveniently be carried in a shirt pocket. This receiver would be tuned to a specified frequency upon which an alert signal could be broadcast.

(2) The ground transmitter to be used with the low frequency alert receiver is inoperative awaiting repair parts. These have been ordered and field tests will be conducted when the transmitter is again operating. While awaiting transmitter parts it was decided to investigate the possibility of using a high frequency receiver for which a more efficient antenna could be designed. This would be similar to those in general use for paging or doctors' call systems which operate at 35.58 megacycles. These call systems employ a two-tube super-regenerative receiver with an effective reception range of 50 miles from the 250 watt transmitter. In these systems the code number of the person being called is recorded on tape and transmitted continuously. The person carrying the receiver need only turn it on periodically and listen for his number, then call the station for the message. This periodic receiver operation gives long battery life and allows vacuum tubes to be used. For military alerting use, the receiver would have to be operated continually and use of vacuum tubes would give a prohibitively short battery life. Parts necessary to

construct a transistor receiver on 35.58 megacycles have been ordered and upon receipt, the receiver will be constructed and its operation tested on reception of the commercial call system transmitter now in operation at Shreveport, Louisiana. At present no military transmitters are normally operated at 35.58 megacycles, but the AN/FRT-15 will operate up to 26 megacycles. This frequency will also be investigated.

5. Auxiliary Test Project Number 18, "Development of a VHF Communications Jammer Using Increductors".

a. Date initiated: 1 April 1954.

b. Percentage complete: 55%.

c. Hours flown: None.

d. Present status:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which allow it to be swept through the VHF frequency band and lock-on any frequency to which an associated receiver is tuned. If frequency of the receiver is changed, the transmitter will automatically shift frequency to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver.

(2) An electronically tuned receiver is under construction. Associated with the receiver will be control circuits for causing receiver to automatically scan the band, locate the signal, identify it, lock-on, tune transmitter to the same frequency and begin jamming with periodic look-through. Should the victim signal change frequency, jamming system will follow the change. If the victim signal is discontinued, the receiver will resume searching until another signal is found. Provisions will be made to prevent one jammer from locking on another in the vicinity.

(3) Six sections of the search-and-lock-on receiver have been built: master sweep circuits, master multi-vibrator circuits, master control circuits, RF circuits, IF strip, and regulated power supply. The RF and IF units

have been aligned to tune the VHF band from 100 to 156 megacycles. The sweep circuits have been adjusted to tune the receiver over this range at approximately three sweeps per second. Work at present is progressing on the lock-on and gate circuits. The receiver lock-on circuitry has progressed to a point where lock-on of 0.1 to 0.2 seconds duration can be obtained at any frequency in the 100 to 156 megacycle band. Longer lock-on periods have not been possible to date due to leakage in the memory circuitry. The receiver and transmitter gating section is operational insofar as the gates generated start when the sweep starts and end when a signal is obtained. The circuitry is unstable at present and requires a 30 microvolt input level to the receiver to trigger the gates. Work is continuing to stabilize the gate circuits and extend lock-on time. No work has yet been accomplished on the transmitter "on" time or lock-through circuits.

6. Auxiliary Test Project Number 28, "S-Band RF Systems".

a. Date initiated: 1 November 1954.

b. Percentage complete: 78%.

c. Hours flown: 48:00.

d. Present status:

(1) In using high powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated.

(2) A T-402/ALT-6 transmitter has been modified to allow the magnetron oscillator tube and tuning mechanism to be operated remotely from the transmitter case. In this manner the transmitter may be mounted in its normal position while the magnetron is installed very close to the antenna. The remote unit was constructed and tested in the laboratory to insure the magnetron would be adequately cooled through the remote cooling fluid lines. After laboratory tests were completed, the unit was mounted in the wheel well of an aircraft in the posi-

tion normally used to mount the right horn antenna. A 12 inch piece of flexible waveguide was used between the magnetron and antenna mount. A normal AN/ALT-6 installation was made in the left ATO compartment using a QRC-2 (T) transmission line and AT-528 horn antenna.

(3) Two flight tests were flown locally to compare effectiveness of the remote magnetron installation with normal installation against the AN/GPQ-T1 radar training van located at Barksdale AFB. It was desired that the aircraft fly a pre-determined course first with the normal installation in operation and then repeat the course with the remote installation in operation. It was necessary to abort the first scheduled flight before any data could be obtained due to malfunction of the remoted equipment. Failure was determined due to a short circuit which developed in flight between the high voltage cable shield and center conductor within a Cannon plug connector at the remote magnetron unit. This trouble was corrected and both equipments operated satisfactorily during the second test flight. Though both the remote and normal installations gave effective results, data obtained on the test could not be used for any accurate comparison because the tracks flown with the two equipments differed considerably due to navigation errors.

(4) A third flight test for comparison of the remote magnetron installation with the normal installation was flown against the AN/FPS-10 radar at Bartlesville, Oklahoma. The same track was to be flown with each of the installations in operation and the jamming affect on the radar compared. The remoted AN/ALT-6 equipment failed after one and a half hours operating time, and the standard AN/ALT-6 equipment failed immediately after the run for this equipment started, so the exact data desired was not obtained. Results from the remote installation were very effective in that jamming strobes were heavier and wider than obtained using single AN/ALT-6 transmitters on previous missions against this radar site.

(5) The remote magnetron equipment was examined in the laboratory after the third flight test and the cause for failure was determined to be overheating of the filament-cathode connectors in the magnetron section. Sufficient heat was generated to melt solder connections to the magnetron filament and cathode connections, also some of the silver-soldered contact fingers on the cathode connector ring became unsoldered. To eliminate this source of difficulty on future tests, the filament and cathode connections are being changed to make them more secure, and a

small axial flow blower is being installed to cool the magnetron filament and cathode connectors. When this modification is complete, more flight tests will be made so that conclusive comparison of the remote and normal transmitter installations can be made.

(6) Results obtained from the flight test on the remote magnetron installation appeared so good that it was decided to investigate the possibility of using a fed slot antenna on other transmitters. Six of these slot antennas are being fabricated. These will consist of plates the same size as the AB-109 antenna mounts in which the oval shaped receptacle of the AB-109 will be replaced by a hole the same dimension as the interior of the standard waveguide. A UG-1106/ALT-6 waveguide to coaxial transformer will be used to feed the plate. A Teflon cover will be used over the slot to prevent moisture from entering the guide. It is expected tests of these antennas can be made during December.

7. Auxiliary Test Project Number 45, "AN/ALQ-3 Suitability Test".

a. Date initiated: 2 May 1955.

b. Percentage complete: 18%.

c. Hours flown: 25:00.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 S-band search-and-lock-on jamming system. Two complete AN/ALQ-3 systems have been received for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing.

(2) One successful flight test was conducted during November with the AN/ALQ-3 operating against the MSQ-2 precision tracking radar at Little Rock, Arkansas. AN/ALQ-3 system number two was installed in a KC-97F aircraft and operated continuously for a period of four hours while the aircraft made radial and tangential passes against the radar site. The aircraft altitude was maintained at 20,000 feet and airspeed at 220 knots TAS. Several runs were made using the conventional AT-518 helix antenna connected to the AN/ALQ-3 receiver; others were made with the QRC-27(T) stub as the receiving antenna. A comparison of results obtained with the two receiving antennas indicated the QRC-27(T) is superior to the AT-518 as far as operation of the AN/ALQ-3 is concerned.

Runs using the AT-518 receiving antenna showed poorer jamming conditions than those for which the QRC-27(T) antenna was used, particularly at maximum ranges of the MSQ-2 radar. Jamming at the MSQ-2 console appeared at a non-periodic rate for periods of three to four seconds and then disappeared for as long as 30 seconds. Jamming during the three to four seconds was not intense enough to cause the radar to break lock but did prevent full automatic operation. Full automatic operation was regained immediately when the jamming disappeared. This condition was not as pronounced when the QRC-27(T) antenna was used, which indicates that the AT-518 does not receive sufficient signal from the radar to keep the AN/ALQ-3 locked on at the greater ranges. Although the maximum jamming intensity obtained during the test was not sufficient to cause the radar to break lock, indications were that the radar was tracking jamming rather than the aircraft, with extreme errors in azimuth, range, and elevation information. During one period when the radar was tracking automatically in azimuth and elevation, and manually in range, the altitude of the target, as determined by the radar, varied continually between 8000 to 35,000 feet. Actual altitude of the aircraft during this time was 20,000 feet. If future tests prove such errors to be characteristic of AN/ALQ-3 jamming, the aircraft will be afforded sufficient protection and it will not be necessary for the jamming signal to cause the radar to completely break lock.

(3) Preliminary conclusions which may be drawn from the tests conducted to date are: MSQ-2 radars can acquire and track a KC-97 type aircraft flying at 20,000 feet at distances up to approximately 75 miles from the radar site. The aircraft is partially protected by the AN/ALQ-3 using the QRC-27(T) antenna at this range, but is only very poorly covered if the AT-518 antenna is used. At closer ranges, better jamming and more coverage for the aircraft are obtained except on tangential courses when the broadside aspect of the aircraft provides the radar with a stronger return. During this time the jamming signal is not sufficient to blot out the radar video return from the aircraft. A sufficient number of successful tests have not been completed to conclude the exact ranges and degree of safety afforded the aircraft by a single AN/ALQ-3.

(4) During November three flight tests were scheduled. The first of these aborted because of equipment failure after takeoff. Post-flight inspection of the equipment showed that a type 6080 vacuum tube (V-4017 regulator tube) in power supply number two had failed, apparently

having lost vacuum. Also, the coil of relay K-4001 in power supply number two had opened and prevented plate voltage from being applied to the receiver. These troubles were corrected and system number two operated successfully on the second scheduled test. The third flight test was aborted because of failure of both systems one and two, and the lack of spare parts to make them operative.

(5) During bench operation of transmitter number two, resistor R-1101 in the modulator grid circuit opened, resulting in loss of noise modulation and bias voltage for the 6019 modulator tube. Heat generated during this failure was sufficient to melt all solder connections to the filament and cathode rings of the tube and some of the silver solder which secures the finger material to the cathode ring. It was not determined whether the grid resistor failed because of the excessive heat or because of the high grid current drawn by a gassy 6019 modulator tube. The 6019 which appeared to be gassy was returned to the W. L. Maxson Corporation where its condition could be determined. A new 6019 tube, cathode ring assembly, and grid resistor have been obtained for transmitter number two. Maintenance time required to repair transmitter number two is approximately ten hours due to the extensive dismantling of the transmitter necessary to gain access to the modulator tube socket. During operation of transmitter number one, a similar failure occurred; however, in this case a lead of resistor R-1101 had broken. Heating in this transmitter was not as severe as experienced in number two, which indicated that the modulator tube in number two was gassy. Transmitter number one was dismantled to replace this resistor.

(6) Another difficulty encountered with the equipment during November was a three to five megacycle difference between the jamming signal and the victim signal with system number one at most frequencies, and at some isolated frequencies with system number two. Indications are that the tuning adjustments on the second pre-selector cavity are too critical (three megacycles per .001 inch). This cavity has a bandwidth of 30 megacycles (equivalent to .01 inch displacement of the tuning plunger) and is used to pass a sample of the transmitter signal to the transmitter error discriminator for fine tuning of the transmitter. At one frequency of receiver two the metal band covering the pre-selector tuning cam was bent, causing the pre-selector to be tuned more than 30 megacycles away from the transmitted frequency, which prevented the transmitter error discriminator from receiving a signal.

The result was that the transmitter did not receive a minimum level signal and would therefore not go into the fine tuning phase but would continue in a perturbed state. At other frequencies the metal band is far enough out of adjustment to lower the amplitude of the error signal to the extent that the transmitter servo amplifier stops the transmitter fine tuning when the transmitter signal is still three to five megacycles away from the victim frequency. The metal used for the pre-selector cam bands appears very ductile and susceptible to wear and bending. If this proves to be the cause of the trouble, a possible solution would be to use stainless steel for the bands. New bands have been obtained for receiver number two. These will be installed and adjusted for perfect operation, after which the difference between jamming and victim frequencies will be recorded as the bands wear. It is felt this is the cause for the difference between the jamming and victim frequencies in system number one; however, conclusive proof has not been obtained.

(7) Other equipment malfunctions have been: one type 6080 regulator tube in power supply one failed; weak 12AT7 tube (V-3407) used as a multi-vibrator in unit 2400 of pulse analyzer number one; weak 12AT7 multi-vibrator tube (V-3407) in unit 2400 of pulse analyzer number two; bad connections on Winchester plugs of plug-in unit 3400 in systems one and two (P-3401 NN on pulse analyzer one, P-3401 BB on pulse analyzer two). A total of approximately 75 manhours have been spent on trouble shooting and maintenance of the two AN/ALQ-3 systems during November.

(8) Two flight tests are scheduled for December. These will be conducted against the Dallas, Texas, RBS site with the AN/ALQ-3 equipment installed in a KC-97 aircraft.

8. Auxiliary Test Project Number 46, "AN/ALQ-7 Suitability Test".

a. Date initiated: 15 August 1955.

b. Percentage complete: 20%.

c. Hours flown: 9:30.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal

encountered whose carrier frequency, pulse width, and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output of up to 400 watts.

(2) Installation of the AN/ALT-7 in the RB-47E aircraft was completed during the first week of November. This involved fabrication of electrical cables and the mounting of the antenna, waveguide, and control indicator.

(3) The first test mission was flown in the local area on 16 November at an altitude of 20,000 feet. Since there were no X-band ground radars available in the local area, an attempt was made to have the AN/ALQ-7 lock-on and jam both the AN/APG-32 fire control radar and AN/APS-23 navigation radar in the aircraft in which the jammer was being flown. The AN/ALQ-7 appeared to lock-on the signal from the AN/APG-32 for a moment or so when first turned on but malfunctioned immediately thereafter, so no further information was gained. The AN/ALQ-7 was repaired and a second mission flown on 22 November against an M-33 tracking radar at Eglin AFB, Florida. The AN/ALQ-7 locked on the radar signal and jamming was quite effective, causing the operator to lose the target several times. The AN/ALQ-7 failed after approximately six minutes of operation and no further information was gained on this test. During the short period of jamming the AN/ALQ-7 appeared effective against the M-33 radar at ranges of from ten to 25 miles. Post-flight inspection of the equipment revealed the cause for the AN/ALQ-7 failure was due to shorted wiring. This was corrected by removing the short. A third mission was flown 30 November against the M-33 radar at Eglin AFB. Results are not available at this time but will be reported in the next monthly report.

(4) The receiver and low voltage power supply section of the AN/ALQ-7 were placed in the altitude chamber to observe

their operation at altitudes up to 40,000 feet. The local oscillator high voltage arced to the fiber cover at 32,000 feet. After this was corrected by better insulation, both units were taken to 40,000 feet where they operated satisfactorily.

(5) Five flight tests are scheduled for December. These are designed to test the operation of the AN/ALQ-7 against ground-based tracking radars, airborne fighter interceptor radars, and the fire control and navigation radars of other nearby B-47 aircraft.

9. Auxiliary Test Project Number 47, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters".

a. Date initiated: 14 September 1955.

b. Percentage complete: 10%.

c. Hours flown: N/A.

d. Present status:

(1) Purpose of this project is to design test and calibration equipment suitable for field use for enabling fast and accurate setting up of AN/ALT-6 and AN/ALT-8 transmitters under conditions common to flight lines of SAC units. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means.

(2) A second model of the sweep limit measuring device was built. This unit, like the first, consists of six cavities mounted on a metal plate. Each cavity has a small antenna and a neon bulb resonance indicator and is tuned to a particular frequency dependent on the sweep limits to be measured. For sweep limits from 2700 to 3100 megacycles, the cavities would be pre-set to 2650, 2700, 2750, 3050, 3100 and 3150 megacycles. To check the sweep limits of a transmitter, the device is held in front of the horn or stub antenna so that the cavity antennas are illuminated by the jamming transmitter output. If the transmitter is sweeping over the correct range, only the four neon bulbs in the cavities tuned to 2700, 2750, 3050 and 3100 flash; if the sweep is too wide, either or both neon bulbs in the cavities tuned to 2650 or 3150 flash. If the sweep limits are too narrow or displaced either high or low, this may also be seen from observing which bulbs flash.

The second model of this device incorporates mechanical and electrical improvements over the first model and is presently undergoing electrical testing and calibration. A shock-proof carrying case for the device has been built.

10. Auxiliary Test Project Number 48, "Airborne Tape Recorder".

a. Date initiated: 4 October 1955.

b. Percentage complete: 15%.

c. Hours flown: 17:00.

d. Present status:

(1) Purpose of this project is to investigate the potential of the AN/APS-54 airborne warning receiver to collect automatically crude information on type, location, and numbers of enemy air defense radars received enroute by regular B-47 aircraft during combat. Data collected by the AN/APS-54 will be recorded on a tape recorder referenced as to aircraft position time. A playback of this tape with the flight log will be used to attempt spotting radar installations along the route flown. An airborne tape recorder (Nadar IV) having eight channels and tape for four hours of recording is being used for test.

(2) A North American engineering representative, Mr H. Gallaher, delivered the prototype model of the Nadar IV recorder to the 376th Bomb Wing and oriented personnel on operation and maintenance of the equipment. No schematic diagrams were received with the recorder but these are to be sent by North American as soon as available. Bench checks of the recorder were made to adjust the recorder amplifier for optimum signal-to-noise ratio. A small amount of 400 cycle ripple was noticed during playback. This condition is believed to be a local one rather than a recorder difficulty; however, cause of this ripple is being investigated. To complete bench checks, several radio programs were recorded and played back. Recorder operation, on the bench, appeared to be satisfactory.

(3) The recorder was installed in the pilot's station of a B-47 aircraft with the control box mounted on the left bulkhead within easy reach for operation. The recording unit was mounted on the floor behind the pilot's seat, positioned so not to interfere with operation of

the ejection seat or A-5 fire control radar system. Operating power was obtained through a 28-volt DC circuit breaker on the pilot's breaker panel and a 115 volt 400-cycle regulated AC circuit breaker on the observer's breaker panel. A voice-signal mixing box was added to the Nadar AN/APS-54 configuration to extend the recording capability for recording both voice and AN/APS-54 signals.

(4) Three flight tests were flown in conjunction with the flight tests on Auxiliary Test Project 46 but the recording equipment malfunctioned on all of these tests. Operating time of the recorder has been between 20 minutes and three hours without failures. On one flight test the tape jammed in the recording head and on other flights various difficulties were encountered, such as broken drive belt, loose clutch plate nut, record switch inoperative in record position, motor running hot with one-half hour's operation, nut loose on one capstan shaft, tape reversal switch inoperative, connections on programmer unit loose or disconnected, wow present on recordings, recording on two channels instead of one channel. Attempts are being made to correct these difficulties and provide better operation on future flight tests.

11. Auxiliary Test Project Number 49, "Flight Test of QRC-18(T)".

a. Date initiated: 15 August 1955.

b. Percentage complete: 20%.

c. Hours flown: 16:00.

d. Present status:

(1) Purpose of this project is to test tactical suitability of the QRC-18(T). Essentially, the QRC-18(T) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS.

(2) One flight test was flown on 22 November using two KC-97 aircraft, one simulating the bomber aircraft carrying the jamming transmitters and the other simulating the fighter aircraft. The aircraft were to maintain a constant 25-mile separation while flying

nose-to-tail over a course extending from Barksdale AFB to Jackson, Mississippi, a distance of approximately 170 miles. The bomber flew at 19,000 feet altitude and the fighter at 18,000 feet. The ground station was a 50 watt BC-640 VHF transmitter located at Barksdale AFB. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. An AN/ARC-3 VHF receiver was used in the fighter. The frequency used was 142.38 megacycles and the ECM operator in the aircraft continually monitored to keep the jammers centered on this frequency. Four runs were made, one with a single sweeping jammer, one spot jamming, and two with two sweeping jammers. One percent sweep units were used and the transmitters adjusted for a jamming rate of 800 to 1000 hits per second with narrow noise modulation. Results obtained, as compiled from the navigator and observer logs and recorded tapes, are shown in the following chart.

	JAMMING CONDITION	FTR FROM GND STA MILES	FTR TO BOMBER SEPARATION-MILES
RUN 1	One 1% Tx 800-1000 Hit/Sec Narrow Noise Pwr Out 125 Watts - Back Pwr 8 Watts		
	0	15	21
	2	30	22
	2	42	19
	2-3	56	18
	3	78	16
	3	100	15
	3	142	19
RUN 2	One TX Spot Jam - Narrow Noise Pwr Out 125 Watts		
	1	142	31
	1	125	31
	1-2	100	25
	1-2	81	20
	2	63	18
	2-3	33	21
	3	17	15
RUN 3	Two 1% Tx 800-1000 Hit/Sec Narrow Noise Pwr Out 125 Watts - Back Pwr 8 Watts		
	0	35	28
	1	58	33
	1	64	32

RUN 3	0	85	35
(Cont)	0	100	34
	0	140	28
RUN 4	Same as for Run 3		
	0	130	32
	0-1	126	31
	1	100	22
	1	84	20
	0	70	20
	0-1	66	21
	1	40	22
	1	39	30

The sweep width, as measured from the ground, was from 144.6 to 138.2 megacycles, or 6.4 megacycles wide during the first run, and from 145.88 to 139.36 megacycles, or 6.52 megacycles wide during the third and fourth runs.

(3) From results of this test and previous tests it appears that the QRC-18(T) equipment has no merit as a communications jammer; however, additional flight tests are scheduled for December.

12. Test Project Number 32, "Cell Support Tests".

a. Date initiated: 17 February 1955.

b. Percentage complete: 28%.

c. Hours flown: 557:55.

d. Present status:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars.

(2) A mission was flown by the 376th Bomb Wing on 3 November using six aircraft in a broad front formation with 20 nautical miles lateral separation between aircraft. Two runs were made against the AN/FPS-10 radar at Bartlesville, Oklahoma. Each run extended from an IP 200 nautical miles east of Bartlesville to a point 200 nautical miles west of Bartlesville and a return over a reciprocal course. On the first run each aircraft used four AN/ALT-6 and two AN/ALT-8 transmitters all

set for a slow sweep speed of 20 megacycles per second. On the second run each aircraft used four AN/ALT-6 transmitters on slow sweep speed and two AN/ALT-8 transmitters on a fast speed of 1200 megacycles per second. The mission was designed as a controlled test to determine the amount and type of jamming and number of skin paints received by the ground radar when the equipment configurations and bomber formation described are used. Preliminary evaluation indicates good jamming and very few skin paints; however, due to an airborne equipment failure rate of about 25%, no firm comparison of the two runs can be made. It is planned to re-run this mission at a future date. A complete mission report is being prepared.

(3) A mission was flown by the 376th Bomb Wing on 10 November using six aircraft in a broad front formation with 20 nautical miles lateral separation between aircraft. RR-20/U chaff was dropped by each aircraft at a rate of one unit every three minutes from an IP 200 nautical miles east of Bartlesville to a point 200 nautical miles west of Bartlesville. No chaff was dropped on a reciprocal return to the IP. This mission was designed as a controlled test to determine if the ground radar could track the dispersed formation when dropping chaff at a random rate. A track chart submitted by the ground radar station, Inclosure 1, indicates that an inadequate track was maintained on the formation. A complete mission report on results of this test is being prepared.

(4) A mission was flown by the 376th Bomb Wing on 16 November using three aircraft in a broad front formation with a lateral separation of 20 nautical miles between aircraft. Run one was made from a point 200 miles east of Bartlesville to a point 200 miles west of Bartlesville. On this run each aircraft used four AN/ALT-6 transmitters set for slow sweep speed and two AN/ALT-8 transmitters set for fast sweep speed. The second run was a reciprocal return over the same course during which all aircraft dropped chaff at a rate of one unit every three minutes. This mission was designed to determine the amount and type of jamming and number of skin paints received by the ground radar when the equipment configurations and bomber formation described are used. A track chart submitted by the ground radar station indicates an inadequate track was maintained on the formation during run one but that they were able to keep an adequate track during run two because of malfunctions of some chaff dispensers. A complete mission report on results of this test is being prepared. This mission will probably be re-run at a future date.

(5) A mission was flown by the 376th Air Refueling Squadron on 28 November in support of this project. A single KC-97 type aircraft equipped with two AN/ALT-8 transmitters having L-band magnetrons feeding diamond antennas flew in the area bounded by Jackson, Mississippi, Texarkana, Arkansas, and Henrietta, Oklahoma. Jamming operations were conducted against the AN/MPS-7 located at Texarkana, which involved changing equipment configuration and settings to determine optimum interference which could be caused the radar. Slow sweep speeds (10, 20 and 40 megacycles per second) proved ineffective at all ranges. High sweep speeds (1200 megacycles per second) were far superior. No anti-jamming measures except the use of MTI were employed at the ground radar. Tests were made at all sweep speeds against the IFF interrogator, but these were unsuccessful. A complete mission report on results of this test is being prepared.

FOR THE COMMANDER:

William H. Murphy

WILLIAM H. MURPHY
Major, USAF
Adjutant

1 Incl
Chart, a/s

DISTRIBUTION:
1-Hq SAC
1-Hq 4AD
1-Hq 8AF (Attn: Elect&Commo)
1-Hq 15AF (Attn: Elect&Commo)
5-Hq 2AF
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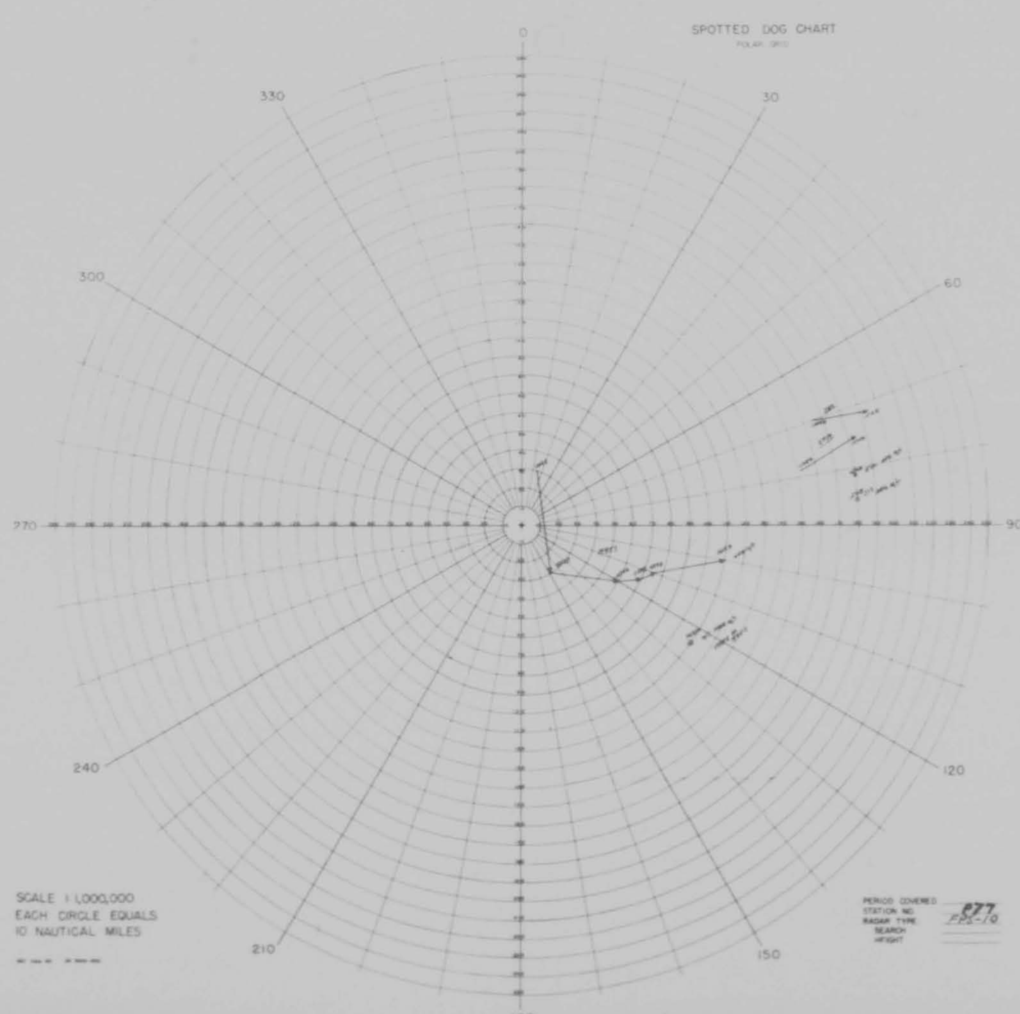

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Initials: Murphy
Date: 10 Jan 56

12

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

SUBJECT: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30)

TO: Commander
Second Air Force
Barksdale Air Force Base
Louisiana

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 December through 31 December 1955. Each succeeding paragraph deals with individual project progress.

2. Test Project Number 1X, "Development of an Unattended Communications Jammer".

a. Date initiated: 2 June 1953.

b. Percentage complete: 50%.

c. Hours flown: None.

d. Present status:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer,

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de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously.

(2) The drive motor was received and the mechanical linkage completed, thus allowing the receiver and transmitter to be tuned simultaneously. Scan rate with the present motor is one cycle every 2½ seconds; one cycle constitutes two complete scans.

(3) One circuit in the power amplifier was found to be slightly off in tracking with the other circuits. This will be corrected during January and the unit tested as a composite unit on the ground. If all tests indicate satisfactory results, it will be ready for initial flight tests.

(4) The drive motor has incorporated a clutch and brake system which allows the tuned circuits to be stopped within the pass band of the receiver. A special reversing circuit was designed and constructed for allowing the motor to reverse after each scan. This is necessary due to the design of the tuning capacitors.

3. Test Project Number 6, "Minimum Performance Standards of ECM Equipments and Installations".

a. Date initiated: May 1952.

b. Percentage complete: 42%.

c. Hours flown: None.

d. Present status: This project was discontinued at the time difficulties occurred with the Blue Cradle and the QRC-27(t) was installed and tested in the Blue Cradle. No action was taken on this project while the 376th Bomb Wing was TDY overseas; however, it will be reinstated immediately and progress reported in the next SAC U-30 report.

4. Test Project Number 28, "Development of an Unattended Random Pulse Jammer".

a. Date initiated: 1 November 1954.

b. Percentage complete: 60%.

c. Hours flown: None.

d. Present status:

(1) The jammer being designed under this project is an unattended, sweeping, random pulsed, S-band transmitter.

Purpose of the jammer is to delay early warning radar system detection of jet aircraft by creating a multitude of random spots on the [illegible] scope. It is not expected that the spots created will resemble the arc-like returns from normal radar pulses, nor is it proposed to synchronize the jammer with the radar pulse recurrence rate. From experience and observation of early warning radars, it has been found that at long ranges such radars paint jet type aircraft, as the B-47, either very poorly or not at all. The paints do not occur on every sweep of the radar and generally appear as small point echoes. These fleeting echoes are used by the radar operator to plot aircraft position by means of dead reckoning for considerable distance beyond the range where normal target returns are obtained. It is believed that by creating random unsynchronized pulses on the radar scope, the marginal paints can be masked and detection of jet aircraft delayed for considerable distance.

(2) A jamming transmitter for producing random pulses is being constructed from an AN/APT-16 transmitter. Standard AN/APT-16 parts are being used insofar as possible. A pulse generator has been built to produce random pulses from 2300 to 28000 pps. The generator can produce pulses to 33000 pps but some pulse deterioration is experienced at this higher rate. The circuit works as follows: A gas tube noise generator provides random pulses to a free-running blocking oscillator. The noise provides pre-triggering of the blocking oscillator and the amplitude of noise determines randomness of the pulses. The pulses are amplified and used to trigger a blocking oscillator driver. Pulses from the driver are applied to a hard tube modulator which modulates the magnetron.

(3) Due to construction difficulties and non-availability of the AN/APT-16 QK-283A magnetrons, it was decided to use the RF section from an AN/ALT-8 transmitter. The QK-459 magnetron of the AN/ALT-8 operated very satisfactorily and no multiple moding was experienced. The sweep mechanism in the AN/ALT-8 eliminates the necessity of constructing one for the random pulse jammer.

5. Test Project Number 33, "Personal Radio Alert Equipment".

a. Date initiated: 6 May 1955.

b. Percentage complete: 23%.

c. Hours flown: N/A.

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d. Present status:

(1) The SAC mission requires immediate availability of key personnel and early availability of many other personnel when alert conditions exist. Purpose of this project is to determine a feasible method of quickly alerting specific groups of individuals through use of radio. Under this plan each individual would be equipped with a small radio receiver that could conveniently be carried in a shirt pocket. This receiver would be tuned to a specified frequency upon which an alert signal could be broadcast.

(2) Experiments were conducted with the modified Regency and locally constructed receiver circuits to determine high frequency limits of transistors now on hand in this organization. Several types from different manufacturers were tried. Most of these operated only in the audio or low RF frequency ranges. Two point contact types were found which would operate up to approximately five megacycles, but operation was quite critical. High frequency transistors which were ordered have not been received; inquiries to manufacturers indicate transistors which might be expected to operate in the frequency range around 30 megacycles are scarce and would be special handpicked units. It is expected that field tests will be conducted on the lower frequencies with the modified Regency receiver.

(3) An officer of the 376th Bomb Wing made a visit to the Capehart-Farnsworth Corporation, Ft Wayne, Indiana, for the purpose of obtaining data regarding the transistorized miniature radio receiver under development by that company. The Capehart-Farnsworth miniature receiver is a conventional superheterodyne type receiver using transistors in place of vacuum tubes, zinc cells for power and a hearing aid ear piece for audio output. In addition, this receiver has an interesting accessory which would be particularly adaptable to any alert call system for use at home when the person concerned would not normally carry the receiver. This is a base unit containing a speaker, push-pull Class "B" audio stage and power supply. The unit is built in the form of an ash tray at the present time and gives full volume comparable to a high tone quality table radio. It is normally connected to a 60 cycle, 115 volt outlet and operates when the transistorized miniature receiver is plugged into it. The receiver still continues to operate from the battery, but since this is in parallel with the power supply of the accessory unit, there is no battery drain, in fact there is a slight charging effect. The miniature receiver is quite compact, about the size of a package of cigarettes. Battery life is estimated

at about 50 hours with four penlite cells. This would be increased to 100 hours using mercury cells which would be considerably more expensive. For use as a call receiver, a squelch circuit could be incorporated which would further increase battery life. Sensitivity of the receiver is 800 microvolts per meter as compared to 1200 microvolts per meter for the Regency portable. Sensitivity could be increased by improving the antenna, which is a ferrite loop. The antenna was designed to fit the narrow size of the receiver, about 2½ inches. A receiver designed for military use would probably be larger in size and allow a larger antenna to give greater sensitivity. Maximum power output of the receiver is about ten milliwatts, which would be acceptable.

(4) Specifications of the Capehart-Farnsworth receiver are less than required by government specifications. Temperature limitations are from five to 50 degrees centigrade. Miniature size of the receiver is obtained mainly (other than through use of transistors) by use of miniature electrolytic capacitors which limit the allowable operating temperatures. Use of other type capacitors would require a somewhat larger size. It is probable that any receiver developed under this test project would not be required to meet government specifications. The receiver is quite resistant to damage from shock due to use of transistors rather than vacuum tubes.

(5) The ash tray type of accessory for increased audio output should be considered for use in an alert call system. Such a device would allow the wearer of the receiver to remove it at home, place it in the accessory receptacle and go about routine household functions. The device would be operated at full volume with a squelch circuit which would cause it to be quiet except when an alarm signal is received. The signal would then be heard loudly and clearly throughout the home and even waken sleepers at night.

(6) Personnel at Capehart-Farnsworth were familiar with the SAC requirement for a personal alert receiver, having been briefed by Headquarters SAC personnel during a visit regarding another project, and indicated they would like to submit an unsolicited proposal on an alert call system. Mr Klinedinst, government contract service representative for the company, was advised to contact the Communications and Electronics Division, Headquarters SAC.

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6. Auxiliary Test Project Number 18, "Development of a VHF Communications Jammer Using Increductors".

a. Date initiated: 1 April 1954.

b. Percentage complete: [illegible]%.

c. Hours flown: None.

d. Present status:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver.

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune through the band, locate the signal, lock-on, then tune the transmitter to the same frequency and begin jamming with periodic look-through. Should the victim signal change frequency, the jamming system will follow the change. If the victim signal is discontinued, the receiver will resume searching until another signal is found. Provisions will be made to prevent one jammer from locking-on another.

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master multi-vibrator circuits, master control circuits, RF circuits, IF strip and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11 inch high standard ECM rack. Space remains for additional circuitry which will be required for look-through and identification capabilities, or any other modifications which may become necessary. Extension cables have been made for all units so they may be removed from the receiver rack for testing and alignment. The RF and IF units have been aligned to tune the receiver through the VHF band from 100 to 156 megacycles. Sweep circuits

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have been adjusted to tune the receiver through the same range at three sweeps per second. This sweep rate is probably not the rate for use in the final version of the jammer, but has been chosen for testing purposes.

(4) First checks of receiver sensitivity show the minimum discernible signal to be less than one microvolt over the entire range. Gain of the receiver is 120 db at the high frequency range and 110 db at the low frequency range. Gate and pause circuits have been adjusted so that pause-and-lock-on periods of as much as three seconds have been obtained on test and actual signals. Longer periods of time may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the receiver has been reduced by decreasing screen grid voltage on the RF and IF amplifiers, therefore it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from the TS-497B/URR signal generator is being used. A gate tube is being added to the transmitter chassis so it can be turned off and on at the correct times in conjunction with the receiver.

7. Auxiliary Test Project Number 28, "S-Band RF Systems".

a. Date initiated: 1 November 1954.

b. Percentage complete: 79%.

c. Hours flown: 52:00.

d. Present status:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated.

(2) A T-402/ALT-6 transmitter has been modified to allow the magnetron oscillator tube and tuning mechanism to be operated remotely from the transmitter case. In this manner the transmitter may be mounted in its normal position while the magnetron is installed very close to

the antenna. The remote magnetron unit is cooled by fluid from the transmitter pumped through remote cooling lines. In addition, a small axial blower is provided in the unit to cool the magnetron filament and cathode connections.

(3) One test was flown during December to compare operation of the remote magnetron installation with a normally installed AN/ALT-6 transmitter. For this test a standard AN/ALT-6 was installed in the left ATO compartment of a B-47E aircraft. The RF output was fed through an eight foot QRC-27(t) transmission line, a 90 degree QRC-27(t) coaxial adapter and a UG-1106/ALT-6 coaxial to waveguide adapter to a 12 inch, 90 degree twist piece of flexible waveguide mounted in the left wheel well horn antenna mount. The modified AN/ALT-6 was mounted in the right ATO compartment with the remote magnetron mounted in the right wheel well position. RF energy from the remote magnetron was fed directly into a 12 inch, 90 degree twist piece of flexible waveguide mounted in the right wheel well horn antenna mount. Identical sections of flexible waveguide were used so the radiation patterns of the two transmitters would be the same.

(4) The test mission was flown against the AN/FPS-10 radar at Bartlesville, Oklahoma, at an altitude of 34,000 to 36,000 feet and airspeed of 430 knots. Run one was made from a point 200 miles east of Bartlesville to a point 200 miles west of Bartlesville. Run two was a return flight over a course 25 miles north. The third and fourth runs were repetitions of runs one and two. The first two runs were made with only the modified AN/ALT-6 transmitter operating and the last two with only the standard AN/ALT-6 transmitter operating. Both equipments were pre-set to sweep from 2945 to 2995 megacycles at a sweep speed of 20 megacycles per second. Jamming was observed on the vertical lower beam of the AN/FPS-10 at 2970 megacycles. Both equipments operated properly during the mission, the modified set for 2:05 hours and the standard set for 1:55 hours. From photographs, logs, and data obtained by observers at the radar site, it appeared the intensity of interference produced by the remote magnetron set was considerably greater than that from the standard set. Intensity of jamming from the remote set was equal at 150 nautical miles distance to that produced by the standard set at 50 nautical miles.

(5) Results from the flight tests of the remote magnetron installation have appeared so good that it was decided to investigate the possibility of using a fed slot

antenna on other transmitters. In order to evaluate this, six plates fed with UG-1106/ALT-6 wave guide to coaxial transformers were constructed to replace the AB-109 antenna receptacles. Tests were made of normal wave-guide-to-air propagation and showed an average voltage standing wave ratio of 1.4 to 1. When the transformers and right angle adapters were tested, however, "built in" discontinuities appeared and the VSWR rose above acceptable values. It is apparent that the right angle adapter requires considerable modification to be electrically acceptable. A further difficulty in the use of the plates is that if the guide opening is covered, as it would have to be on an aircraft, the covering material adds capacitive reactance which disturbs electrical operation. Matching out of the capacitive reactance by means of an inductive iris is possible over only a narrow bandwidth which restricts the frequency range of the antenna. It is hoped that a transition section can be made within the guide to match the opening to a suitable cover. It is possible with such an arrangement that the cover could also be used as a beam warping device to produce a desirable radiation pattern from the antenna.

8. Auxiliary Test Project Number 45, "AN/ALQ-3 Suitability Test".

a. Date initiated: 2 May 1955.

b. Percentage complete: 20%.

c. Hours flown: 30:05.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 S-band search-and-lock-on jamming system. Two complete AN/ALQ-3 systems have been delivered for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing.

(2) Testing of the AN/ALQ-3 at Barksdale AFB have been suspended until such time as the systems on hand can be modified to provide satisfactory operation, or system #5 is received from the manufacturer. System #1 consistently emits a jamming signal which is above the frequency of the victim radar by three to five megacycles at most points, and as much as 20 megacycles at some frequencies. The jamming signal emitted by transmitter #2 is on the frequency of the victim radar; however, the jamming is not steady, appearing for three or four seconds, then disappearing for as long as 30 seconds. At other intermittent times the receiver apparently locks-on the

jamming signal from the transmitter and both wander off the victim signal. The manufacturer has indicated he experienced these difficulties with system #5 and that a modification will be necessary to overcome them.

(3) Two flight tests were scheduled during December to be run against an MSQ-2 tracking radar at Dallas RBS, Texas. System #2 was installed on a KC-97F and pre-flighted. During the pre-flight it was noticed the noise modulation had disappeared. The equipment was returned to the laboratory and inspection revealed the modulator tube had been running very hot, which resulted in cold solder joints on the cathode and grid ring assemblies. Further investigation showed that over-heating was due to an intermittent power connection to the modulator and magnetron cooling fan. The flight test was aborted due to lack of spare parts. The second flight test scheduled for December was aborted due to continuing difficulties encountered with both systems and the indication of the manufacturer that a modification would be necessary.

(4) While awaiting modification instructions and additional equipment, classes are being conducted for 376th A&E maintenance personnel to familiarize them with operation and maintenance procedures of the AN/ALQ-3. During this class the magnetron of transmitter #2 was removed for demonstration purposes. In order to remove the magnetron it is necessary to remove at least one piece of finger material (Part No. 68545) which extends from the output window of the magnetron to the internal waveguide. The section of internal waveguide appears to be made of soft aluminum, approximately 3/32 of an inch thick. Two 4 x 40 machine screws are used to secure each piece of finger material to the guide. When these screws were removed, the threads on the waveguide stripped. It was necessary to re-drill and tap the holes in the waveguide for an 8 x 32 machine screw in order to re-secure the finger material after the magnetron had been replaced. Apparently this difficulty will be encountered whenever a magnetron is replaced; it is felt that the method of securing the finger material to the waveguide is not satisfactory and will result in eventual permanent damage to the section of internal waveguide.

(5) Two flight tests are scheduled to be flown in January if system #5 is delivered on schedule or systems #1 and #2 are modified.

9. Auxiliary Test Project Number 46, "AN/ALQ-7 Suitability Test".

a. Date initiated: 15 August 1955.

b. Percentage complete: 25%.

c. Hours flown: 20:45.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width, and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output of up to 400 watts.

(2) All missions scheduled for December purposed to test effectiveness of the AN/ALQ-7 against X-band gunlaying or tracking radar. Of the five missions scheduled against the Santa Rosa Island testing facility at Eglin AFB, Florida, three were cancelled prior to takeoff of the test aircraft. Two of the cancellations were due to fuel leaks in the test aircraft, and the other to an intermittent open circuit in the low voltage power supply of the AN/ALQ-7.

(3) Two successful missions were flown on 5 and 21 December against the M-33 precision tracking radar at Eglin AFB. The AN/FPS-3 radar at Eglin AFB provided radar tracking of the aircraft position throughout the missions. On 5 December the radar operator could not keep the tracking radar on the target aircraft while the AN/ALQ-7 was operating because of very intense jamming. The radar operators, taking advantage of a malfunction in the AN/

ALQ-7, were able to devise a method to track the aircraft part of the time by deliberately causing the AN/ALQ-7 receiver to lose the radar signal for periods of several seconds. During these periods the radar was able to track the aircraft. The system used to allow part-time tracking of the aircraft was as follows: When the AN/ALQ-7 transmitter started transmitting, very intense jamming (condition 5) would appear on the radar scope and prevent tracking. The elevation operation would then quickly move the radar off the target position by 100 mils and immediately return to the target position. Movement of the radar off the target position would cause the AN/ALQ-7 receiver to break-lock (due to having no radar signal) and the transmitter to stop transmitting. After approximately ten seconds the receiver would again lock-on the radar signal and the transmitter would start transmitting. The radar operator would then move the radar off target and the cycle would be repeated, with the result that the target aircraft was tracked approximately 70% of the time. It should be pointed out that this system would not normally work against a properly operating AN/ALQ-7 system. The relatively long period between loss of the radar signal in the r eceiver and subsequent re-lock-on the radar signal was due to a malfunction in the AN/ALQ-7 system. It should also be pointed out that for all ranges the aircraft could be tracked only when the AN/ALQ-7 transmitter was not transmitting.

(4) On the mission of 21 December the radar scope again showed intense jamming at all ranges. The radar operators could, however, (with considerable effort) get the radar to lock-on the target aircraft through the jamming. The radar could then track the target with relative ease at all ranges.

(5) One more test is scheduled for the first week in January against the M-33 radar at Eglin AFB. Succeeding tests during January and February will be against various airborne radars.

10. Auxiliary Test Project Number 47, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters".

a. Date initiated: 14 September 1955.

b. Percentage complete: 15%.

c. Hours flown: N/A.

d. Present status:

(1) Purpose of this project is to design test and calibration equipment suitable for field use for enabling fast and accurate setting up of AN/ALT-6 and AN/ALT-8 transmitters under conditions common to flight lines of SAC units. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means.

(2) A second model of the sweep limit measuring device has been constructed; this model utilizes seven tuned cavities. Six of the cavities are used to set the desired limit frequencies and frequencies 50 megacycles above and below the limits. The seventh cavity is tuned to the desired center frequency so that this may be accurately set. In the present measuring device, incandescent filament lamps are used for resonance indicators rather than the neon bulbs as in the first model since filament lamps give a more sensitive and sharper resonance indication than the neon bulbs. The neon bulbs were also unsatisfactory in that they gave an unsymmetrical indication as the cavity was tuned through resonance, and remained lit considerably beyond the frequency of cavity resonance. This difficulty, inherent in neon bulbs, is due to the fact that the extinguishing voltage is lower than the starting voltage. The incandescence and nigrescence of the filament lamps are symmetrical on either side of resonance so a very sharp frequency indication can be obtained. The lamps are easily accessible from the front of the device and may be easily changed by merely unscrewing the lamp holder.

(3) Work is continuing to devise the best method for pick-up of energy from the jamming antenna. It is hoped that a satisfactory pick-up device can be made so the instrument can be used in all positions regardless of the polarization of the antenna. A method or circuit to determine sweep speed is also to be incorporated in the device.

11. Auxiliary Test Project Number 48, "Airborne Tape Recorder".

a. Date initiated: 4 October 1955.

b. Percentage complete: 18%.

c. Hours flown: 19:00.

d. Present status:

(1) Purpose of this project is to investigate the potential of the AN/APS-54 airborne warning receiver to collect automatically crude information on type, location, and numbers of enemy air defense radars received enroute by regular B-47 aircraft during combat. Data collected by the AN/APS-54 will be recorded on a tape recorder referenced as to aircraft position time. A playback of this tape with the flight log will be used to attempt spotting radar installations along the route flown. An airborne tape recorder (Nadar IV) having eight channels and tape for four hours of recording is being used for test.

(2) The Nadar IV recorder was installed, ground tested in a KC-97 aircraft and flown on a two-hour flight during December. Signals received on an AN/APR-4 receiver and crew voice signals were recorded. During the flight the one ampere AC fuse blew and was replaced. The recorder operated for two hours till the recorder drive motor burned up, thus terminating the test. North American Aviation Corporation was contacted to obtain a replacement motor. Further tests have been suspended until the replacement arrives.

(3) Electronically, the Nadar recorder seems good, with two exceptions: there is a slight hum and 400 cycle ripple present in the audio, and the recording gain cannot be adjusted without removing the record amplifier. Mechanically, the performance of the recorder has been disappointing. Some of the troubles encountered are: The copper contacts which reverse the tape at the end of tape travel are unreliable. The recording motor runs hot. Because of speed variations, "wow" occurs intermittently in the recordings. The tape jams the recorder and gets off track often. A total of six manhours was required to replace a broken drive belt because the entire record mechanism had to be disassembled. The tape recorder has failed to record a full four hours in flight on any of the tests conducted. The tape de-magnetizer furnished with the equipment fails to completely erase previous recordings.

12. Auxiliary Test Project Number 49, "Flight Test of QRC-18(T)".

a. Date initiated: 15 August 1955.

b. Percentage complete: 25%.

c. Hours flown: 20:00.

d. Present status:

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(1) Purpose of this project is to test tactical suitability of the QRC-18(T). Essentially, the QRC-18(T) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS.

(2) One flight test was flown on 14 December using two KC-97 aircraft, one simulating the bombing aircraft carrying the jamming transmitters and the other simulating the fighter aircraft. The aircraft maintained a constant 25-mile separation while flying nose-to-tail over a course extending approximately 175 miles from the ground station. The bomber flew at 19,000 feet altitude and the fighter at 18,000 feet. The ground station was a 50 watt BC-640 VHF transmitter and RC-81 antenna located at Barksdale AFB. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. An AN/ARC-3 VHF receiver was used in the fighter. The frequency used was 142.38 megacycles and the ECM operator in the bomber continually monitored to maintain the swept band of the jammers centered on this frequency. Four runs were made using from one to three sweeping transmitters and one transmitter on spot jamming. One percent sweep units were used and the transmitters adjusted for a jamming rate of 800 to 1000 hits per second with narrow noise modulation. Results obtained, as compiled from the navigator and observer logs and recorded tapes, are shown in the following chart:

	JAMMING CONDITION	FTR FROM GND STA MILES	FTR TO BOMBER SEPARATION-MILES
RUN 1	One 1% Tx 800-1000 Hits/Second Narrow Noise. Pwr Output 120 Watts		
	0	42	7
	0	58	16
	0	72	32
	0	110	30
RUN 2	Two 1% Tx 800-1000 Hits/Second Narrow Noise. Pwr Output 140 and 115 Watts		
	0	117	20
	0	86	14
	3	79	16
	3	58	15
	3-2	30	15
	2	24	14

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RUN 3 — Three 1% Tx 800-1000 Hits/Second
Narrow Noise, Pwr Output 140, 115, 120 Watts

2	32	21
2	40	35
2	60	33
3	78	34
3	84	34
4	94	34
4	125	22
4	142	14

RUN 4 — One Tx Spot Jamming
Narrow Noise, Pwr Output 140 Watts

4	126	25
4	115	12
4	80	14
4	49	13
4	40	13

(3) Three flight tests are scheduled for January. It is planned to use three transmitters on these tests with various sweep and modulation settings.

13. Test Project Number 32, "Cell Support Tests".

a. Date initiated: 17 February 1955.

b. Percentage complete: 30%.

c. Hours flown: 583:10.

d. Present status:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars.

(2) Mission 26 was planned to compare five different antenna systems as used with the AN/ALT-6 transmitters. On each run an aircraft from the 376th Bomb Wing was equipped with four AN/ALT-6 transmitters in the Blue Cradle set for slow sweep operation and using one of the antenna systems. The route was laid out to give a 200 nautical mile inbound and outbound run and 200, 150, 100 and 50 nautical mile tangential runs against the AN/FPS-10 radar site at Bartlesville, Oklahoma. The first flight

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was made on the morning of 21 December by an aircraft equipped with helix antennas. The second flight was made on the afternoon of 21 December by an aircraft equipped with QRC-27(T) antennas. On 22 December an aircraft equipped with AT-520 antennas was flown, and on 23 December an aircraft equipped with Diamond antennas. Because of technical difficulties, the fifth type of antenna system was not flown but may possibly be rescheduled in the future. A mission report on results of these flights will be prepared as soon as photographs can be processed.

(3) Mission reports have been completed on missions 21 through 25.

FOR THE COMMANDER:

William H. Murphy
WILLIAM H. MURPHY
Major, USAF
Adjutant

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Auth: COMDR 376BOMWG M
Initials: Rg Hall
Date: 8 February 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT 9 February 1956

13

SUBJECT: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30)

TO: Commander
Second Air Force
Barksdale Air Force Base
Louisiana

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 31 January 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 1X, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Percentage complete: 52%.

c. Hours flown: None.

d. Present status:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer, de-energizes the control

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circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) Initial tests to determine proper tracking, as indicated in the December U-30 report, were made with a grid dip meter with both the transmitter and receiver turned off. This was found to be invalid during tests conducted in January. Conditions leading to the erroneous results in December were: (SECRET)

(a) An error of from two to four megacycles in the grid dip meter.

(b) A change in circuit capacitance as the various circuit elements became warm.

(3) Minor circuit changes resulting from tracking procedures were made during January. These changes have increased the tuning range by ten megacycles and increased circuit efficiency due to better L/C ratios. Additional work is required to complete the tracking of all tuned circuits in the transmitter and receiver. (SECRET)

(4) Inasmuch as all work during January was confined to tracking of circuits, no tests were conducted to determine the effect of the added tuning range on the receiver sensitivity. (SECRET)

3. Test Project Number 6, "Minimum Performance Standards of ECM Equipments and Installations". (CONFID)

a. Date initiated: May 1952.

b. Percentage complete: 43%.

c. Hours flown: None.

d. Present status:

(1) The project directive has been brought up-to-date to provide minimum performance, maintenance and inspection standards for ECM systems now on hand in this and other SAC Wings. Equipment to be studied and order of precedence are as follows: (CONFID)

1 - ECM antennas and RF cabling systems
2 - AN/ALT-8
3 - AN/ALT-6
4 - AN/ALT-7

5 - AN/APS-54
6 - AN/APT-9
7 - AN/ALA-10
8 - AN/ALE-1

(2) So that this project may be quickly pursued and badly needed data obtained as soon as possible, two experienced officers have been assigned this project. One officer is especially qualified in supply and maintenance procedures and techniques, and the other is a technically skilled operator and repairman with extensive background in inspection and maintenance of ECM equipment. (CONFID)

(3) Completed data on each item listed above will be supplied in the form of interim reports. (CONFID)

4. Test Project Number 28, "Development of an Unattended Random Pulse Jammer". (SECRET)

a. Date initiated: 1 November 1954.

b. Percentage complete: 63%.

c. Hours flown: None.

d. Present status:

(1) The jammer being designed under this project is an unattended, sweeping, random pulsed, S-band transmitter. Purpose of the jammer is to delay early warning radar system detection of jet aircraft by creating a multitude of random spots on the radar scope. It is not expected that the spots created will resemble the arc-like returns from normal radar pulses, nor is it proposed to synchronize the jammer with the radar pulse recurrence rate. From experience and observation of early warning radars, it has been found that at long ranges such radars paint jet type aircraft, as the B-47, either very poorly or not at all. The paints do not occur on every sweep of the radar and generally appear as small point echoes. These fleeting echoes are used by the radar operator to plot aircraft position by means of dead reckoning for considerable distance beyond the range where normal target returns are obtained. It is believed that by creating random unsynchronized pulses on the radar scope, the marginal paints can be masked and detection of jet aircraft delayed for considerable distance. (SECRET)

(2) One flight test was flown 13 January 1956 using a C-47 aircraft at 10,000 feet altitude against the AN/FPS-10 radar at Bartlesville, Oklahoma, as a preliminary check

on operation of the random pulse jammer. Both sweep and spot jamming runs on the vertical lower beam of the radar were made at ranges up to a maximum of approximately 50 miles. Runs were made using two different random pulse rates, a low rate of approximately 2300 pulses per second and a high rate of approximately 28,000 pulses per second. Radar scope photographs and ground observers reports indicated that somewhat better results were obtained with the low random pulse rate. This setting gave false targets over 360° of the radar scope at jamming distances up to approximately 40 miles. At greater distances, strobes of false targets were obtained. Intensity of the false targets was considerably lower than that of normal target returns but they would probably cause some difficulty in obtaining and tracking a marginal target. (SECRET)

(3) Although results of this preliminary test were encouraging, it is felt operation of the jammer can be greatly improved by lowering the entire range of random pulse rates and arranging these to change during operation. The rate will be lowered to cover a range of approximately 400 to 5600 pulses per second, with the rate being changed slowly during operation. This means a small number of pulses would be emitted at the lowest rate, increasing, however, until the highest rate was reached. The circuit would then instantly revert to the lowest rate and the cycle of rate change would be repeated. The cycle or increase of pulse rate would not follow a regular pattern but advance in a random manner controlled by the random noise pulses from the gas noise tube. At some point in the cycle the jammer pulse rate will synchronize with the radar repetition rate and produce high intensity targets on the radar scope. (SECRET)

(4) The modifications described above are being incorporated into the jammer; additional flight tests will be scheduled when these are completed. (SECRET)

5. Test Project Number 33, "Personal Radio Alert Equipment". (CONFID)

a. Date initiated: 6 May 1955.

b. Percentage complete: 26%.

c. Hours flown: N/A.

d. Present status:

(1) The SAC mission requires immediate availability of key personnel and early availability of many other personnel when alert conditions exist. Purpose of this project is

to determine a feasible method of quickly alerting specific groups of individuals through use of radio. Under this plan each individual would be equipped with a small radio receiver that could conveniently be carried in a shirt pocket. This receiver would be tuned to a specified frequency upon which an alert signal could be broadcast. (CONFID)

(2) During January, field tests of the Regency transistor radio were made. The receiver has been modified to operate fixed-tuned to 2131 kilocycles. The speaker and output transformer have been removed and a hearing-aid type phone is used. The variable condenser has been removed and replaced with small trimmer-type tuning condensers. The oscillator and antenna coil have been modified for the new operating frequency. The space in the receiver created by the removal of the variable condenser, speaker and output transformer is used to mount a second battery to increase operating time of the receiver. (CONFID)

(3) For field tests, a Wilcox 96D transmitter with 2.5 kilowatts input power, tone modulated at 65% with a 1000 cycle tone, was used. The transmitter fed a 175 foot long wire antenna pointing northeast and southwest. This end-fed antenna was approximately 60 feet off the ground. The receiver was tested in the daytime and at night by driving around the local area of Bossier City and Shreveport, Louisiana. In most cases it was possible to hear the signal with the receiver sitting on the front seat inside a 1955 Plymouth sedan. When a carryall vehicle was used, the signal inside the carryall was somewhat weaker than in the passenger car. This was expected since the carryall has more shielding from the metal body. The following results are typical of those found by driving around town, under bridges, in buildings, etc.: (CONFID)

LOCATION OF RECEIVER	TIME	DISTANCE MILES TO TX AFRX	SIGNAL STRENGTH	WEATHER
		IN CARRYALL VEHICLE		
Building T-799, Barksdale AFB	1730	5	Loud-clear	Rainy-cool
Dental Clinic, Barksdale AFB	1740	5	Loud-clear	Rainy-cool
Base Supply, Barksdale AFB	1743	5	Loud-clear	Rainy-cool
Inside flight line gate 40	1750	5	Loud-clear	Rainy-cool
Inside base Post Office, BAFB	1805	5	Loud-clear	Rainy-cool
Inside metal garage, Bossier	1815	6	Loud-clear	Rainy-cool
Inside frame house, Bossier	1820	6	Weak-clear	(retuned set)
Down main street of Bossier	1830	6	Weak-clear	Rainy-cool
Across metal bridge	1842	7	Weak-clear	Rainy-cool
Main street through business section of Shreveport	1845	8	Weak-clear	Clear-cool
Between two tall bldgs, Shrvpt	1905	8	Weak-clear	Clear-cool

Youree Drive to Kingshighway	1905	10	Weak-clear	Clear-cool
Broadmoor section to Confederate Memorial Hospital, Shrvpt	2010	10	Loud-clear	Clear-cool
Greenwood Road, Shreveport	2105	14	Weak-clear (retuned set and installed new battery. Sig/noise ratio improved.	
Highway 80, 7½ miles west of Shreveport	2150	21½	Weak-some fading	

One field strength measurement made in Shreveport on Ockley Drive ten miles from ground station - 1200 microvolts/meter. (CONFID)

IN 1955 PLYMOUTH

Building T-799, Barksdale AFB	1100	5	Loud-clear	Warm-clear
Building T-38, 376th A&E	1109	5	Loud-clear	Warm-clear
Base Supply, Barksdale AFB	1115	5	Loud-clear	Warm-clear
Inside base Post Office	1120	5	Loud-clear	Warm-clear
West Gate, Barksdale AFB	1125	5	Loud-clear	Warm-clear
In car in metal garage, Bossier	1130	6	Loud-clear	Warm-clear
Inside frame house, Bossier	1145	6	Loud-clear	Warm-clear
Police station, Bossier City	1150	6	Weaker (retuned set - signal now loud and clear)	
Downtown Bossier City	1155	6	Loud-clear	Warm-clear
In Bossier City only, signals weak under traffic lights.				
Junction Highways 80-71	1200	7	Loud-clear	Warm-clear
Metal bridge to Shreveport	1205	7	Loud-clear	Warm-clear
Gun-Cycle Shop, Shreveport (inside shop whose floor is below street level)	1210	8	Loud-clear	Warm-clear

Buses, trains and other traffic had no affect on signal strength; however, when in the vicinity of a broadcast station in Shreveport, the broadcast station frequently over-rode the signal. (CONFID)

(4) Results of these field tests with the Regency receiver are considered fairly good for the particular receiver. As was noted in the preceding paragraph, the receiver had to be re-tuned or slightly adjusted from time to time. This indicates some frequency instability which could be eliminated by a crystal-controlled oscillator. The receiving antenna, while compact and efficient and adequate for its original purpose, exhibits directional characteristics which are undesirable for its present application. The idea of using the hearing-aid phone cord as part of the antenna is to be investigated. The transmitting antenna used in the tests is also directional. A vertical transmitting antenna with its inherently stronger ground wave radiation and freedom from directional effects will be tried. (CONFID)

6. Auxiliary Test Project Number 18, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Percentage complete: 57%.

c. Hours flown: None.

d. Present status:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a flyback time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus no reason to continue jamming it. If there were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multi-vibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension cables have been made for all units so they

may be removed from the receiver rack for testing and alignment. The RF and IF units have been aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. This sweep rate is probably not the rate for use in the final version of the jammer, but has been chosen for testing purposes. (SECRET)

(4) First checks of receiver lock-on sensitivity show the minimum signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 db at the high frequency range and 110 db at the low frequency range. Gate and pause circuits have been adjusted so that pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods of time may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the receiver has been reduced by reducing screen voltage on the RF and IF amplifiers; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is being used. All receiver functions have been completed and checked. All memory, lock-on, and receiver gate circuits are operating. A transmitter gate circuit has been built and tested. Work will now be concentrated on making the transmitter work with the receiver. (SECRET)

7. Auxiliary Test Project Number 28, "S-Band RF Systems". (SECRET)

a. Date initiated: 1 November 1954.

b. Percentage complete: 79%.

c. Hours flown: 52:00.

d. Present status:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) No flight tests of the remote magnetron installation were flown during January since only one T-402/ALT-6 has been modified for such operation and it is desirable to compare

results obtained with several AN/ALT-6 equipments using waveguide transmission lines. Six such installations are needed so results may be compared with those obtained from the test of four other S-band antennas used on Mission 26 of Test Project Number 32 on 21 and 22 December 1955. Rather than modify five additional transmitters, it is planned to use a cradle installation wherein six AN/ALT-6 transmitters will feed RF output directly into waveguides. Examination of the normal equipment mounting positions in the cradle and the existing AB-109 antenna receptacles revealed that it would be necessary to relocate some equipment mountings in order to use waveguide transmission systems with six transmitters. (SECRET)

(3) A study is being made of the best positions for mounting six AN/ALT-6 transmitters in the Blue Cradle and measurements are being taken so the necessary lengths of waveguide transmission line and adapters may be fabricated. When the waveguide installation has been completed, a flight test mission will be scheduled for comparison with Mission 26 of Test Project Number 32. It is expected the mission may be flown during the latter part of February. (SECRET)

8. Auxiliary Test Project Number 45, "AN/ALQ-3 Suitability Test". (SECRET)

a. Date initiated: 2 May 1955.

b. Percentage complete: 22%.

c. Hours flown: 35:00.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 S-band search-and-lock-on jamming system. Two complete AN/ALQ-3 systems have been delivered for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing. (SECRET)

(2) Testing of the AN/ALQ-3 was resumed as systems 6, 7 and 8 were received from the manufacturer during January. These systems incorporate modifications designed to correct shortcomings of the first two production models. Systems 6, 7 and 8 were uncrated, inspected, and bench tested on arrival. Following are troubles noted in the equipment: (SECRET)

(a) System 6 receiver - no screw securing bottom of mixer assembly to second pre-selector cavity. First and second pre-selector cam straps were dented in shipment by faulty plungers striking against the bands.

This resulted in decreased receiver sensitivity between 3000 and 3050 megacycles and erratic transmitter lock-on. System 6 transmitter - neither the top nor bottom high voltage interlock switches would engage when the systems arrived. Proper operation of the interlock switches was obtained by placing shims under the switch plates. The plate connection to the 35T vacuum tube had apparently become overheated during factory run-up and caused the solder to melt and the connection to come lose in transit. Potentiometer R-1504 in the Servo Amplifier was found to be intermittently open. The manufacturer has sent a replacement potentiometer and the faulty part replaced. System 6 pulse analyzer - relay K-3501 was found to be mechanically jammed when the equipment arrived. The relay has been replaced and the unit operates satisfactorily. System 6 was operated in the laboratory for approximately 12 hours, during which time the difference in frequency between the victim and transmitter jamming frequency was measured every ten megacycles between 2650 and 3350 megacycles. The difference in frequency was less than two megacycles except at the points where the cam bands had been bent. (SECRET)

(b) System 7 receiver - Pre-selector cam bands slightly bent in transit at 3030 and 3070 megacycles. System 7 was operated approximately seven hours in the laboratory. It was found that the transmitter would lock and jam from 20 to 30 megacycles away from the victim frequency at various points in the band of 2650 to 3350 megacycles. The cause for this has not been determined. (SECRET)

(c) System 8 receiver - pre-selector cam bands damaged in shipment at 3100 megacycles. System 8 transmitter - interlock switches would not close when end bells were placed on the transmitter. System 8 has been operated in the laboratory for seven hours. Transmitter lock-on is very erratic, sometimes emitting a jamming signal above the victim signal, and at other times, below. The difference between victim and jamming frequency varies from zero to 20 megacycles. The transmitter spectrum appears to be approximately 60 megacycles wide as viewed on an AN/APR-9 receiver. Apparently the magnitude of the transmitter output is sufficient 20 megacycles away from the victim signal to cause cut-off of transmitter sweep. When this occurs, transmitter tuning is cut-off outside the discriminator band and fine tuning cannot take place. (SECRET)

(3) Systems 9 and 10 arrived at Barksdale AFB 25 January. The manufacturer has corrected the difficulty encountered with

the receiver cam bands by using stiffer bands and tieing the plungers during shipment. Both systems have been inspected and operated and are apparently in satisfactory operating condition. (SECRET)

(4) System 6 was installed in a KC-97 aircraft and flown against the MSQ-2 precision tracking radar at Little Rock, Arkansas, on 24 January. Both radial and tangential runs were made. Data from this mission has not been completely reduced; however, it can be said that the radar operators experienced very little difficulty in tracking the aircraft through the jamming. From all indications, the AN/ALQ-3 was operating properly and was within two megacycles of the victim radar signal. (SECRET)

(5) Three flight tests are planned for February against RBS sites at Dallas and Little Rock. These will be flown with the AN/ALQ-3 equipment installed in a KC-97 aircraft, or in a B-47 aircraft if connectors can be obtained for the B-47 cabling. (SECRET)

9. Auxiliary Test Project Number 46, "AN/ALQ-7 Suitability Test". (SECRET)

a. Date initiated: 15 August 1955.

b. Percentage complete: 30%.

c. Hours flown: 27:05.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width, and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output up to 400 watts. (SECRET)

(2) Five missions were scheduled for January, only one of which was successfully completed. The missions were scheduled accordingly. (SECRET)

5 January - against M-33 gunlaying radar, Eglin AFB - successfully completed.

13 January - against navigation and fire control radars in another B-47 in same formation - cancelled due to aircraft trouble.

18 January - against navigation and fire control radars in another B-47 in same formation - cancelled because of bad weather.

24 January - against navigation and fire control radar in another B-47 in same formation - cancelled due AN/ALQ-7 malfunction.

27 January - against AI fire control radars in fighter aircraft at Perrin AFB, Texas - cancelled due to aircraft trouble (RB-47). (SECRET)

(3) On 5 January the AN/ALQ-7 was operated against the M-33 precision tracking radar at Eglin AFB. The AN/FPS-3 radar at Eglin AFB provided radar tracking of the test aircraft throughout the mission. Results of the test were similar to those of the test on 21 December 55. The radar scope showed intense jamming at all ranges; however, the radar operators were able to get the radar to acquire and track the target through the jamming most of the time. It was noted that the experience of the range operator and degree of effort exerted by him in trying to track the target through the jamming greatly influenced the results. It was also noted that the "system" employed previously whereby the elevation operator deliberately moved off the target in elevation in order to cause the AN/ALQ-7 to lose the target still could be employed to allow tracking of the aircraft for approximately 70% of the time without jamming. The AN/ALQ-7 was able to track the radar signal without difficulty while the radar frequency was being changed. (SECRET)

(4) Tests for February are planned against airborne AI radars in fighter aircraft from Perrin AFB. Testing of the AN/ALQ-7 against multiple M-33 and T-33 radars is anticipated as soon as necessary arrangements can be completed. (SECRET)

10. Auxiliary Test Project Number 47, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Percentage complete: 18%.

c. Hours flown: N/A.

d. Present status:

(1) Purpose of this project is to design test and calibration equipment suitable for field use for enabling fast and accurate setting up of AN/ALT-6 and AN/ALT-8 transmitters under conditions common to flight lines of SAC units. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) A pick-up unit was designed and built to permit use of the simple seven cavity sweep limit measuring device without regard to jamming transmitter antenna polarization or orientation of the individual cavities of the measuring device. The pick-up device is essentially a small, shielded case or cavity which incloses the seven frequency cavities. A single probe antenna extends through the case and excites the seven cavities. Individual cavities are adjusted according to their sensitivities to receive equal amounts of excitation from the common probe. The probe in turn is held near the jamming transmitter antenna. Thus, regardless of the total energy received by the probe, equal amounts are fed to each cavity. This prevents spurious readings which might occur if some cavities were excited more than others. The entire unit is comprised of the shielded box, measuring approximately 8"x8"x2", a probe of approximately three inches extending from the back of the shielded box, and the seven cavity adjusting screws extending approximately two and a half inches from the front of the box. The seven indicating lamps associated with the cavities extend through the front panel of the box. The box exciting probe is a Teflon-insulated adjustable quarter-wave dipole which feeds energy through a matching transmission line to a quarter-wave antenna and circular ground plane within the box. The unit is now under evaluation. As it now stands, it may be used to rapidly check three transmitter functions: (CONFID)

(a) A rough yes-no check of relative transmitter power output. Size of the indicator lamps were chosen to give illumination with normal power output from a transmitter when a fixed coupling between pickup probe and transmitter antenna is used. (CONFID)

(b) Accurately sets frequency limits of the swept band by means of pre-set cavities.

(c) Gives sweep rate (for low speeds) by observing and timing the successive lighting of the indicator lamps. Accuracy is increased by timing the traverse between maximum limits. (CONFID)

(3) It was planned to gang three cavities so that a constant separation would be maintained in any portion of the transmitter range. This was to be used to measure sweep rate directly on a meter; however, it will not be incorporated in the present unit which is to be taken to Headquarters WADC for evaluation. Instead, another unit will be built which will measure the sweep rate electronically, and the power on a calibrated meter. (CONFID)

(4) A simple yes-no modulation indicator has been built. This uses a broad-band folded dipole which feeds a crystal detector and a set of headphones. Thus, the ECM mechanic, by listening in the headphones, can tell whether the jammer signal is being modulated with noise. If necessary, some of the rectified power from the crystal detector can be used to power a transistor audio amplifier to give greater volume in the headphones. The rectified current could also be used to indicate approximate power on an indicating meter. (CONFID)

11. Auxiliary Test Project Number 48, "Airborne Tape Recorder". (SECRET)

a. Date initiated: 4 October 1955.

b. Percentage complete: 18%.

c. Hours flown: 19:00.

d. Present status:

(1) Purpose of this project is to investigate the potential of the AN/APS-54 airborne warning receiver to collect automatically crude information on type, location, and numbers of enemy air defense radars received enroute by regular B-47 aircraft during combat. Data collected by the AN/APS-54 will be recorded on a tape recorder referenced as to aircraft position time. A playback of this tape with the flight log will be used to attempt spotting radar installations along the route flown. An

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airborne tape recorder (Nadar IV) having eight channels and tape for four hours of recording is being used for test. (SECRET)

(2) The Nadar IV recorder was installed, ground tested in a KC-97 aircraft and flown on a two-hour flight during December. Signals received on an AN/APR-4 receiver and crew voice signals were recorded. During the flight the one ampere AC fuse blew and was replaced. The recorder operated for two hours till the recorder drive motor burned up, thus terminating the test. North American Aviation Corporation was contacted to obtain a replacement motor. Further tests have been suspended until the replacement arrives. (SECRET)

(3) No work was done on this test project during January due to lack of a replacement drive motor. A North American Aviation Corporation engineer arrived at Barksdale AFB 30 January with the necessary motor. During his stay here it is planned to resume flight test of the recorder and continue evaluation of the Nadar IV. (SECRET)

12. Auxiliary Test Project Number 49, "Flight Test of QRC-18(T)". (SECRET)

a. Date initiated: 15 August 1955.

b. Percentage complete: 35%.

c. Hours flown: 49:20.

d. Present status:

(1) Purpose of this project is to test tactical suitability of the QRC-18(T). Essentially, the QRC-18(T) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

(2) Two flight tests were flown during January. Both tests used two KC-97 aircraft, one simulating the bombing aircraft carrying the jamming transmitters, and the other, a fighter aircraft. Aircraft maintained approximate 25-mile separation while flying nose-to-tail over a course extending approximately 175 miles from the ground station. The bomber flew at 19,000 feet altitude and the fighter at 18,000 feet. The ground station was a 50 watt BC-640 VHF transmitter and RC-81 antenna

located at Barksdale AFB. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. An AN/ARC-3 VHF receiver was used in the fighter. The frequency used was 142.38 megacycles and the ECM operator in the bomber continually monitored to maintain the swept band of the jammers centered on this frequency. The ECM observer in the fighter monitored VHF reception, made tape recordings, and scored the jamming as follows:

Condition 0 - no jamming.

Condition 1 - all transmissions can be received with only a little background annoyance.

Condition 2 - can understand practically all messages but an occasional word is blocked out.

Condition 3 - can understand words and phrases but not complete continuity (a good operator can copy a repeated message).

Condition 4 - can tell a transmission is being made but cannot receive the message.

Condition 5 - cannot tell that a transmission is being made.

Eight runs were made, all of which used three transmitters operated at jamming rates of either 800 to 1000 or 400 to 600 hits per second. One percent sweep units were used in all transmitters, and both narrow and wide noise modulation and CW operation were used. Jamming results on all runs were very poor. The best jamming condition obtained was occasional condition three at ranges of 100 to 140 miles from the ground station when the 800 to 1000 hit per second jamming rate was used. When the 400 to 600 hit per second rate was used, no condition better than one was obtained at any range. Type of modulation used appeared to have no effect on jamming condition. (SECRET)

(3) Additional flight tests are scheduled for February on which only spot jamming runs will be made. Although the AN/ALT-7 is apparently capable of successfully spot jamming VHF communications, the narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of the ECM receiver make this very difficult. The use of CV-253/ALR tuning

units in the receiver may enable closer setting on; however, these could not be obtained for the tests so the TN-17/APR-4 tuning units will be used. (SECRET)

13. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Percentage complete: 31%

c. Hours flown: 634:00.

d. Present status:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Mission 27 was flown on 5 January as a re-run of Mission 22 against the AN/FPS-10 radar at Bartlesville, Oklahoma. This was a comparison mission to determine relative effectiveness of two different jamming transmitter configurations. Six aircraft were used in a dispersed front with four AN/ALT-8 and four AN/ALT-6 transmitters in each aircraft. The first run was a 400 nautical mile leg passing over the radar site and return on the same course. On this run six AN/ALT-6 transmitters in the Blue Cradle were operated on slow sweep (20 megacycles per second) in each aircraft. Run two was over the same track as run one but each aircraft operated four AN/ALT-6 transmitters on slow sweep and two AN/ALT-8 transmitters on fast sweep (1200 megacycles per second). The QRC-27(T) transmission lines and RF systems were used with all transmitters. A mission report has been prepared but results are not considered valid due to intermittent malfunction of the ground radar video circuits throughout the test. (SECRET)

(3) Mission 28 was flown on 26 January against the AN/FPS-10 radar at Bartlesville. It was planned that three B-47E aircraft would fly in a dispersed front from an IP 200 miles east of Bartlesville to a point 200 miles west of Bartlesville, and return over the same route. On the east-to-west run the two northernmost aircraft were to drop RR-20/U chaff and the southernmost aircraft was to drop RR-39/AL chaff. On the return run, all aircraft were to jam, using four AN/ALT-6 and two AN/ALT-8 transmitters in each aircraft. The center aircraft was aborted prior to the mission. A mission report

on the results of this flight will be prepared when the radar photographs can be processed. (SECRET)

FOR THE COMMANDER:

William H. Murphy

WILLIAM H. MURPHY
Major, USAF
Adjutant

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Initials:
Date: 7 March 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT 7 March 1956

SUBJECT: The 376th Bombardment Wing, Medium, Test and Development Program (RCS: SAC-U30)

14

TO: Commander
Second Air Force
Barksdale Air Force Base
Louisiana

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 29 February 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 1X, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Percentage complete: 54%.

c. Hours flown: None.

d. Present status:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second

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jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) Tests were conducted to determine effect of the added tuning range on receiver sensitivity. Initial checks indicate no adverse effect on sensitivity. Preliminary tracking between receiver and transmitter has been accomplished and power output of the transmitter checked over the entire band. A minimum of 15 and maximum of 45 watts was noted. These tests were conducted into a dummy load. The power output may vary considerably from test results when an actual antenna is used. It should be kept in mind that at present there is no suitable antenna available for the 100 to 150 megacycle band. The AT-190 and AT-191 antennas are not mechanically suitable for use on B-47 aircraft and neither antenna is useful electrically over the entire VHF frequency band. (SECRET)

(3) A flight test has been scheduled for early March to test the action of the receiver and all control circuits. This test will indicate to what extent receiver will tend to lock-on aircraft electrical noise and what distance from the ground station a positive lock-on can be expected. A test will also be made to determine length of time required for the receiver to find and lock-on an enemy signal. (SECRET)

(4) Airborne tests of the receiver and transmitter combination will require an isolated area, free of VHF signals, to preclude other signals from interfering with the test and avoid undesirable jamming of other VHF signals. An area in the Gulf of Mexico approximately 250 miles from Pensacola, Florida, was selected as being suitable. A visit was made to the Naval Air Basic Training Center at Pensacola where a destroyer is stationed. The Naval Director of Plans advised this vessel can be made available for limited use as a base for a VHF transmitter. These destroyers are equipped with an SPS-6B radar which can be used for tracking and vectoring aircraft. VHF transmitter is a TDQ which has a power output of approximately 35 watts. Through use of an amplifier this power level can be increased to that of the BC-640 used in all previous VHF jamming tests. It is not anticipated that tests will be run prior to April because of aircraft commitments during the month of March. (SECRET)

(5) As per SAC directive, this project will henceforth be designated as Test Project 34. (UNCL)

3. Test Project Number 6, "Minimum Performance Standards of ECM Equipments and Installations". (CONFID)

a. Date initiated: May 1952.

b. Percentage complete: 48%.

c. Hours flown: Approximately 70 with Bus Stop testing ALT-8A.

d. Present status:

(1) The project directive has been brought up-to-date to provide minimum performance, maintenance and inspection standards for ECM systems now on hand in this and other SAC Wings. Equipment to be studied and order of precedence are as follows: (CONFID)

1 - ECM antennas and RF cabling systems
2 - AN/ALT-8
3 - AN/ALT-6
4 - AN/ALT-7
5 - AN/APS-54
6 - AN/APT-9
7 - AN/ALA-10
8 - AN/ALE-1

(2) To establish minimum standards for the ALT-8A, the equipment was flight tested under Project Bus Stop. For a Bus Stop test, two ALT-8A's are installed in the Phase V capsule and two in the battery compartment of each aircraft. Of six single-ship missions flown, it was found that the power supplies used in the battery compartment all failed to operate shortly after the aircraft reached an altitude of 35,000 feet. Three multiple-ship missions were flown (three aircraft in each formation, plus a spare) and failure rates were as follows: First mission, seven of the eight power supplies installed in the battery compartment failed to operate. On the second mission five of eight used failed to operate; and on the third mission seven of the eight failed to operate. All failures were due to a loss of pressure in the power supplies. None of the sets installed in the capsule failed to operate, but the capsule is pressurized. (CONFID)

(3) Representatives from WADC and Raytheon Manufacturing Company have visited both the 376th Bomb Wing and 2d Bomb Wing in an effort to determine causes for this malfunction. Pressure leaks have been found around the escape valve and also around the plugs. On 2 March plugs were removed from two power supplies and a sealing compound

recommended by the manufacturer was applied to and under the plugs. After flight test, two of the four sets had lost pressure. The manufacturer has suggested an interim fix (use around the plugs of a new sealing compound) and in the very near future a new type of plug will be used. If submerged in water with a pressure of 21 pounds, it can be determined if pressure valves and plugs leak, but this is unreliable in that it does not simulate actual conditions of flight. It has been recommended that future tests of this equipment be curtailed until the item functions properly. Until acceptable, no standards for minimum performance or maintenance can be set for the equipment. (CONFID)

(4) It was suggested by the WADC representative that hard nosed plugs used in the basic aircraft should be replaced with soft nosed plugs. Tests did prove that leakage increases when hard nosed plugs are used, but since the manufacturer has stated that plugs on the ALT-8A power supply are defective, no further changes should be made until the new plugs have been procured. (CONFID)

4. Test Project Number 28, "Development of an Unattended Random Pulse Jammer". (SECRET)

a. Date initiated: 1 November 1954.

b. Percentage complete: 64%.

c. Hours flown: None.

d. Present status:

(1) The jammer being designed under this project is an unattended, sweeping, random pulsed, S-band transmitter. Purpose of the jammer is to delay early warning radar system detection of jet aircraft by creating a multitude of random spots on the radar scope. It is not expected that the spots created will resemble the arc-like returns from normal radar pulses, nor is it proposed to synchronize the jammer with the radar pulse recurrence rate. From experience and observation of early warning radars, it has been found that at long ranges such radars paint jet type aircraft, as the B-47, either very poorly or not at all. The paints do not occur on every sweep of the radar and generally appear as small point echoes. These fleeting echoes are used by the radar operator to plot aircraft position by means of dead reckoning for considerable distance beyond the range where normal target returns are obtained. It is believed that by creating random

unsynchronized pulses on the radar scope, the marginal paints can be masked and detection of jet aircraft delayed for considerable distance. (SECRET)

(2) One flight test on this project was flown during February against the AN/FPS-10 radar at Bartlesville, Oklahoma, using the random pulse jammer in a C-47 type aircraft. Both spot and sweep jamming runs were made with random pulse rate varied from approximately 300 to 2500 pulses per second. A slightly longer random pulse width was used on this flight test than on the first test. The ground observer's log and photographs taken of the radar scope during the mission indicate the jammer has good possibilities of producing numerous distractor targets on the radar scope. (SECRET)

(3) This project has been cancelled by SAC directive. A final report covering details of the jamming transmitter, tests flown, and test results to date is being prepared. (UNCL)

5. Test Project Number 33, "Personal Radio Alert Equipment". (UNCL)

a. Date initiated: 6 May 1955.

b. Percentage complete: 28%.

c. Hours flown: N/A.

d. Present status:

(1) The SAC mission requires immediate availability of key personnel and early availability of many other personnel when alert conditions exist. Purpose of this project is to determine a feasible method of quickly alerting specific groups of individuals through use of radio. Under this plan each individual would be equipped with a small radio receiver that could conveniently be carried in a shirt pocket. This receiver would be tuned to a specified frequency upon which an alert signal could be broadcast. (UNCL)

(2) During February a vertical antenna was erected for the ground radio station. This type of antenna gives a more powerful ground wave in the local area and would be more suitable for alerting purposes than the long wire antennas normally used for long distance communications. A crystal for control of the alert receiver oscillator has not yet been received but field measurements were made without this. (UNCL)

(3) This project has been cancelled by SAC directive. A final report of progress to date with details of tests and results obtained is being prepared. (UNCL)

(4) This project was downgraded to Unclassified by authority of message from Headquarters SAC, DOCER 14737, 23 February 56. Request all recipients of the SAC U-30 report downgrade all previous reports on Project 33 to Unclassified. (UNCL)

6. Auxiliary Text Project Number 18, "Development of a VHF Communications Jammer Using Increductors".

a. Date initiated: 1 April 1954.

b. Percentage complete: 58%.

c. Hours flown: None.

d. Present status:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a flyback time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus no reason to continue jamming it. If there were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multi-vibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension cables have been made for all units so they may be removed from the receiver rack for testing and alignment. The RF and IF units have been aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. This sweep rate is probably not the rate for use in the final version of the jammer, but has been chosen for testing purposes. (SECRET)

(4) First checks of receiver lock-on sensitivity show the minimum signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 db at the high frequency range and 110 db at the low frequency range. Gate and pause circuits have been adjusted so that pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods of time may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the receiver has been reduced by reducing screen voltage on the RF and IF amplifiers; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is being used. All receiver functions have been completed and checked. All memory, lock-on, and receiver gate circuits are operating. A transmitter gate circuit has been built and tested. Three front panel connectors have been added to the transmitter and receiver. Signals which have to be interconnected are the transmitter gate, transmitter lock-on information and RF output sample from the transmitter to the discriminator in the receiver chassis. Several methods of coupling the RF sample from the transmitter have been tested, most of which were inadequate. The method being used now consists of a resistive divider across the matching transformer to the antenna. This arrangement gives a fairly constant output for all required frequencies. Transmitter lock-on has been accomplished over approximately two thirds of the required band. Failure to lock-on over the remainder of the band is probably due to an imperfect wave shape in the transmitter control circuits. More work is being done to extend the lock-on range. (SECRET)

(5) As per SAC directive, this project will henceforth be designated as Project 35. (UNCL)

7. Auxiliary Test Project Number 28, "S-Band RF Systems". (SECRET)

a. Date initiated: 1 November 1954.

b. Percentage complete: 80%.

c. Hours flown: 52:00.

d. Present status:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) A Blue Cradle installation is being made wherein six AN/ALT-6 transmitters will feed RF output directly into wave guides. This installation is now nearing completion. The AN/ALT-6 equipped cradle has been installed in the aircraft and sufficient wave guide received for six sets. The wave guide is being fitted to the contour of the bomb bay door. When completed, each set will feed RF output into a wave guide approximately 28 inches long which will radiate through apertures in the bomb bay door. It is expected this installation will be completed and ready for flight test early in March. Results of flight tests will be compared with results of similar tests made with helix, diamond, and QRC-27 (T) installations. (SECRET)

(3) As per SAC directive, this project will henceforth be designated as Project 36. (UNCL)

8. Auxiliary Test Project Number 45, "AN/ALQ-3 Suitability Test". (SECRET)

a. Date initiated: 2 May 1955.

b. Percentage complete: 24%.

c. Hours flown: 35:00.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 S-band search-and-lock-on jamming system. Five complete AN/ALQ-3 systems have been delivered for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing. (SECRET)

(2) Three flight tests were scheduled for the AN/ALQ-3 during February, two against Dallas RBS and one against Little Rock RBS. Both Dallas missions were aborted due to aircraft troubles and the Little Rock mission was cancelled due to replacement radar equipment in use at the site during overhaul of the permanent radar. (CONFID)

(3) The B-47 Blue Cradle installation of the AN/ALQ-3 has been completed and three missions are scheduled during March against the Dallas RBS site. (CONFID)

(4) Per SAC directive, this project will henceforth be designated as Project 37. (UNCL)

9. Auxiliary Test Project Number 46, "AN/ALQ-7 Suitability Test". (SECRET)

a. Date initiated: 15 August 1955.

b. Percentage complete: 31%.

c. Hours flown: 46:05.

d. Present status:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a

noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output up to 400 watts. (SECRET)

(2) Seven missions were scheduled for February. These were:

1 February - against AI equipped fighters at Perrin AFB. Cancelled because of SAC alert. (CONFID)

7 February - against AI equipped fighters at Perrin AFB. Aborted because of AN/ALQ-7 malfunction. (CONFID)

10 February - against AI equipped fighters at Perrin AFB. Cancelled because of AN/ALQ-7 malfunction. (CONFID)

15 February - against navigation and fire control radar in another B-47 aircraft, same formation, and against AI equipped fighters at Perrin AFB. Ground aborted due AN/ALQ-7 malfunction. (CONFID)

20 February - against navigation and fire control radar in another B-47 aircraft, same formation, and against AI equipped fighters at Perrin AFB. Cancelled because of AN/ALQ-7 malfunction. (CONFID)

23 February - against navigation and fire control radar in another B-47 aircraft, same formation, and against AI equipped fighters at Perrin AFB. Partially completed; aborted part of mission due AN/ALQ-7 malfunction. (CONFID)

29 February - against M-33 precision tracking radar at Eglin AFB. Cancelled due AN/ALQ-7 malfunction. (CONFID)

(3) On the flight of 23 February the AN/ALQ-7 was operated against the AN/APS-23 navigation radar and AN/APG-32 airborne fire control radar in another B-47 aircraft in close formation. The first run was made with the target aircraft at 34,500 feet altitude and the AN/ALQ-7 equipped aircraft at 35,000 feet, one and a half miles in trail of the target aircraft. On the second run the aircraft flew at the same altitude but the AN/ALQ-7 equipped aircraft flew one and a half miles behind and one mile to the left of the target aircraft. On both runs the target aircraft was in position to "spotlight" the jamming aircraft with its fire control radar. Navigational and fire control radars in

jamming aircraft were turned to either standby or off during all tests. On the first portion of each run the navigational radar (APS-23) in the target aircraft was turned to standby and the fire control radar (APG-32) tried to lock-on the trailing aircraft. On the second portion of each run the navigational radar was turned on and the fire control radar turned off. During both runs, when the fire control radar was operating, the AN/ALQ-7 receiver locked-on the radar signal but the AN/ALQ-7 transmitter locked-on only during the first run. The fire control radar in the target aircraft was not functioning properly during the test and the operator saw no jamming. During portions of the runs when the navigational radar was operating, the AN/ALQ-7 receiver did not lock-on, so no jamming occurred. Upon completion of the second run, a malfunction in the AN/ALQ-7 made further formation tests and the AI tests impossible. (SECRET)

(4) Very little information was obtained from the 23 February test due poor operation of the AN/ALQ-7 and fire control radar in target aircraft. Information obtained, however, indicates the AN/ALQ-7 is capable of operating as expected in that it will lock-on and provide jamming of X-band radars provided radars continuously illuminate the jamming aircraft. Also, it appears the AN/ALQ-7 will not effect operation of navigational radars in nearby aircraft because these radars do not continuously illuminate the jamming aircraft. (SECRET)

(5) A great deal of trouble has been experienced from malfunctions of the AN/ALQ-7 equipment. The majority of these malfunctions do not indicate a breakdown in any particular component or part of the system. The malfunctions have occurred in various components of the system and are of a minor nature in that most are short circuits, open circuits, failure of small components and the like, which are readily remedied once they are located. Undoubtedly some of the malfunctions can be attributed to faulty initial installation of components. A great number of the AN/ALQ-7 components are subminiature type, including tubes, connectors, wiring, etc, and can be considered rather delicate. Some few malfunctions have been recurring and are probably due to either inferior manufacture or design. Three of these recurring troubles are: rupturing of liquid coolant hoses between units, failure of a particular relay in the low voltage power supply, and failure of the local oscillator high-voltage transformer-rectifier unit in the low voltage power supply. At present all

maintenance of the AN/ALQ-7 system is being performed by representatives of the manufacturer. This is necessary due to lack of any technical publications or maintenance manuals on the equipment. We have been informed that these publications will be forthcoming in the near future. (CONFID)

(6) Tests for March are planned against the M-33 precision tracking radar at Eglin AFB. Formation interference tests against AN/APS-23 and AN/APG-32 radars in adjacent B-47 aircraft are also planned as companion missions to the M-33 tests. (CONFID)

(7) Per SAC directive, this project will henceforth be designated as Test Project 38. (UNCL)

10. Auxiliary Test Project Number 47, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Percentage complete: 19%.

c. Hours flown: N/A.

d. Present status:

(1) Purpose of this project is to design test and calibration equipment suitable for field use for enabling fast and accurate setting up of AN/ALT-6 and AN/ALT-8 transmitters under conditions common to flight lines of SAC units. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) The seven cavity sweep limit measuring device was evaluated by using it to measure sweep limits and sweep rates of an AN/ALT-6 transmitter set up in the laboratory. A small pickup probe and crystal detector was added to the master cavity of the device. Output from the crystal detector is taken from a headphone jack on the front panel. The operator may plug headphones into the jack and listen to the signal from the transmitter for a check on the jammer modulation. Additional improvements of the measuring device were made by replacing the copper pick-up loops with silver plated loops and by removing excess metal support bars on the lamp bulb holders. The calibration device was taken to WADC and demonstrated between 8 and 10 February to personnel of WADC,

Hallicrafters Company, General Electric, and Raytheon Manufacturing Company. At their request, the device was left at WADC for further tests and investigation. (CONFID)

(3) While the cavity device is being examined at WADC, work continues in investigating other possible methods of measuring various characteristics of the S-band jammer, such as measuring transmitter frequency by observing the hot spots caused by standing waves on a lamp filament. When a lamp such as an ordinary light bulb is excited by the RF output from a jamming transmitter, it has been observed that the filament is lighted at certain points, depending on the transmitter frequency. As the frequency is changed, the hot spots on the lamp filament move in accordance with the frequency change. If such a device is found to give consistent indications, it could be used not only for measuring frequency but also to give a visual measurement of sweep width and sweep rate. (CONFID)

(4) In accordance with SAC directive, this project will be designated henceforth as Test Project 40.

11. Auxiliary Test Project Number 48, "Airborne Tape Recorder". (SECRET)

a. Date initiated: 4 October 1955.

b. Percentage complete: 19%.

c. Hours flown: 23:00.

d. Present status:

(1) Purpose of this project is to investigate the potential of the AN/APS-54 airborne warning receiver to collect automatically crude information on type, location, and numbers of enemy air defense radars received enroute by regular B-47 aircraft during combat. Data collected by the AN/APS-54 will be recorded on a tape recorder referenced as to aircraft position time. A playback of this tape with the flight log will be used to attempt spotting radar installations along the route flown. An airborne tape recorder (Nadar IV) having eight channels and tape for four hours of recording is being used for test. (SECRET)

(2) A North American Aviation Company engineer arrived at Barksdale AFB 30 January and brought a replacement drive motor for repair of the Nadar recorder. The engineer replaced the drive motor and adjusted the recorder. The recorder was flown in a KC-97 aircraft on

16 February and used to record signals from the AN/APR-4 receiver. No malfunctions occurred on this flight but the drive motor heated considerably when operated for extended periods. After the test flight the recorder was returned to North American Aviation Company. The engineer agreed to have a transcription of the recording made on standard quarter inch tape for 376th Bomb Wing. A transcription is necessary because the Nadar recorder uses wide tape which is not compatible with standard quarter inch tape as commonly used on most recorders. (CONFID)

(3) This project has been cancelled by SAC directive. A final report covering all tests and test results is being prepared. (UNCL)

12. Auxiliary Test Project Number 49, "Flight Test of QRC-18(T)". (SECRET)

a. Date initiated: 15 August 1955.

b. Percentage complete: 45%.

c. Hours flown: 57:35.

d. Present status:

(1) Purpose of this project is to test tactical suitability of the QRC-18(T). Essentially, the QRC-18(T) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

(2) One flight test was flown during February. Two KC-97 aircraft were used, one simulated the bombing aircraft carrying the jammers, and the other, the fighter. Aircraft maintained approximately 25-mile separation while flying nose-to-tail over a course extending approximately 175 miles from the ground station. The bomber flew at 19,000 feet and the fighter at 18,000 feet. The ground station was a 50 watt BC-640 VHF transmitter and RC-81 antenna located at Barksdale AFB. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. An AN/ARC-3 VHF receiver was used in the fighter. Frequency used was 142.38 megacycles. An observer in the fighter monitored VHF reception and scored the jamming as follows: (SECRET)

Condition 0 - no jamming

Condition 1 - all transmissions can be received with only a little background annoyance.

Condition 2 - can understand practically all messages but an occasional word is blocked out.

Condition 3 - can understand words and phrases but not complete continuity (a good operator can copy a repeated message).

Condition 4 - can tell a transmission is being made but cannot receive the message.

Condition 5 - cannot tell that a transmission is being made.

(3) Six spot jamming runs were made with narrow noise modulation and transmitter power output of 150 watts. The airborne ECM operator used an AN/APR-4 receiver with TN-17/APR-4 tuning unit and an AN/ALA-2 panoramic adapter to set the jamming transmitter on the ground station frequency. On the fourth run an operator at a ground receiver site aided the airborne operator by giving tuning instructions until the jamming signal could be heard in an AN/ARC-3 receiver set on the ground station frequency. Results of the jamming runs are shown in the following table: (SECRET)

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA (MILES)	SEPARATION FTR TO BOMBER (MILES)
1	0	163	24
	0-1	135	26
	1	130	25
	1	119	24
	1-0	104	25
	0	93	24
	0	42	20
2	1	41	25
	1	55	25
	1	90	27
	1	115	27
	1-0	128	27
	0	148	27
3	0	164	27
	0	115	25
	0-1	78	25
	0	55	26
	0	34	25

4	THIS RUN "TALKED-ON" FROM THE GROUND		
	2	153	26
	4	141	25
	4	132	25
	4	125	26
	4	100	25
	3	80	25
	3	72	26
	2	67	27
	1	60	25
	1	45	25
	0	40	25
5	0	47	25
	1	63	25
	1	95	27
	1	120	26
	1	140	25
	0	162	26
6	0	25	25
	1	38	25
	1	50	25
	1	65	25
	0	75	25
	0	80	25
	1	90	25
	1	115	25
	0	135	25

(4) Two flight tests are scheduled for March with only spot jamming runs being made. It is expected these flights will complete the portion of tests flown in KC-97 type aircraft. (CONFID)

(5) In accordance with SAC directive, this project will henceforth be designated as Test Project 39. (UNCL)

13. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Percentage complete: 32%.

c. Hours flown: 634:00.

d. Present status:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Mission 29 was set up as a ground test and run 13, 14 and 15 February to determine amount and type of jamming which a single or two AN/ALT-8A jamming transmitters could cause the AN/MPS-7 L-band radar located at Texarkana, Arkansas. The AN/ALT-8A transmitters were operated in an AN/GPQ-T1 radar training set van which was towed by truck from Barksdale AFB to Texarkana and parked approximately one mile from the radar site. Spot jamming and various combinations of slow and fast sweep jamming were tried to determine amount and type of jamming caused the AN/MPS-7 radar. Effect of each anti-jamming circuit of the radar was tried against each type of jamming. A mission report giving results of this test is being prepared but preliminary evaluation indicates the following conclusions: (SECRET)

(a) Because of the AN/MPS-7 improved receiver it appears doubtful that intensity of "white strobe" jamming will be great enough to cover all targets.

(b) "Black strobe" jamming was noted, probably produced by blocking of the receiver. Since this results in all targets being eliminated within the strobe, this type of jamming would be extremely effective if the "black strobes" can be caused at greater ranges.

(3) In order to prove or disprove results obtained which apply only to this ground test, airborne missions using multiple transmitters will be run against the AN/MPS-7 radar. (SECRET)

FOR THE COMMANDER:

William H. Murphy

WILLIAM H. MURPHY
Major, USAF
Adjutant

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SECRET

Classification: SECRET
Auth: COMDR 376BOMWG M
Initials: RG Wall
Date: 9 april 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

9 April 1956

SUBJECT: Test Progress Report (RCS: SAC-U30)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

15

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 31 March 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 6, "Minimum Performance Standards of ECM Equipments and Installations". (CONFID)

a. Date initiated: May 1952.

b. Estimated date of completion: Continuous.

c. Hours flown: Approximately 70 with Bus Stop testing AN/ALT-8A.

d. Present status: Additional work on this project is being held in abeyance pending receipt of a new Headquarters SAC directive which will set down new guide lines for test accomplishments. (UNCL)

3. Test Project Number 34, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Estimated date of completion: March 1957.

c. Hours flown: 4:00.

d. Summary:

(1) The jammer designed under this project is an electro-mechanical approach to the problem

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of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) Two flight tests scheduled to be flown during March were cancelled because of aircraft maintenance difficulties. One flight test was conducted on 22 March in conjunction with a training flight in a C-47 aircraft. Details of this flight test and results obtained are described in the project engineer's flight test report, attached as Inclosure 1. (UNCL)

(3) The project engineer visited Pensacola Naval Air Station, Florida, to brief the destroyer crew for flight tests to be conducted 3, 4 and 5 April. All preparations for these tests have been completed. (UNCL)

(4) Tests were scheduled during the period 3 through 5 April using a Navy destroyer located 200 miles off shore in the Gulf of Mexico as a ground station or victim signal. Two KC-97 aircraft will be used, one acting as the simulated fighter and the other as the simulated bomber carrying the search-and-lock-on jammer. Jamming runs will be conducted to determine effectiveness of the jammer with various separations between aircraft at different distances from the ground station. The remaining time between April and June will be spent in evaluating test data obtained and modifying equipment as necessary to increase effectiveness.

As modifications are made, additional flight tests will be conducted to determine their effect. If flight tests do not indicate need for modifications, the jammer will be completed by adding identification and sequential devices. Final flight testing of the jamming system will be conducted when these have been added. (UNCL)

4. Test Project 35, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Estimated date of completion: April 1957.

c. Hours flown: none.

d. Summary:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a flyback time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the

desired victim signal, thus no reason to continue jamming it. If there were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multivibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension cables have been made for all units so they may be removed from the receiver rack for testing and alignment. The RF and IF units have been aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. (SECRET)

(4) First checks of the receiver lock-on sensitivity show minimum signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 DB at the high frequency range and 110 DB at the low frequency range. Gate and pause circuits have been adjusted so pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the lock-on circuits has been reduced by turning down the threshold control; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is being used. All receiver functions have been completed and checked. All memory, lock-on, and receiver gate circuits are operating. A transmitter gate has been built and is operating. Necessary cables and connectors have been added to the receiver and transmitter, and the two units inter-connected. The system has been tested over the entire band and will lock-on any frequency in the range from 96 to 158 megacycles. Further tests show accuracy of lock-on

is not satisfactory at some frequencies. At some frequencies the error of lock-on is as great as 400 kilocycles. This would not be close enough to the victim signal to provide effective jamming. Work is being done on both the receiver and transmitter AFC circuits to correct this and give closer lock-on. (SECRET)

(5) A problem anticipated on this project, and on other projects using equipments in the VHF band, is a suitable antenna for use on B-47 and other high speed aircraft. The AS-321/APT-13 antenna is being investigated for possible use at VHF frequencies. This antenna, normally a part of the AN/APT-13 system, is a stub constructed of wire mesh covered with a fiberglass plastic and is designed to mount in a standard AB-109 antenna mount. Normal and x-ray photographs were taken of these antennas to determine their inner construction. Three of these antennas were installed on a B-47 aircraft to test their aerodynamic performance. One antenna has been installed on each bomb bay door and one near the camera compartment. The antennas will remain on the aircraft during its normal flying schedule and will be removed, re-examined and x-rayed after several flight hours to see if any structural defects have occurred. A fourth antenna is being tested in the laboratory for frequency response, bandwidth, and standing wave ratio. Preliminary checks indicate that some type of matching device will be required so the antenna will present the proper load over the entire desired frequency range. A photograph of three of these antennas is attached as Inclosure 2, and an x-ray photograph showing internal construction as Inclosure 3. (CONFID)

5. Test Project Number 36, "S-Band RF Systems". (SECRET)

a. Date initiated: 1 November 1954.

b. Estimated date of completion: This project is intended as a continual survey and investigation of latest techniques and RF systems.

c. Hours flown: 78:25.

d. Summary:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) A B-47E aircraft Blue Cradle installation was completed wherein six AN/ALT-6 transmitters each feed RF output into a waveguide approximately 28 inches long, including a 90° H-plane bend, and radiate through apertures in the bomb bay doors. For comparison purposes, another B-47E Blue Cradle installation was made wherein four AN/ALT-6 transmitters each feed RF output through QRC-27(T) transmission systems and radiate from QRC-27(T) antennas installed in AB-109 antenna receptacles on the bomb bay doors. (CONFID)

(3) Two flight tests were flown during March using the installations described. These tests were flown 8 and 16 March at approximately 34,000 feet altitude against the AN/FPS-10 radar at Bartlesville, Oklahoma. Four transmitters were operated on slow sweep (20 megacycles/second) in each aircraft with frequency limits of 2700 to 3100 megacycles. On the aircraft having the waveguide installation, two of the transmitters were carried as back-up equipment in case of malfunctions. Each aircraft was to fly from an IP 200 miles east of Bartlesville to a point 200 miles west of Bartlesville; thence a west-to-east tangential run 100 miles north of Bartlesville; thence an east-to-west tangential run 150 miles north of Bartlesville, and finally a west-to-east tangential run 50 miles north of Bartlesville. This course was chosen so the tests could be compared to previous tests using the helix, diamond, and QRC-27(T) antennas. (SECRET)

(4) Very little information was obtained from the 8 March test due to various difficulties and equipment failures. (UNCL)

(a) The navigation radar of both aircraft failed.

(b) IFF equipment on the aircraft having the waveguide installation failed.

(c) The alternator on the aircraft having the QRC-27(T) installation malfunctioned, requiring the run be started over at the IP.

(d) The waveguide-equipped aircraft reached the IP and started a jamming run before the other aircraft completed its run. This gave additional jamming and confused the test until the second aircraft could be contacted to stop jamming and hold over the IP.

(e) Shortly after the waveguide aircraft started its test run, a "Sierra Juliet" was received from several RBS sites, including the site at Kansas City.

Because of these various difficulties the second aircraft was able to fly only the first leg of the track and return over the same course. (UNCL)

(5) Post-flight equipment operational checks revealed the following malfunctions of ECM equipment which, because of their nature, would not have been apparent to the air crew while in flight: (UNCL)

(a) On the QRC-27(T)-equipped aircraft, one transmitter was inoperative due to failure in the PP-933/ALT-6 power supply.

(b) On the waveguide-equipped aircraft, one transmitter was inoperative due loss of sweep in the T-402/ALT-6 transmitter, and three were found to have sweep speeds which were too fast by approximately three megacycles/second.

(6) The 16 March mission was a re-run of the 8 March mission, with no equipment malfunctions other than inoperative IFF on the waveguide-equipped aircraft. This required that the ground station operators compute a D/R track for a good portion

of the mission. Although results of this test were encouraging, it is felt the amount of testing is insufficient as yet to make any definite conclusions. Also, it is believed the waveguide installation can be further improved to increase its effectiveness. Additional flight tests are scheduled for further comparison and evaluation. (UNCL)

(7) Laboratory measurements are being made with the waveguide sections terminated in a simulated bomb bay door ground plane to determine the material best suited for a termination cover. Teflon, fiberglass, and other materials are to be tested as aperture covers to minimize reflections in the waveguide. (CONFID)

6. Test Project Number 37, "AN/ALQ-3 Suitability Test". (SECRET)

a. Date initiated: 2 May 1955.

b. Estimated date of completion: October 1956.

c. Hours flown: 41:00.

d. Summary:

(1) Purpose of this test project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Five complete AN/ALQ-3 systems have been delivered to the 376th Bomb Wing for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing; to date, 16 systems have been delivered. Their status is as follows: (SECRET)

(a) Systems #1 and #2 - waiting modification to meet operational specifications.

(b) Systems #6, #7, #8, #9, and #10 - being used for test.

(c) Nine systems are still in crates in the 376th Armament and Electronics supply room.

(2) Two B-47E Blue Cradles have been modified for installation of the AN/ALQ-3. This modification consists of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and

circuit breakers in the cradle junction box. No aircraft or cradle wiring changes have been necessary, only the additions described. (UNCL)

(3) Three flight tests were conducted during March with the AN/ALQ-3 installed in a B-47E aircraft and flown against a single precision tracking radar of the MSQ-2 type at Dallas, Texas, RBS site. Purpose of these tests was to determine protection afforded a single AN/ALQ-3 equipped B-47 from a precision tracking radar at various ranges and altitudes within the reliable operating range of the radar. In addition, the radar susceptibility to jamming as a function of its mode of operation (fully automatic, aided range, with and without smoothing) was investigated. (SECRET)

(4) The aircraft track for the flight tests consisted of six runs against the tracking radar, two radial passes with terminal points 50 nautical miles from the site, and four runs passing the site tangentially at ranges of five, 10, 15 and 20 nautical miles respectively. Aircraft altitude was maintained at 33,000 feet and airspeed at 430 knots TAS. Of the three flight tests, only two were successful. The other was unsatisfactory because of transmitter magnetron multiple-moding at the tracking radar frequency. This resulted in no jamming power on the radar frequency, and consequently allowed the radar to track aircraft throughout the mission. (CONFID)

(5) On the two successful flights the jamming intensity appeared to be approximately the same regardless of aircraft position within the 50 mile radius of the RBS site. Further tests are to be conducted at Eglin AFB using better instrumentation to confirm or negate this observation. When the radar is operated in B-2 mode (automatic tracking in range, azimuth, and elevation) with no radar smoothing, jamming is sufficient to cause the radar to break lock regardless of position or altitude of the aircraft. Inclosure 4 shows a three minute sample of Esterline-Angus recording as made during radar B-2 operation with no smoothing. The three recordings show target slant range, target altitude, and target azimuth with respect to the site, as determined by the computer associated with the MSQ-2 radar. Data shown on the recordings would be the same as

that fed to a gun or missile directing system. Starting from the bottom of the strips up to 1225C, the aircraft was being tracked automatically with the AN/ALQ-3 transmitter not energized. When tracking with no interference, the recorded tracks of range, altitude and azimuth are relatively smooth. At 1225C the AN/ALQ-3 transmitter was turned on, causing the radar to break lock. This is shown by the rapid and irregular variation in range, altitude and azimuth. During the two-minute interval from 1225C to 1227C, the radar re-acquired the aircraft six times and tracked it for a period of approximately three seconds before jamming caused the radar to break lock. (SECRET)

(6) The effect of AN/ALQ-3 jamming with the radar operating in B-2 mode with radar smoothing appears to be similar to that obtained without smoothing except that the period of tracking without breaking lock is longer. Inclosure 5 shows samples of recordings obtained from the radar while operating in B-2 mode with smoothing. During the period from 1249:30 to 1252, the aircraft was tracked four times for an average period of 15 seconds before jamming caused it to break lock. (SECRET)

(7) During radar A-2 operation (automatic tracking in azimuth and elevation angle and manual aided tracking in range) the radar is able to track the aircraft through jamming, provided radar operator has sufficient time to set in the approximate rate of change of range before the AN/ALQ-3 transmitter begins jamming. Esterline-Angus tapes made during A-2 mode of operation were not satisfactory because of poor time synchronization. Part of the tests scheduled to be conducted at Eglin AFB during April will be devoted to obtaining more valid data concerning effect of jamming on the A-2 mode and tracking the target through jamming. (SECRET)

(8) Eight flight tests are scheduled during April against precision tracking radars at Eglin AFB, Florida. Purpose of these tests

will be to determine protection afforded a single AN/ALQ-3-equipped B-47 against a minimum of three precision tracking radars, and to obtain additional data on the jamming effectiveness of a single AN/ALQ-3-equipped aircraft operating against a single precision tracking radar. (CONFID)

7. Test Project Number 38, "AN/ALQ-7 Suitability Test". (SECRET)

a. Date initiated: 15 August 1955.

b. Estimated date of completion: 20 April 1956.

c. Hours flown: 64:50.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output up to 400 watts. (SECRET)

(2) Aircraft used for test missions is an RB-47E with the AN/ALQ-7 installed in Section 43, station 1099 to 1166. Both receiving and transmitting antennas are mounted on the bottom of the aircraft. (CONFID)

(3) Results of previous missions against the M-33 precision tracking radar indicate the AN/ALQ-7 is capable of initiating a receiver lock-on and transmitter jamming condition out to maximum range of

the radar, which is 100,000 yards or 50 nautical miles. It will continue to provide jamming of the M-33 beyond maximum range of the radar provided the aircraft is illuminated by the radar. On these previous missions jamming intensity varied considerably between missions but varied only little during any one mission. On three of the missions the radar operators could track aircraft part of the time through the jamming, but at other times encountered considerable difficulty in maintaining correct radar range. Skill of the range operator greatly influenced quality and accuracy of the tracking data. On another mission, intensity of the AN/ALQ-7 jamming signal was such that operators could not track the aircraft. Attempts were made to try confusing the AN/ALQ-7 by changing the radar frequency during jamming. The AN/ALQ-7 was able to follow these frequency changes about 90 percent of the time. (SECRET)

(4) A system was devised during an early mission by the M-33 elevation operator to cause the AN/ALQ-7 to cease jamming and go into the search phase. The operator, by quickly changing radar elevation about 100 mils would cause the AN/ALQ-7 to lose the radar signal and go into the search phase. If the radar target is then immediately re-acquired in elevation, the target can be tracked from seven to ten seconds before the AN/ALQ-7 can again find the radar signal and begin jamming. This long delay in resumption of jamming is due, in part, to failure of the image reject circuits to operate properly. The AN/ALQ-7 should re-acquire the radar signal and provide jamming in approximately three seconds. It was noted this system would only work when the radar target was at medium or long ranges. At short ranges, changing elevation of the radar would not cause the AN/ALQ-7 to lose the radar signal, with the result that the jamming continued. (SECRET)

(5) In tests made against the AN/APS-23 airborne navigational radar located in the same aircraft as the AN/ALQ-7, it was found that jamming encountered by the AN/APS-23 was periodic and that the AN/ALQ-7 would not lock-on and continuously jam the radar. The AN/ALQ-7 would not continuously jam the navigational radars in nearby aircraft because these radars do not continuously illuminate jamming aircraft. (SECRET)

(6) Two missions were flown with the AN/ALQ-7 during March to test effectiveness of the AN/ALQ-7 against the M-33 precision X-band tracking radar and determine amount and type of interference encountered by navigational and fire control radars in other B-47 aircraft flying in various formation positions with respect to the jammer-equipped aircraft. The first of these missions was flown 6 March against the M-33 radar at Eglin AFB, Fla. The test aircraft flew at an altitude of 35,000 feet. See Inclosure 6 for observer's log. Photographs numbered 1, 2, 3 and 4 on Inclosure 7, were taken 6 March and represent a sample of the jamming conditions. Photograph 1 was made with no jamming on the scope and radar tracking target aircraft. Photograph 2 represents an initial hit on the radar by the jamming. Photograph 3 shows the jamming during the AGC recovery period after the initial hit. Photograph 4 is a sample of the jamming after the AGC had fully recovered. A track overlay showing the aircraft flight during jamming activities is attached as Inclosure 13. (SECRET)

(7) The second mission was flown on 9 March 1956 and consisted of two parts:

(a) Part 1 was a formation mission designed to determine amount and type of interference encountered on navigational (APS-23) and fire control (APG-32) radars located on other aircraft in the same formation with the ALQ-7-equipped aircraft. The following formations were flown: (CONFID)

RUN NO.	TARGET A/C ALT	AN/ALQ-7 A/C ALT & POSITION
1	33,000 ft	33,500 ft, 1½NM aft,in trail
2	33,000 ft	33,500 ft, 1½NM aft, 1 NM left
3	33,000 ft	33,500 ft, 1½NM aft, 1 NM right
4	33,000 ft	33,500 ft,abreast, 1 NM right
5	33,000 ft	33,500 ft,abreast, 1 NM left
6	33,000 ft	33,500 ft,abreast, 2 NM right
7	33,000 ft	33,000 ft,abreast, 2 NM left

Three logs were maintained during this part of the mission and are attached as Inclosures 8, 9 and 10. The logs were made by the observer and co-pilot in the target aircraft and by the ALQ-7 operator in the ALQ-7-equipped aircraft. Each phase indicated on the logs was scheduled for two-minute duration. Four O-15 scope photographs are attached as Inclosure 11. They may be referenced to the target aircraft observer's log by use of O-15 frame numbers. The interference referred to in the target aircraft observer's log refers only to the spiral type interference shown in frame number 1134 and not to any interference that may be shown in the other photographs. This spiral type interference is definitely not caused by the ALQ-7. (CONFID)

(b) Part 2 was flown against the M-33 precision tracking radar at Eglin AFB. The test aircraft was operated at an altitude of 35,000 feet. See Inclosure 12 for observer's log. Photographs 5, 6, 7 and 8, shown in Inclosure 7, were taken on 9 March 1956 and represent a sample of the jamming conditions. Photograph 5 was made with no jamming on the scope and radar tracking target aircraft. Photographs 6, 7 and 8 represent normal jamming condition. No change in jamming effectiveness was noted due to AGC recovery. Track overlay of the aircraft flight path during jamming activity is attached as Inclosure 14. (UNCL)

(8) A great deal of trouble has been experienced from malfunctions of the AN/ALQ-7 equipment. These have occurred in various components of the system, and undoubtedly some of the failures can be attributed to faulty initial installation of components. A great number of the AN/ALQ-7 components are subminiature type, including tubes, connectors and wiring, and can be considered rather delicate. Indications at the present time, however, are that the troubles encountered are due in part to design characteristics which lead to failure of various components of the system. During the past month only one system, made up of two AN/ALQ-7 systems available, has been operational at any one time. This poor operating record cannot be due to lack of experienced maintenance personnel as one field engineer and one field technician representing the manufacturer,

both thoroughly familiar with the equipment, have made every effort to keep the systems operating. (CONFID)

(9) The following conclusions have been drawn from results of tests conducted during March:

(a) The AN/ALQ-7, when operated against a single M-33 X-band conically scanning radar, will search for, lock-on, and provide jamming of the radar frequency at all ranges out to and beyond the maximum range of the radar (50 nautical miles). (SECRET)

(b) Installation of the ALQ-7 antennas in the bottom of the aircraft provide forward and aft jamming coverage, effectiveness of which changes very little with range. (CONFID)

(c) Jamming is of such a nature that the quality of the tracking data is affected at all times. At times the target is completely obliterated by the jamming; at others, the operators can see the target periodically through the jamming. However, quality of the data is questionable because the range operator has great difficulty in properly tracking the target. It is concluded that unless the operators, and especially the range operator, are highly skilled in tracking through jamming interference, they will not be able to provide valid data for fire control purposes. (SECRET)

(d) No conclusions are drawn from the 9 March formation test. This is due to lack of sufficient data. Indications are, however, that the ALQ-7 will periodically jam the APS-23 navigational radar on another aircraft in close formation, and will jam the APG-32 fire control radar when this radar illuminates the ALQ-7-equipped aircraft. (SECRET)

(e) Due to the great number of system malfunctions which have repeatedly occurred in the ALQ-7 system since the beginning of the test project, it is concluded that the system in its present design is not stable enough for practical use in the field. (CONFID)

(10) The following recommendation is made on the basis of test results obtained to date. Recom-

mend the AN/ALQ-7 not be considered for procurement in its present state. This is primarily based on the general unreliability of the equipment and not on its jamming effectiveness against precision tracking ground-based and airborne radars. (CONFID)

8. Test Project Number 39, "Flight Test of QRC-18(T)". (SECRET)

a. Date initiated: 15 August 1955.

b. Estimated date of completion: June 1956.

c. Hours flown: 57:35.

d. Summary:

(1) Purpose of this project is to test tactical suitability of the QRC-18(T). Essentially, the QRC-18(T) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

(2) Two spot jamming tests scheduled during March in KC-97 aircraft were cancelled due to aircraft maintenance difficulties. Four sweep jamming flight tests using three QRC-18(T) modified transmitters in a B-47 cradle installation are scheduled for 3, 10, 18 and 26 April. A second B-47 aircraft having a VHF radio installation will be used as a simulated fighter. Test procedures are to be the same as used on sweep jamming tests run using KC-97 aircraft. If similar results are obtained, these flights will complete sweep jamming tests. (UNCL)

(3) Four flight tests of spot jamming against VHF communications are scheduled to be run in connection with Project Bus Stop during April using a Phase V aircraft from the 68th Bomb Wing. Since information to be obtained from these flight tests is the same as required for the spot jamming portion of Test Project 39, these tests will be coordinated with Test Project 39. (UNCL)

9. Test Project Number 40, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Estimated date of completion: September 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) A sweep limit measuring device was constructed using seven S-band cavities. Preliminary tests were made on this device, and it was taken to WADC for evaluation in February. No information has been received from WADC to date on the results of the evaluation. (CONFID)

(3) Work is continuing on the moving hot-spot method of measuring S-band transmitter frequencies. This method does not use cavities but rather the heating effect of the transmitter RF energy in a fine coil of tungsten wire. When the fine wire coil is exposed to RF energy from the transmitter, a small section of the coil, the position of which is dependent on frequency, becomes heated to incandescence and forms a small bright spot. This heated bright spot moves along the coil as frequency of the exciting RF energy is changed. Thus, position of the hot-spot may be used as a measure of frequency. To make the lighted hot-spot small and obtain maximum excursion of the spot along the coil as the frequency is changed, diameter of the coil must be made as small as possible. Also, the wire diameter must be very small to provide sufficient sensitivity. Typical values of the wire and coil size used are: average diameter of wire - .003", outside diameter of coil - .0132", and spacing between coil turns - .0007". To give an idea of the physical size of the coil, a small portion of it

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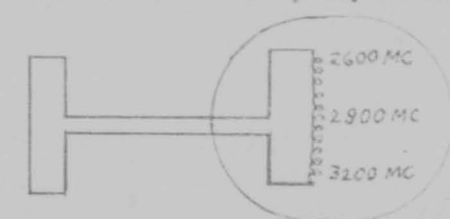
used as a specimen, containing nine turns, measured approximately .064", about 1/16th of an inch. For a practical device, a much longer coil is used. The simplified sketch shows elementary details of a possible device for frequency measurement:



This shows a broad-band folded dipole antenna, which might also be a stub antenna, feeding RF energy from the jamming transmitter through a transmission line to the evacuated tube containing the hot-spot indicating device. The hot-spot would move along the small coil as frequency of the transmitter changed, in this case moving from bottom to top as frequency is lowered. When transmitter frequency is 2900 megacycles, the spot would be in the center of the coil as shown for that frequency. The small coil is contained in an evacuated glass tube so the heated spot will not burn out under normal use. (CONFID)

(4) To obtain practical utilization of the hot-spot effect, two approaches are planned. One method is to have a small coil in an evacuated tube or box. To the tube is affixed a magnifying lens, calibrated in megacycles, through which the spot may be observed. The lens would be provided because movement of the spot with changing frequency is small and magnification is needed for accurate measurement. A second method is to place near one end of the coil either a form of heat or light detector, i.e., a thermocouple or photo cell. The output of such a detector would be displayed on a suitable indicating meter. As the spot approaches the detector, the meter indication would increase; this could be calibrated in terms of frequency. (CONFID)

(5) A third type of cavity-tuned S-band calibration tester for flight line use is under construction. This unit employs only three cavities, each having

a precision calibrated micrometer tuning drive. One cavity is used to monitor the upper frequency sweep limit, one to monitor the lower frequency sweep limit, and the third for the mid-band or center frequency. Since cavities in this tester are not fixed-tuned as in the previous model, only three are required. In use, the center cavity will be tuned to set the center frequency of the AN/ALT-6 or AN/ALT-8 transmitter. High and low frequency cavities will be set to frequencies required for the particular mission. The transmitter sweep width will then be set until a maximum reading on the indicators of the end frequency cavities is obtained. Exact end frequencies may then be measured as a final check. This tester will use meters as indicating devices rather than neon bulbs, or lamps as in the second model. Also, provisions will be made to monitor the rectifier output of the center frequency cavity as a modulation check, and power measurement. (CONFID)

10. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Estimated date of completion: Continuous.

c. Hours flown: 634:00.

d. Summary:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gun-laying, and interceptor radars. (SECRET)

(2) Mission 31 was set up as a ground test and conducted 21, 22 and 23 March to determine amount and type of jamming which a single AN/ALT-6A jamming transmitter could cause the AN/FPS-10 S-band radar located at Duncanville, Texas. The AN/ALT-6A is the latest model of this equipment and contains several operating characteristics not included in earlier models. This ground test was conducted to aid in determining which equipment settings should be used on subsequent airborne tests of the AN/ALT-6A against the AN/FPS-10. The AN/ALT-6A transmitter was operated in an AN/GPQ-T1 radar training set van which was towed by truck from Barksdale AFB to Duncanville

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and parked approximately one mile from the radar site. Spot jamming and various combinations of slow and fast sweep jamming were tried to determine amount and type of jamming caused the AN/FPS-10 radar. The raw data from this test is being collected and reduced. A mission report giving full details of the test and results obtained is in preparation. (CONFID)

(3) Two five-aircraft ECM support missions were scheduled against the FPS-10 radar at Kirksville, Mo. These missions were designed to utilize a minimum number of aircraft which would accurately reflect a normal tactical mission. Both missions were cancelled due to weather. Additional tests could not be scheduled because of higher headquarters commitments. A five-aircraft support mission, as well as a number of single aircraft Phase III capability test missions, are scheduled for April. (UNCL)

FOR THE COMMANDER:

William H. Murphy
WILLIAM H. MURPHY
Major, USAF
Adjutant

14 Incls
1. Proj 34, Flt Test #1 Rept (CONFID)
2. Proj 35, antenna photo (UNCL)
3. Proj 35, antenna x-ray photo (UNCL)
4. Proj 37, sample recording (SECRET)
5. Proj 37, sample recording (SECRET)
6. Proj 38, observer's log, msn on 6 Mar (SECRET)
7. Proj 38, photo of 8 photos (SECRET)
8. Proj 38, Msn log, 9 Mar (SECRET)
9. Proj 38, Msn log, 9 Mar (SECRET)
10. Proj 38, Msn log, 9 Mar (SECRET)
11. Proj 38, Photo of 4 O-15 scope photos (SECRET)
12. Proj 38, observer's log, msn on 9 Mar (SECRET)
13. Proj 38, track overlay, Msn 6 Mar (UNCL)
14. Proj 38, track overlay, Msn 9 Mar (UNCL)

DISTRIBUTION:
6--SAC (DOPLT, DORQ, DOCEN, DMAT, OPS ANALYSIS, D/INTELL)
1--4AD
2--8AF (ODC)
2--15AF (DOELE)
2--2AF (DOEM, DOOP)
14-376DCTT

SECRET

TEST PROJECT 34
FLIGHT TEST #1 REPORT

DATE CONDUCTED: 22 March 1956.

AIRCRAFT USED: C-47.

GROUND EQUIPMENT: ARC-3 transmitter-receiver, 50 watt AM-14/APT amplifier, tape recorder, and Bird Through Line. (UNCL)

AIRBORNE EQUIPMENT: ARC-3 transmitter-receiver and Project No. 34 receiver. (UNCL)

PURPOSE OF TEST: To determine effect of aircraft vibration and electrical noise on the lock-on characteristics of the receiver. Part 2 of the test will indicate the effective range of lock-on at a given altitude and the possible frequency error due to overshoot. (UNCL)

METHOD OF CONDUCTING TEST:

The ground station was located in the laboratory at 376th Bomb Wing Test and Tactics. This station was set up on 117.18 mc with a power output of 50 watts as indicated on the Bird Through Line. (UNCL)

The weapon was installed on the aircraft and a set of 117.18 mc crystals installed in the aircraft VHF transceiver (ARC-3). (UNCL)

After climbing to an altitude of 6000 feet, the aircraft began its first run away from Barksdale AFB at a heading of 87°. (UNCL)

With the ground station emitting a signal on 117.18 mc of 50 watts, and being modulated with the tape recorder for continuous operation, the aircraft observer energized the weapon receiver and caused it to lock-on the victim signal. This signal was identified by the observer during the look-through time and the dial setting was noted. (UNCL)

The airborne receiver was manually unlocked and allowed to search the entire band to determine the effect of electrical noise and vibration. The receiver reacted in a satisfactory manner in that it had a tendency to lock only on valid VHF signals within its search range. During this phase of the test, approximately 23 VHF signals were noted. The weapon locked on each of these successfully. As the weapon locked-on each signal, the observer would attempt to identify the signal and log its frequency. Most of the signals were not identified due to a short look-through time. (CONFID)

Incl 1

SECRET

As the aircraft progressed farther away from the station the ability to lock-on the victim signal was repeatedly tested by manually unlocking the receiver and allowing it to again find and lock-on the victim signal. With each lock-on, the observer would identify the signal during the look-through time. The audio of the victim signal was consistently audible, indicating a lock-on well within the pass band of the receiver. When the aircraft reached Monroe, Louisiana, the ground station was no longer audible in the aircraft ARC-3. The weapon continued to lock-on the victim signal until the aircraft reached Delhi, Louisiana, 130 miles from Barksdale AFB. This test indicated the weapon receiver was considerably more sensitive than the normal receiver located in the aircraft. As this comparison was only conducted using one ARC-3 receiver, it is not conclusive as the particular aircraft receiver checked could have been out of alignment slightly. (CONFID)

The aircraft continued its run at a heading of 87° and no further contact was observed between the weapon and victim signal. When the aircraft reached Meridian, Mississippi, it completed one orbit which concluded run #1. (UNCL)

Run #2 began as the aircraft took up a heading of 267° at an altitude of 6000 feet and flew toward Barksdale AFB, La. (UNCL)

Many VHF signals were noted as the run progressed; however, no contact was made with the victim signal until the aircraft was over Delhi, La. At this time the weapon received a positive lock-on condition and the victim signal was identified during the look-through cycle. The weapon was constantly re-cycled manually during this run to determine any variation in overshoot due to varying signal strength. No variation was noted and each lock appeared to be well within the pass band of the receiver. (CONFID)

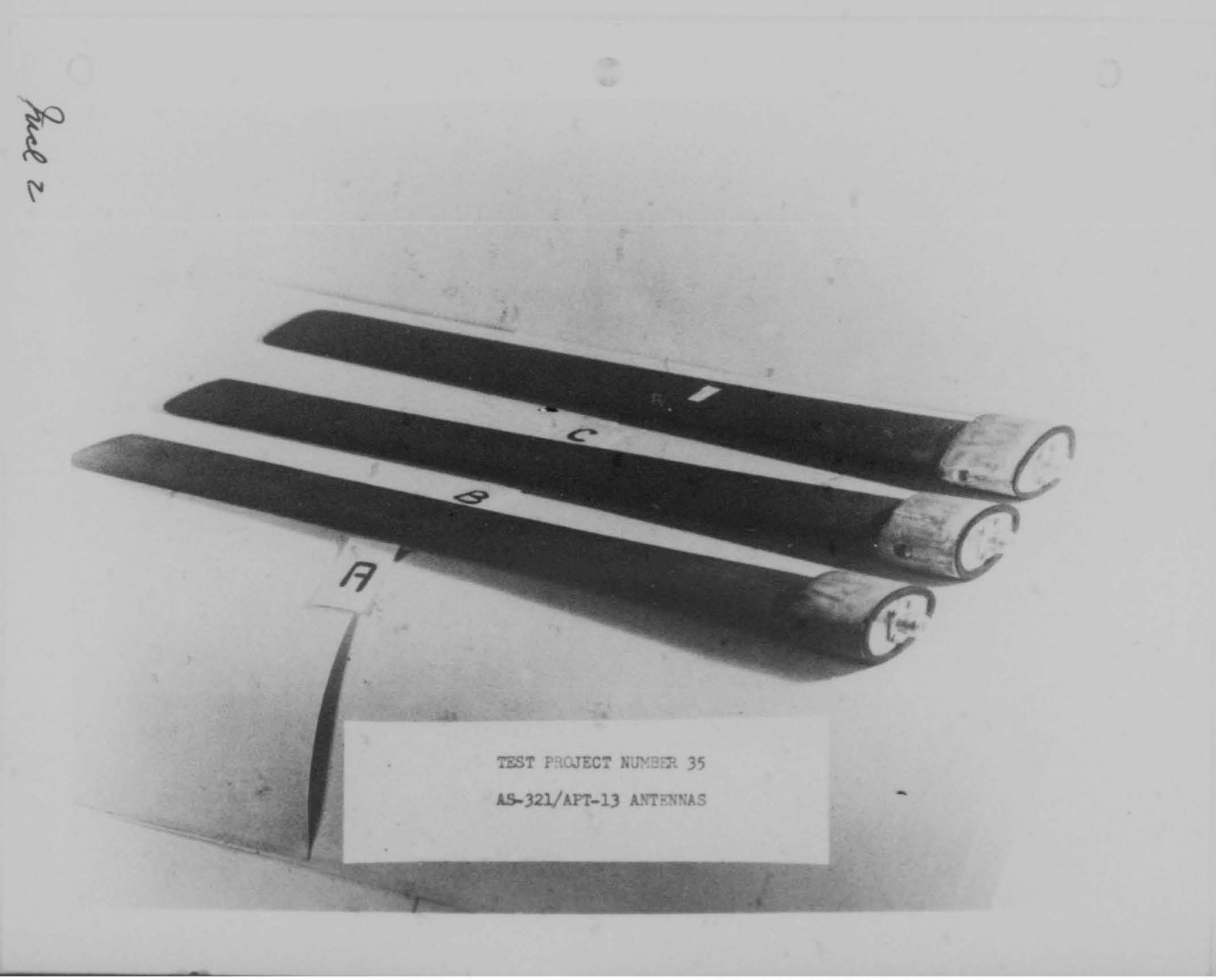
CONCLUSIONS:

The receiver portion of Project Number 34 appears to be satisfactory for the intended purpose. (UNCL)

RECOMMENDATIONS:

Due to the large number of VHF signals present in the local area, it does not seem feasible to conduct extensive tests of this weapon in this area. (UNCL)

Incl 2



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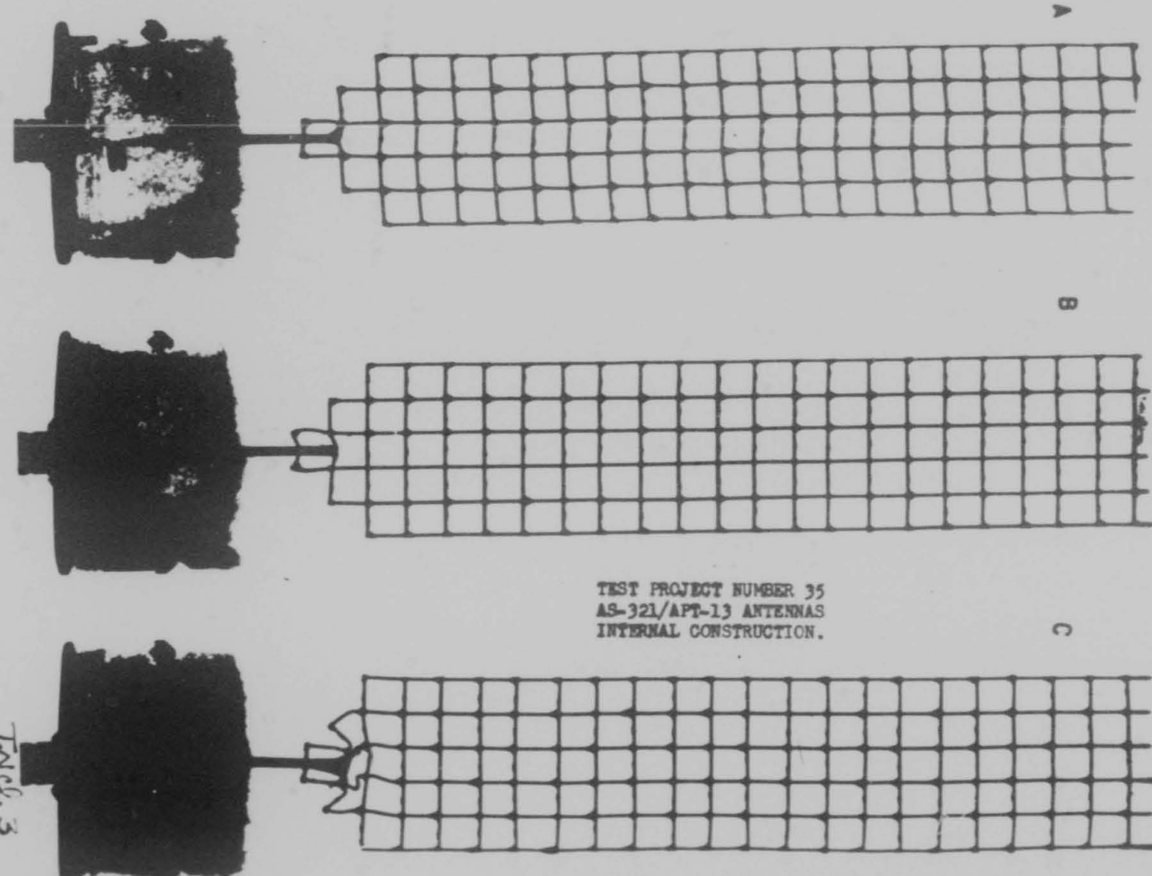

TEST PROJECT NUMBER 35
AS-321/APT-13 ANTENNAS
INTERNAL CONSTRUCTION.

Incl. 3

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SINGLE AN/ALQ-3 VS MSQ-2 RADAR B-47 #424 DALLAS RBS SITE 16 MAR 56
RADAR MODE B-2 (FULL AUTOMATIC) NO SMOOTHING

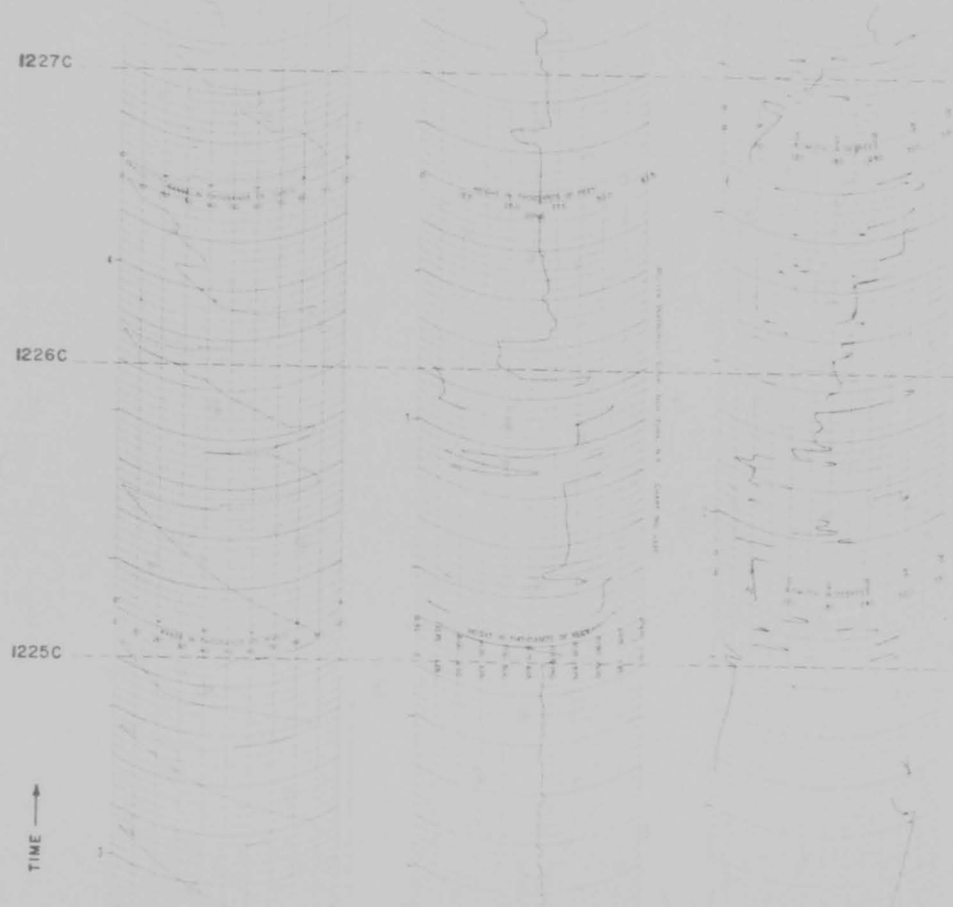

FIGURE 1

A/C POSITION : 1225C - 32MI , 312° , 33K FT   1227C - 23MI , 351° , 33K FT

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SINGLE AN/ALQ-3 VS MSQ-2 RADAR B-47 #424 DALLAS RBS SITE 16 MAR 56

RADAR MODE B-2 (FULL AUTOMATIC) WITH SMOOTHING

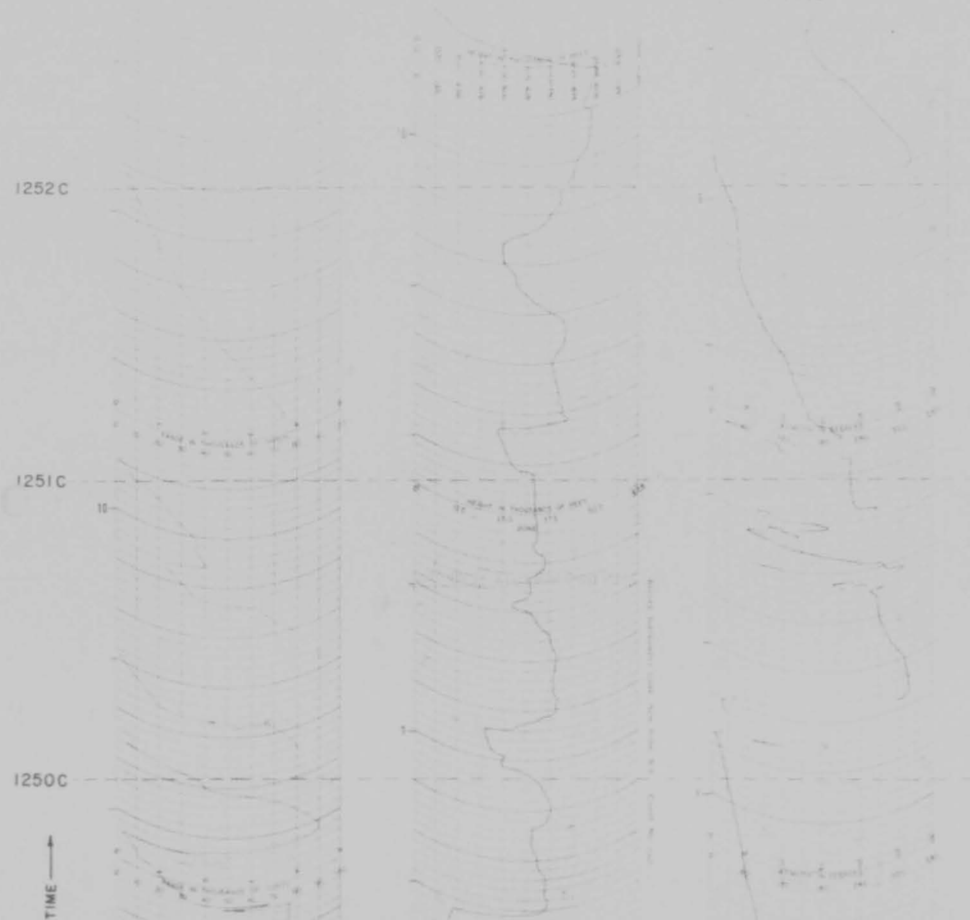

FIGURE 2

A/C POSITION : 1250 - 18MI , 39° , 33K FT   1252 - 10MI , 353° , 33K FT

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TEST PROJECT 38

MISSION OF 6 MAR 56

The following log was tape recorded by the 376th Bomb Wing observer located in the M-33 tracking radar van. Central Standard time was used. (SECRET)

1127 - Picked up jamming signal. Target not seen, only jamming. Base line not well defined at all on A-scopes. Magnitude of jamming in upward direction from base line is weak (barely above grass), however, magnitude of jamming downward from base line is much greater. Since target is not visible, operators have no indication of aircrafts position. 35mm camera taking pictures of A-scope.

1128 - Jamming disappeared. Radar not illuminating aircraft. Aircraft close overhead.

1129½- No jamming, no target. Radar still not illuminating aircraft .

1131½- No jamming, no target. Radar still not illuminating aircraft.

1132 - Asked Demon Control (FPS-3) for aircraft position. Still no jamming operation as radar is not illuminating aircraft.

1133 - Located aircraft on S-band acquisition radar PPI scope. X-band tracking radar slewed to approximate range and azimuth of target. Jamming started immediately. Target not seen at all due to jamming interference.

1134 - Jamming appearing now only part of the time due to elevation operator moving quickly off target in elevation in order to make ALQ-7 go into search phase. Elevation operator quickly reacquires target and radar tracks target with no jamming for about 7 to 10 seconds. Jamming then reappears. Target cannot be seen in range notch during jamming operations. Jamming magnitude upward is small, downward is much larger. Base line not sharply defined.

1135½- Same conditions as 1134

1137 - Starting Run 2. Jamming present. Operators are now seeing target through jamming. Jamming magnitude upward is still weak. Base line is separated so that there is a clear space free of jamming between lower base line and jamming above. Azimuth and elevation operators in automatic operation and range operator in aided-range. Quality of data questionable as target not seen continuously through jamming and when seen is not always at correct range.

1138 - Jamming still present. Target lost in jamming. Elevation operator can't make ALQ-7 go into search phase by moving off target in elevation since aircraft is close to radar and is continuously illuminated.

1139 - Jamming disappeared. Aircraft completely lost by radar.

1141 - Still lost. Aircraft apparently passing overhead.

1142 - Aircraft still lost. No target, no jamming.

1143 - Located target on acquisition radar PPI. Trying to get track radar on it.

Incl 6

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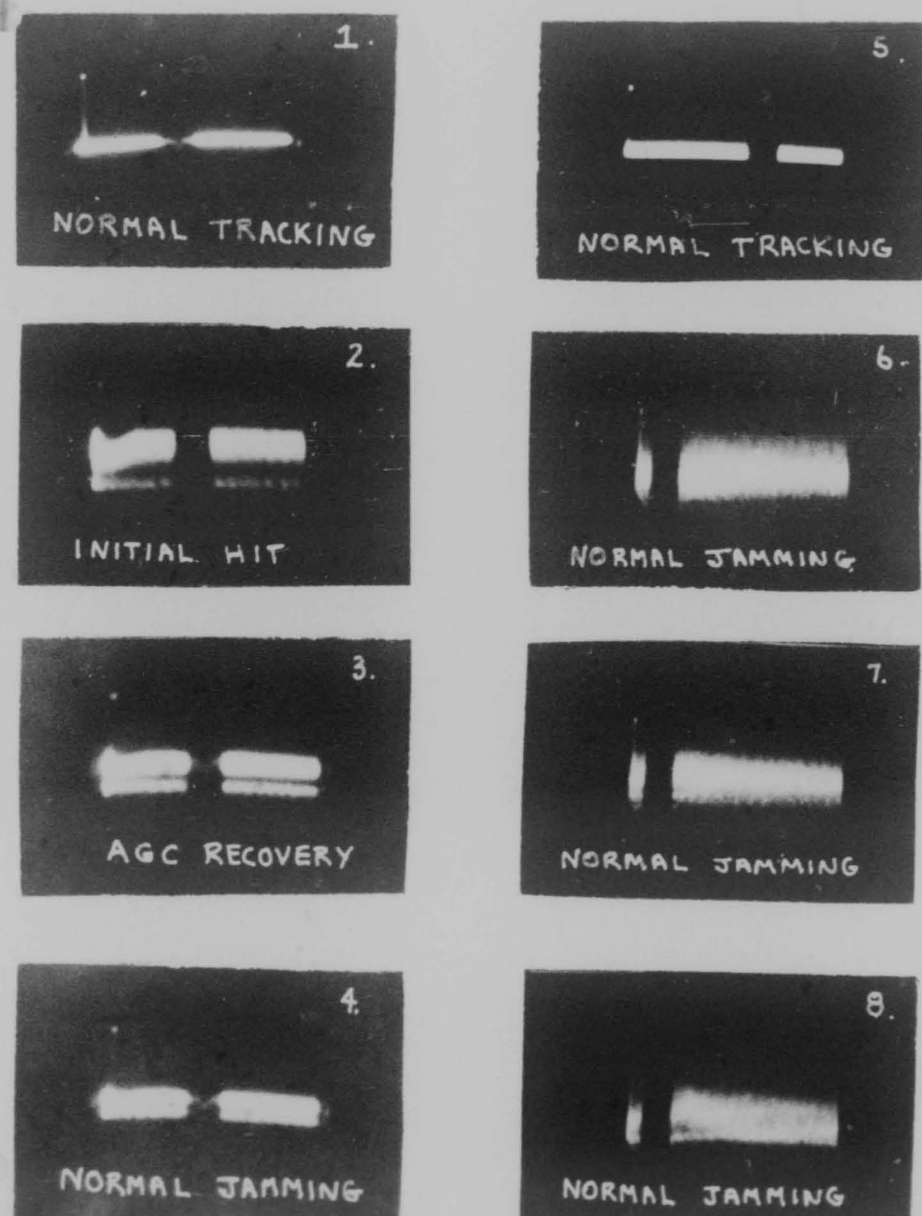
1144 - Jamming present. Looks same as before. Target being seen periodically in 500-yd notch. Target being followed in aided-range. Tracking data very poor as target moves back and forth throughout 500-yd notch without operator being able to keep target in center.

1145 - Same conditions as at 1144. Elevation operator again causing ALQ-7 to go into search phase by moving off target, then reacquiring. Several seconds delay after reacquiring before jamming reoccurs.

1147 - Jamming still present. Target no longer seen through it. Target at long range.

1148 - ALQ-7 malfunctioned. End of test.


1.
NORMAL TRACKING
2.
INITIAL HIT
3.
AGC RECOVERY
4.
NORMAL JAMMING
5.
NORMAL TRACKING
6.
NORMAL JAMMING
7.
NORMAL JAMMING
8.
NORMAL JAMMING

SECRET

TEST PROJECT 38 MISSION ON 9 MAR 56
TARGET AIRCRAFT OBSERVERS LOG

Incl 8

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	0-15 FRAME NO START	0-15 FRAME NO END	REMARKS CONCERNING APS-23
1 (Phase A rerun later)	A	1536	1538	OFF	ON			
	B	1539	1541	ON	OFF	1116	1133	Weak interference aft of aircraft
2	A	1550	1552	OFF	ON			
	B	1553	1555	ON	OFF	1134	1153	Weak interference aft of aircraft and beyond target range of APS-23. Antijam circuit in operation frames 1150 and 1151.
3	A	1600	1602	OFF	ON			
	B	1603	1605	ON	OFF	1154	1179	Very little to no interference.
4	A	1618	1620	OFF	ON			
	B	1622	1624	ON	OFF	1180	1228	Very little to no interference.
5	A	1626	1628	OFF	ON			
	B	1628½	1630½	ON	OFF	1229	1252	Very little to no interference.
6	A	1633½	1635	OFF	ON			
	B	1637	1639	ON	OFF	1253	1270	Very little to no interference.
7	A	1642	1644	OFF	ON			
	B	1645	1648	ON	OFF	1271	1308	Very little to no interference.
1 (Return of Phase A)	A	1650	1653	OFF	ON			

SECRET

Incl 9

SECRET

TEST PROJECT 38 MISSION OF 9 MAR 56
TARGET AIRCRAFT CO-PILOTS LOG

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	REMARKS CONCERNING APG-32
1 (Phase A rerun later)	A	1536	1538	OFF	ON	APG-32 not working properly. Apparently not warmed up yet.
	B	1539	1541	ON	OFF	
2	A	1550	1552	OFF	ON	Locked on aircraft carrying ALQ-7 prior to start of phase. When jamming started APG-32 lost target immediately and went into search Phase. Sweep or jizzle band saturated with vertical jamming strobes and with transverse jamming strobes that travel from bottom to top in corkscrew-like pattern. Target blip completely disappears during jamming. By pressing action switch on hand control (stopping radar search), jamming disappears. Target then reacquired. After several seconds, jamming reappears and process is repeated.
	B	1553	1555	ON	OFF	
3	A	1600	1602	OFF	ON	Same as Run 2 Phase A.
	B	1603	1605	ON	OFF	
4	A	1618	1620	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1622	1624	ON	OFF	
5	A	1626	1628	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1628½	1630½	ON	OFF	
6	A	1633½	1635	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1637	1639	ON	OFF	
7	A	1642	1644	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1645	1648	ON	OFF	
1 (Rerun of Phase A)	A	1650	1653	OFF	ON	Same as Run 2 Phase A.

SECRET

SECRET

INCL 10

TEST PROJECT 38 MISSION OF 9 MAR 56

ALQ-7 OPERATORS LOG

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	ALQ-7 RCVR LOCK		ALQ-7 XMTR JAM		REMARKS CONCERNING ALQ-7
						YES	NO	YES	NO	
1 (Phase A rerun later)	A	1536	1538	OFF	ON	X		X		Jammed for 10 to 15 sec at end of run at freq of 9200mc. Rcvr temporarily locked on several times after that without staying on long enough for Xmtr to tune to Rcvr and jam.
	B	1539	1541	ON	OFF	X			X	Rcvr locked on temporarily several times. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
2	A	1550	1552	OFF	ON	X		X		Locked on and jammed several times at a freq of 9200mc.
	B	1553	1555	ON	OFF	X		X		Locked on and jammed for three 10-second periods.
3	A	1600	1602	OFF	ON	X		X		Locked on and jammed for a period of 10 seconds.
	B	1603	1605	ON	OFF	X		X		Locked on and jammed for two 6 or 7 second periods.
4	A	1618	1620	OFF	ON		X		X	Receiver did not lock on.
	B	1622	1624	ON	OFF	X		X		Rcvr temporarily locked on once, but did not stay locked on long enough for xmtr to tune to rcvr and jam.
5	A	1626	1628	OFF	ON	X			X	Rcvr temporarily locked on several times. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
	B	1628½	1630½	ON	OFF	X		X		Locked on and jammed for 20 seconds at start of phase.
6	A	1633½	1635	OFF	ON		X		X	Rcvr did not lock on.
	B	1637	1639	ON	OFF	X			X	Rcvr temporarily locked on twice. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
7	A	1642	1644	OFF	ON		X		X	Rcvr did not lock on.
	B	1645	1648	ON	OFF	X			X	Rcvr temporarily locked on several times but did not remain locked on long enough for xmtr to tune to rcvr and jam. Rcvr finally locked on and xmtr jammed for 5-sec period.
1 (Rerun of Phase A)	A	1650	1653	OFF	ON	X		X		Locked on and jammed for 6-sec period, two 15-sec periods, and one 10-sec period.
	B									

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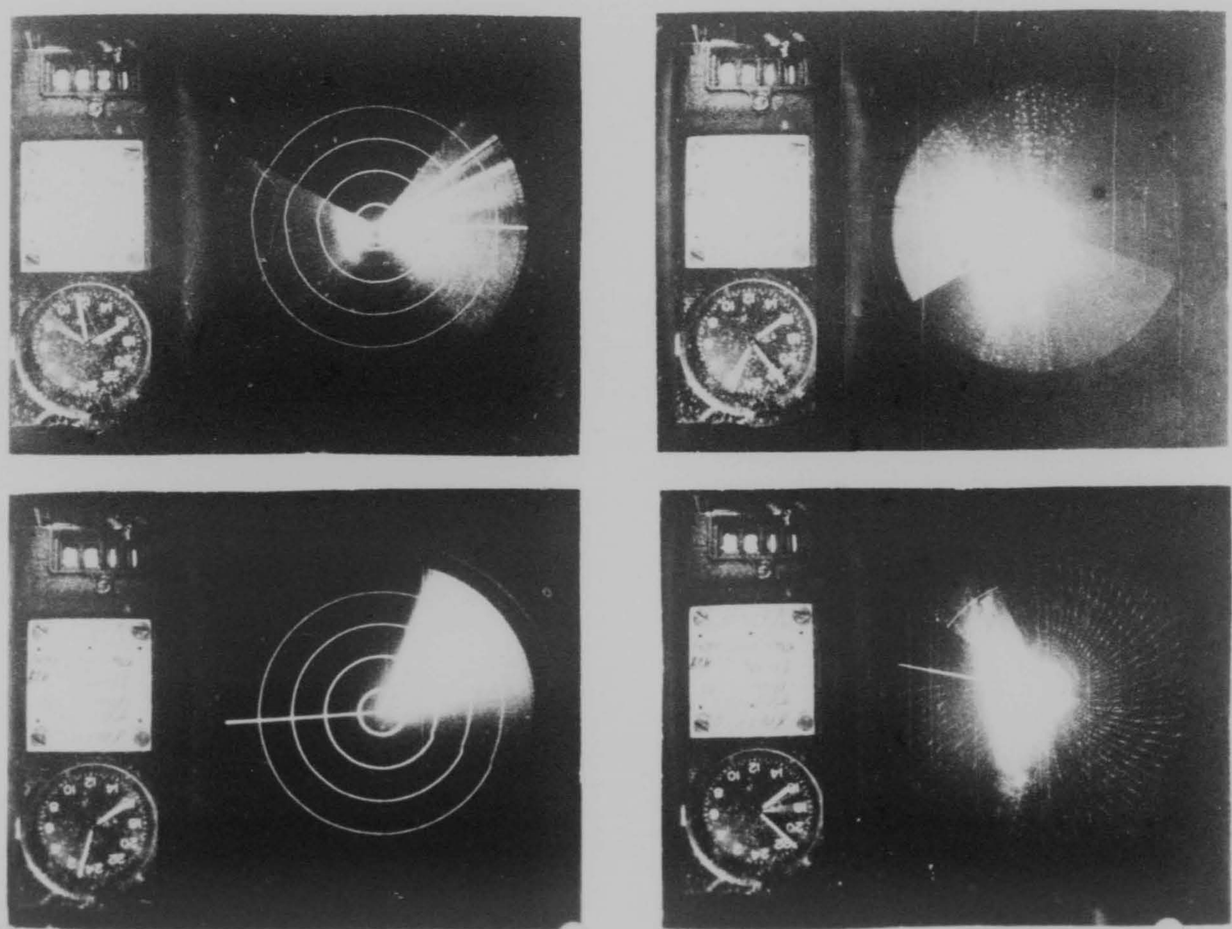

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TEST PROJECT 38
MISSION ON 9 MAR 56

(a) The following log was tape recorded by 376th Bomb Wing observer located in the M-33 tracking radar van. Central Standard time was used. (SECRET)

1110 - Demon Control (FPS-3) was called to find present position of aircraft. No jamming, no target.

1111 - Jamming present. Did not see target prior to start of jamming. Magnitude and intensity of jamming is high. Base line completely obliterated on A-scopes with jamming going both directions from where base line should be. No chance at all of seeing a target through the jamming.

1111½ - Jamming disappeared. Target has not yet been seen.

1112 - No jamming, no target.

1112½ - Jamming present again. Target not seen. Jamming is very strong. Base line gone. Jamming going both directions, up and down. No chance of seeing target through jamming. Elevation operator trying to cause ALQ-7 to start searching by changing elevation of radar, but can't cause ALQ-7 to stop jamming by this method. Operators have no idea of position of target. 35mm pictures being taken.

1113 - Jamming disappeared. No target.

1115 - No jamming, no target.

1115½ - Getting jamming from time to time. Looks same as before. Target never seen.

1116 to 1124 - No jamming, no target. Operator in aircraft says that ALQ-7 has malfunctioned.

1124 to 1204 - Tracking aircraft in full automatic operation. No jamming. ALQ-7 malfunctioned.

1205 - End of test.

INCL 12

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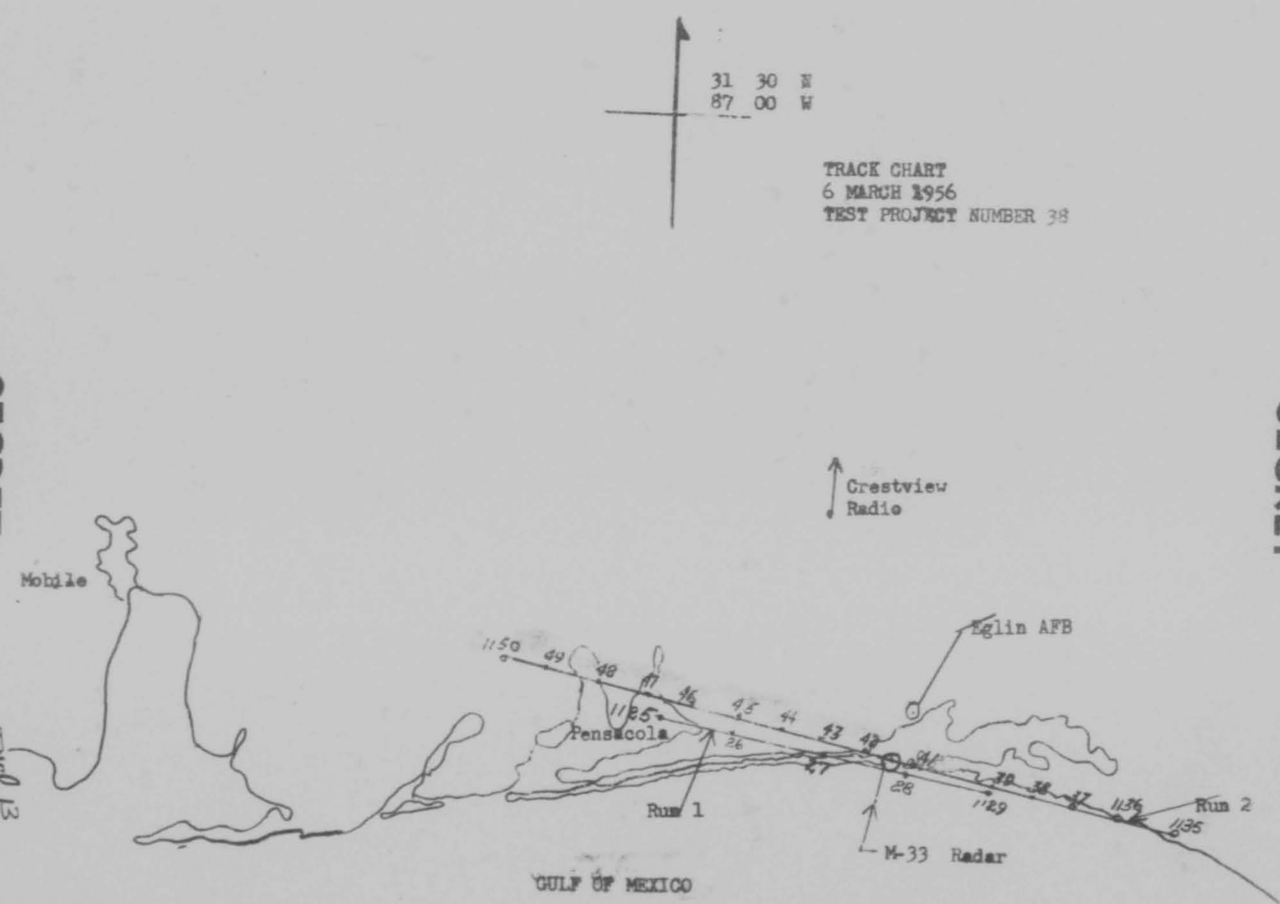

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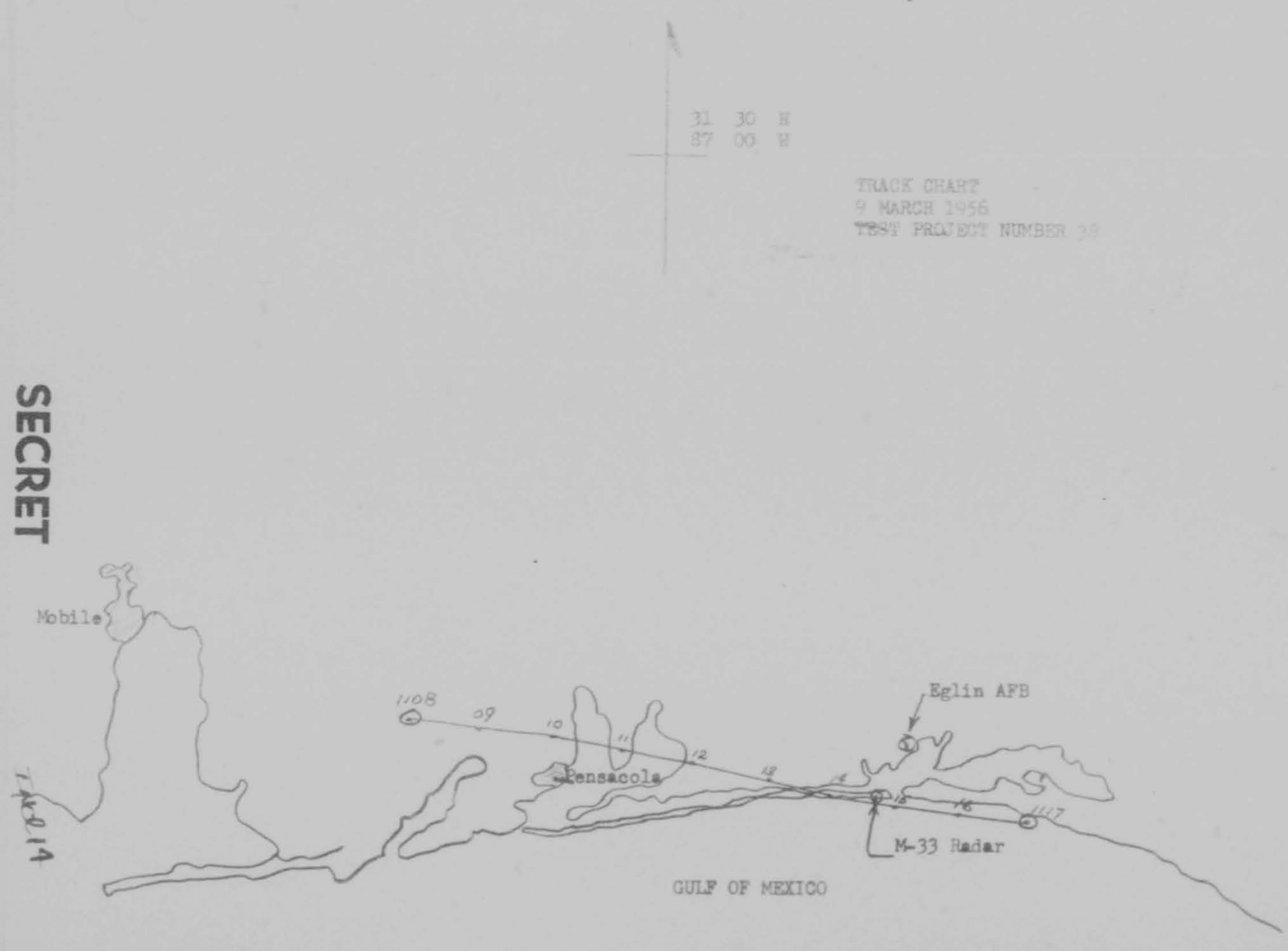

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16

376 TH BOMBARDMENT WING

BARKSDALE
AIR
FORCE
BASE
LOUISIANA

FINAL REPORT

TEST PROJECT NUMBER 33

MARCH 1956

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

MAY 9 1956

376DCTT

SUBJECT: Final Report on Test Project 33, "Personal Radio Alert Equipment"

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Transmitted herewith is the final report on Test Project Number 33, the purpose of which was to determine a feasible method of quickly alerting specific groups of individuals through the use of radio.

2. A Regency Model TR-1, all transistor, portable broadcast receiver, modified for this test, was to be used in conjunction with a specially designed and constructed transmitting antenna.

3. Results of the tests, which were terminated prior to their completion, are marginal. It is believed that the completed test results would have fairly well satisfied requirements of Test Project 33.

4. This project was downgraded to Unclassified by Headquarters SAC message DOCER 14737, 23 February 56, and terminated by Headquarters SAC message DOPLT 15438, 24 February 56.

1 Incl
Final Rept, Test Proj 33, w/photos

For and in the absence of

STEPHEN D. McELROY
Colonel, USAF
Commander

SYNOPSIS

Purpose of this project was to determine the feasibility of using personal radio equipment for alerting SAC personnel.

An all transistor Regency TR-1 portable broadcast receiver was modified for use as a test receiver for this project. A specially designed vertical antenna was to have been used as a transmitting antenna on the test frequency of 2131 kilocycles. Use of this frequency was authorized by the Federal Communications Commission. The project was terminated before the vertical antenna and certain receiver modifications could be tested. Field strength measurements were made at frequencies up to ten megacycles in order to determine the frequency most suitable for an alert receiver. Two listening tests were conducted with the modified receiver on 2131 kilocycles.

Results of the tests, though not entirely satisfactory, indicated use of a small receiver for alert use would be feasible. Several improvements on the receiver, such as use of mercury cell batteries and crystal control of the receiving frequency, were planned but time did not permit test of these modifications.

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FINAL REPORT

ON

TEST PROJECT NUMBER 33

TABLE OF CONTENTS

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INTRODUCTION

GENERAL.

This test project was initiated to determine the feasibility of using personal radio equipment to alert SAC personnel.

DESCRIPTION.

The SAC mission requires immediate availability of key personnel and early availability of many other personnel when alert conditions exist. Purpose of this test project was to determine a feasible method of quickly alerting specific groups of individuals through use of radio. Under this plan each individual would be equipped with a small radio receiver that could conveniently be carried in a shirt or coat pocket. This receiver would be tuned to a specified frequency upon which an alert signal could be broadcast.

Some desirable characteristics in the design of a personal receiver for alerting purposes are:

1. Small enough to fit in a shirt or coat pocket.

2. Contain its own power supply and antenna.

3. Capable of continuous operation with a minimum of component failures.

4. Battery life of at least one week (168 hours).

5. Sensitivity must be such that signals could be received several miles from the transmitter at any hour of the day or night, inside buildings, automobiles, etc, yet not respond to static or interference noises which would result in unintentional alerts.

6. Rugged enough mechanically and electrically to withstand handling, wearing, and accidental dropping.

7. Fixed-tuned to the alert signal frequency and stable enough to maintain tuning.

A survey was made of existing commercial receivers. None of those available met all existing requirements. The particularly important and stringent requirement for long battery life ruled out the possibility of using vacuum tube receivers. Regency TR-1 transistor receiver, then commercially available, seemed at least a compromise and was decided on for the test receiver.

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OPERATIONAL ASPECTS

LABORATORY TESTS.

The Regency TR-1, which is designed as a small portable broadcast receiver, was modified to work on a frequency of 2131 kilocycles. Certain components of the receiver not in an alert receiver, were removed to provide additional battery space. Sensitivity of the receiver was measured to determine the order of power which would be required of a ground transmitter for alerting purposes.

FIELD TESTS.

A series of field strength measurements of the radiation from a 400 watt transmitter (BC-610) were made to determine the frequency most suitable for alerting purposes. Frequency range was limited to that covered by transmitters normally found on SAC bases. Early in the tests frequencies from four to ten megacycles were eliminated due to low signal strengths obtained during daylight hours and extreme interference from distant stations during night operation. More critical comparison measurements were made between two and three megacycles. Results of these comparisons indicated that for the majority of the time the signal field strength at 2.95 megacycles exceeded that of 3.312 megacycles. All field strength measurements were made using a vertical transmitting antenna cut to one-quarter wave length at the frequency being measured, and loaded to the same antenna current and modulation percentage on all frequencies.

As a result of the signal strength measurements, after listening for several days to a receiver, and consulting the regional office of the Federal Communications Commission, a frequency of 2131 kilocycles was chosen as the receiver test frequency. Two operating tests were made with the modified Regency receiver at distances up to approximately 20 miles from a 2.5 kilowatt transmitter feeding a 175 foot long-wire antenna. The type of antenna used on these tests is not the optimum for alerting purposes in that it was designed for operation over long distances and puts a rather poor signal into the local area. It was hoped to test the receiver with a transmitter using a vertical antenna designed to put a maximum ground signal into the local area but the project was cancelled before this test could be conducted. Additional details of tests and results obtained are contained in the appendix to this report.

CONCLUSIONS

The modified Regency receiver, as tested, gave only marginal performance but results show such a system would be feasible.

RECOMMENDATIONS

It is recommended that further research be done on this project using later model receivers than the Regency. This research should include:

1. Further investigation of more suitable power source for the receiver.

2. Crystal control of the receiver frequency.

3. A squelch circuit for the receiver. Purpose of the squelch circuit would be to conserve battery life by disabling the audio stage of the receiver during the time when no alert signal is being broadcast. Since the audio output stage, which must deliver power, consumes at least 50% of the total battery current drain, a squelch circuit would materially prolong life of the receiver battery.

4. An amplifier for the receiver when utilized in a house, i.e., at night or over a weekend. This amplifier, getting its power from the 110 volt house circuits, would also provide power to the receiver and prolong receiver battery life.

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APPENDIX I

METHOD OF CONDUCTING TESTS AND DATA OBTAINED

LABORATORY TESTS.

A Regency Model TR-1 miniature transistor superheterodyne receiver was converted to operate on a fixed frequency of 2131 kilocycles. This frequency is within the two megacycle band which was found from field strength measurements to be most practical for use with existing SAC communications site equipment to give reliable night and day coverage within a radius of 30 miles from the transmitter. Performance measurements were made on the unmodified Regency TR-1 receiver in order to set up a standard for comparison with the receiver after modification. An RF signal from a TS-413 signal generator was injected into the receiver and the output measured with a General Radio Type 783-A output meter. The following chart shows a summary of the results obtained from measurements made at 2131 kilocycles after the set was modified:

FREQUENCY	% MODULATION	OUTPUT MILLIWATTS	INPUT MICROVOLTS	MOD. FREQ.
500 kc	30	18-20	100	1000 cycles
1600 kc	30	16	100	1000 cycles
2131 kc	30	18	100	1000 cycles

Minimum discernible signal was one-to-one-and-a-half microvolts for a 540 kilocycle signal modulated 30% by a 1000 cycle tone. Minimum discernible signal at 2131 kilocycles was slightly higher than this but it is believed the sensitivity at this frequency can be improved.

Modification of the TR-1 receiver consisted of replacing the variable tuning condenser with small trimmer type condensers and removing turns from the antenna and oscillator coils. Two miniature CRL trimmer condensers were substituted for the variable condenser as tuning devices for the antenna and oscillator section. Miniature trimmers measure 9/16" x 3/4" x 1/4" as compared to 15/16" x 1-5/16" for the variable condenser. Several turns were removed from the ferrite antenna coil to bring it up to 2131 kilocycles. The "Q" of the antenna coil was checked before modification and found to be 150 at 500 kilocycles and 130 at 1000 kilocycles. After modification, the coil "Q" was 120 at 2131 kilocycles. This appears to be normal for this coil, however, there is a possibility that the "Q" can be increased by changing coil design and placement in the receiver. A higher "Q" would give greater selectivity which is very desirable for an alert receiver. Five turns were removed from the oscillator coil and the tuning slug and trimmer condenser adjusted in an effort to get the receiver local oscillator up to a frequency of 2393 kilocycles (262 kilocycles above desired frequency). The oscillator, however, stopped oscillating before reaching this frequency. It was therefore decided to operate the oscillator at 1869 kilocycles or 262 kilocycles below the signal frequency. At this frequency the oscillator seems to function normally. It is possible that changing the converter transistor may allow the oscillator to be operated above the signal frequency if this is found to be desirable.

FIELD TESTS.

Field Strength Tests. Field strength measurements were made to determine relative value of different radio frequencies using ground wave propagation during day and night operation under various practical conditions. Tests were made on five different frequencies of the field strength of a BC-610 transmitter feeding a vertical antenna. The antenna was cut to one-quarter wavelength on each frequency used and loaded to the same antenna current on each frequency. The transmitter was modulated 100% at 1000 cycles for all tests. The chart below shows the transmitter frequencies and operating values used on all field strength tests:

FREQ KC	ANTENNA CURRENT AMPS	MODULATOR PLATE CURRENT - MA	RF AMPLIFIER PLATE CURRENT - MA
3312.5	2.65	40	200
4757.5	2.65	40	210
5815	2.65	40	240
9910	2.65	40	305
10117.5	2.65	40	295

Field strength measurements were made with a Stoddart Radio Company Model NM-20B field strength meter. Typical results obtained at the five different frequencies at various times are shown in the following charts.

Location: Alden Bridge - 14.41 miles north of transmitter
Receiving Antenna Height - six feet
Topograph: Flat land, open field
Weather: Cloudy

FREQ KC	TIME CST	SIGNAL STRENGTH MICROVOLTS	NOISE MICROVOLTS
3312.5	0900	15	1.5
4757.5	0915	12	2.0
5815	0930	6	1.7
9910	0945	2.6	1.9
WWV 10 mc	0950	13 max with fading	
10117.5	1000	2.5	1.7

Location: Alden Bridge - 14.41 miles north of transmitter
Receiving Antenna Height - six feet
Topography - Flat land, open field
Weather - Clear

FREQ KC	TIME CST	SIGNAL STRENGTH MICROVOLTS	NOISE MICROVOLTS
3312.5	2100	25-40	5-10
4757.5	2115	25-40	3-6
	Interference and heterodynes		
5815	2130	10-20	3-5
	Signal under heavy interference from other stations		
WWV 5 mc	2140	20-50	
9910	2145	no signal	2
	No measurable signal - buried under severe interference		
WWV 10 mc	2150	20-50	
10117.5	2200	no signal	1.5
	No measurable signal - buried under severe interference		

Location - Caddo Parish Court House lawn, 10 miles west of transmitter
Receiving Antenna Height - six feet
Topography - Flat, congested downtown area
Weather - Cloudy

FREQ KC	TIME CST	SIGNAL STRENGTH MICROVOLTS	NOISE MICROVOLTS
3312.5	0900	30-35	2
4757.5	0915	11-12	2
5815	0930	3-3.5	1.8
9910	0945	no signal	2
10117.5	1000	no signal	1.7
WWV 10 mc	1005	4-10	
9910	1330	10	2
10117.5	1345	5-6	2

Location - 5th floor, Caddo Parish Courthouse, ten miles from transmitter
Receiving antenna height - six feet (above floor)
Topography - Flat, congested downtown area
Weather - Clear

FREQ KC	TIME CST	SIGNAL STRENGTH MICROVOLTS	NOISE MICROVOLTS
3312.5	1400	3.4	1
4757.5	1415	no signal	1.8

5815	1430	no signal	1.8
9910	1445	no signal	1.8
WWV 10 mc	1450	can just hear WWV	2.0
10117.5	1500	no signal	1.5

From the foregoing measurements and similar ones made over a period of several days, it was decided that a low frequency would be more suitable for alert receiver operation. As can be seen from the charts, the signal strength at the high frequencies was relatively weak during daylight hours and extreme interference was encountered from distant stations during night time operation.

Further field strength tests were made at frequencies between two and three megacycles at distances up to 30 miles. The following chart shows the minimum signal strength and maximum noise over a 24-hour period as derived from six separate tests on 2950 kilocycles. Readings were taken with three different types of receiving antennas as indicated in the chart.

SHREVEPORT BUSINESS AREA 10 miles from station Outside	Inside	OPEN COUNTRY AREA 7 mi	14 mi	30 mi	MAXIMUM NOISE
		MICROVOLTS/METER OF ANTENNA			
10.5uV	3.7uV	375uV	50uV	18uV	50uV
		MICROVOLTS/30.5 CM ANTENNA			
5.5uV	1.6uV	65uV	11uV	3uV	8uV
MICROVOLTS/HUMAN BODY AS ANTENNA (holding hand on antenna terminal of Field Strength Meter)					
35uV	7.5uV	70uV	85uV	18uV	100uV

Receiver Tests. For receiving tests with the modified Regency TR-1 receiver, a Wilcox 96D transmitter with 2.5 kilowatts input power, tone modulated at 65% with a 1000 cycle tone, was used. This transmitter fed a 175 foot long-wire antenna pointed northeast and southwest. This end-fed antenna was 60 feet off the ground. The receiver was tested in the daytime and at night by driving around the local area of Bossier City and Shreveport, Louisiana. In most cases it was possible to hear the signal with the receiver sitting on the front seat inside a 1955 Plymouth sedan. When a carryall vehicle was used, the signal inside the carryall was somewhat weaker than the signal in the passenger car. This is to be expected since the carryall has more shielding from the metal body. The following results are typical of those found by driving around town, under bridges, in buildings, etc:

Location of Receiver	Time	Aprx Mi from Trans	Signal Strength	Weather
		IN CARRYALL VEHICLE		
Bldg T799, BarksdaleAFB	1730	5	Loud-clear	Rainy-cool
Dental Clinic, "	1740	5	"	"
Base Supply, "	1743	5	"	"
Inside Flt Line Gate	1750	5	"	"
Inside PostOffice	1805	5	"	"
Inside Metal Garage,BC	1815	6	Weak-clear	Retuned set
Inside frame house, BC	1820	6	"	Rainy-cool
Main st, Bossier City	1830	6	"	"
Across metal bridge	1842	7	"	"
Main st, Shreveport	1845	8	"	Clear-Cool
Btwn 2 tall bldgs,city	1905	10	"	"
Youree Dr to Kingshighway	2010	10	"	"
Broadmoor to Confederate Hospital, Shreveport	2105	14	" Retuned set-installed new battery-signal/noise ratio improved.	
Highway 80, 7½ mi west of Shreveport	2150	21½	Weak, fading, heterodynes from other stations.	
		IN 1955 PLYMOUTH		
Bldg T799, BAFB	1100	5	Loud-clear	Warm-clear
376A&E, Bldg T38	1109	5	"	"
Base Supply, BAFB	1115	5	"	"
West Gate, BAFB	1125	5	"	"
Metal garage, BC	1145	6	"	"
Inside frame house,BC	1149	6	"	"
Downtown BossierCity	1200	6	"	"
In Bossier City only signals weak under traffic lights				
Junction Highways80-71	1205	7	"	"
Metal bridge	1209	7	"	"
Gun-Cycle Shop,City	1209	7	"	"
Inside shop, floor below st level	1220	7	"	"

Buses, trains, other traffic had no affect on signal strength, however, when in vicinity of broadcast station, the station frequently overrode the signal

Results obtained on these "listening" tests with the Regency receiver are considered fairly good for the particular receiver. As may be noted, the receiver had to be re-tuned or slightly adjusted during the test. This indicates some frequency instability which could be eliminated by use of a crystal-controlled oscillator in the receiver. The receiver antenna, while compact and efficient and adequate for its original purpose, exhibits some directional characteristics which might be undesirable in an alert receiver. It was intended to make further tests using the hearing aid phone cord as part of the antenna. The transmitting antenna used in the tests is inherently directional and designed for long distance transmission. Also, this antenna is designed to radiate a strong sky wave and has a relatively weak ground wave in the local area. Future tests were planned to use a vertical transmitting antenna designed to put a maximum ground wave signal into the local area. Time available before the cancellation of the test project did not permit the conducting of these additional tests.

Photographs and Reports. Photograph 1 at the end of this report shows the Regency TR-1 receiver and hearing aid earpiece. The tuning dial and volume control knob have been removed from the receiver. Photograph 2 shows the inside view of the receiver. The variable tuning condenser, volume control, and speaker have been removed to provide additional battery space. Two batteries are shown in place; there is room for a third just below these. Note that the receiver proper occupies less than half the receiver volume, the greater portion of the space being required for battery supply. The receiver antenna is the flat coil at the top of the case, and just below this can be seen the small trimmer-type condensers used to fix-tune the receiver frequency. The small hearing aid is used in place of the speaker. It was intended that a small unit such as this would be used as the alarm device and be clipped to the wearer's clothing in an inconspicuous place.

Two TDY reports containing information pertaining to this project are included in this report. The first of these is a report of two engineers from the 376th Bomb Wing who visited several companies in quest of information on various phases of this test project. The second report is of a visit by an officer of the 376th Bomb Wing to the Capehart-Farnsworth Corporation. Photograph 3 shows the working part of the small Farnsworth transistor receiver described in the report. Photograph 4 shows some small transistor receivers and a walkie-talkie receiver. At the time of this photograph (December 55), some experimental units of these sets were being tested by the Signal Corps.

C O P Y C O P Y

TDY REPORT

12 September 1955

Personnel of the 376th Bomb Wing visited several manufacturers to survey the state of the art relative to status of miniature receivers and components. The following companies were visited:

Melpar Inc - Falls Church, Va.
Philco Corp - Philadelphia, Pa.
Aircall Inc - NYC
Yardney Battery Mfg Co - NYC
P R Mallory Battery Mfg Co - NYC
Emerson Radio and Phonograph Co - Jersey City, NJ
Massachusetts Institute of Technology - Cambridge, Mass.
Raytheon Mfg Co - Newton, Mass.
Sylvania Electric Co - Waltham, Mass.
Regency Div, IDEA Inc - Indianapolis, Ind.
National Radio Co - Malden, Mass.
Capehart-Farnsworth - Ft Wayne, Ind.

Transistorized receivers were seen at Philco, MIT, Raytheon, Emerson and Regency. Components and construction techniques of miniature receivers were observed. Some applicable items seen and studied were transistors, coils, miniature resistors, capacitors, speakers, batteries and miniature electromechanical audio frequency resonant reeds. Various methods of packaging and encapsulating components, such as using honeycomb method or potting, were seen. Types of etching and dip soldering construction and methods for placing and locating components for optimum performance were investigated and studied. Miniature circuit techniques to prevent inter-stage feedback and capacity coupling of components were discussed. All manufacturers and engineers contacted expressed concern over the incompatibility of battery size with life or operating requirements for an alert receiver.

The following chart is a general evaluation of the six receivers observed:

MFGR	SIZE	SENSI-TIVITY	TUNING RE-LIABILITY	AUDIO-OUTPUT	BATTERY LIFE	SELEC-TIVITY
Philco	pocket	good	unreliable	poor	short	poor
Emerson	too big	good	unreliable	good	short	good
MIT	too big	good	unreliable	good	short	good
Raytheon	too big	good	unreliable	good	short	good
Regency	pocket	good	unreliable	fair	short	good

Evaluation of these receivers has been made with respect to characteristics required for an alert receiver. Sensitivity of the receivers varied from a maximum of about 100 microvolts to a minimum of about 1200 microvolts in the broadcast frequency range. Physical size of the antenna used and number of transistor stages in the set are the main factors which determine sensitivity of the receiver. Both these factors have considerable influence on the size of the receiver. If size is made smaller by reducing antenna dimensions, then the number of stages results in greater receiver size, not so much from the additional transistors and components required, but from additional batteries required due to increased power drain. All receivers viewed were designed for broadcast listening use and had a tuning stability which would be unreliable for alert use. A practical design would probably be along the lines of the Regency receiver which is similar to that now being sold as a broadcast portable receiver. Battery life for continuous operation of such receivers is generally poor and it is probable that a major portion of the physical volume of a practical alert receiver would be occupied by batteries if a resonable interval between battery changes is to be realized.

Two small pocket-size receivers were observed at the Aircall Company. Both receivers contained vacuum tubes which would make them unsuitable for an alert receiver; however, one, an experimental set, contains a selective relay system which might possibly be adapted for alert use. This receiver is designed for use in a selective call system and employs a coding unit which responds to a transmitted four-tone code. The receiver uses three tubes, one as a regenerative detector, one as an audio amplifier, and the third as an audio oscillator to drive the speaker as an alarm signal. Selection is accomplished by means of four mechanical vibrating reeds, each reed resonating with a particular tone. When a call signal is received containing the four tones in proper sequence, corresponding to the resonant frequencies of the reeds, all reeds vibrate together and trigger the audio oscillator to drive the speaker for an aural alarm. The selective receiver was unreliable during demonstration. At times it failed to sound the alarm and the operator had to tap the receiver to start the reeds vibrating in order to make them respond to the call signal being broadcast. An engineer was asked if the receiver could withstand normal shocks such as dropping the set on the floor. He replied that a set had accidently fallen to the floor and failed to operate. He felt the failure was caused by damage to the vibrating reeds. The present receiver has a battery life of only approximately 100 hours intermittent operation, or about seven hours continuous operation. The company was unable to give engineering details of the selective receiver and particularly of the coding unit because the originator of the vibrating reed is seeking patent rights.

In general, all transistors with the more desirable electrical characteristics are in short supply and at present are being produced at a slow rate. Transistors studied which seem to offer maximum performance with respect to frequency and general desirable operating characteristics include the Philco SB-100 surface barrier type, Raytheon CK-760 and CK-761, also Texas Instrument T1-210, T1-221, and T1-223. Three of the Philco surface barrier transistors and five experimental Western Electric type 1859 transistors were received from WADC for use on this project.

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C O P Y C O P Y

TDY REPORT

3 January 1956

TDY visit was made to the Capehart-Farnsworth Corp, Ft Wayne, Indiana, for the purpose of obtaining data regarding transistorized miniature radio receiver under development by that company.

The 376th Bomb Wing representative arrived at Capehart-Farnsworth Corp on 20 December and was taken to the office of Mr Boedecker, Assistant Vice President for Sales. Mr Boedecker arranged a conference with the following individuals:

J. F. Conway - Chief Engineer, New Products Div
John Silvey - Laboratory Chief
F. Patterson Smith - Design Engineer

Because of the possibilities of equipment development, the following personnel from the Farnsworth Electronic Corp attended:

M. S. Klinedinst--Government Contract Service
Clifford Smith --Sales Engineer

After explaining the purpose of his visit to the group, the 376th BW representative was asked by Mr Klinedinst if this concerned SAC's requirement for a personal alert receiver to be used by key personnel. Mr Klinedinst explained that LtCol Green, SAC, had recently visited the Farnsworth Electronic Corp regarding another project but had explained the requirement for an alert receiver.

The Capehart-Farnsworth miniature receiver is a conventional superheterodyne type receiver using transistors in place of vacuum tubes, zinc cells for power and a hearing aid earpiece for audio output. In addition, this receiver has an interesting accessory which would be particularly adaptable to any alert call system for use at home when the person concerned would not normally carry the receiver. This is a base unit containing a speaker, push-pull class B audio stage and power supply. It is built in the form of an ash tray at the present time. This unit gives full volume comparable to a high tone quality table radio. It is normally connected to a 60 cycle 115 volt outlet and operates when the transistorized miniature receiver is plugged into it. The receiver still continues to operate from the battery but since this power supply is in parallel with the supply of the accessory unit, there is no battery drain; in fact, there is a slight charging effect.

The Capehart-Farnsworth transistorized miniature receiver was quite compact, about the size of a package of cigarettes. Battery life was estimated at 50 hours using four penlite cells. This would be increased to 100 hours using mercury cells which would be considerably more expensive. For use as a call receiver, a squelch circuit could be incorporated which would triple battery life. The receiver sensitivity was 800 microvolts per meter compared to 1200 uv/m of the Regency portable. This sensitivity could be increased by improving the antenna which is a ferrite loop. The antenna was designed to fit the narrow width of the radio, about 2½ inches. A receiver designed for military use would probably be larger in size and consequently allow use of a larger antenna giving greater sensitivity. Maximum audio output of the receiver is about 10 milliwatt, which is acceptable.

The specifications of the receiver are less than government specifications. Temperature limitations are from 5-50° centigrade. This is limited primarily through the use of electrolytics. Miniature size of the receiver is obtainable mainly (other than through use of transistors) by use of miniature electrolytic capacitors. Use of other type capacitors would require a somewhat larger unit. It is probable that any receiver developed under Project 33 would not be required to meet government specifications. The receiver is quite resistant to shock due to use of transistors. A complete engineering summary of this receiver and story of its development was given to me and is on file in the project folder.

Mr Klinedinst indicated the Farnsworth Electronics Corp would like to submit an unsolicited proposal on an alert call system. He was advised to contact LtCol Green, Chief of Communications, C&E Division, SAC.

The ash tray type of accessory for increased audio output should be considered for use in an alert call receiver. Such a device would allow wearer of radio to remove it when he arrived at home, place it in receptacle and go about business around the house. The device would be operated at full volume with a squelch circuit which would cause it to be quiet except when alarm signal is received. The signal would then be heard loudly and clearly throughout the home and even awaken sleepers at night.

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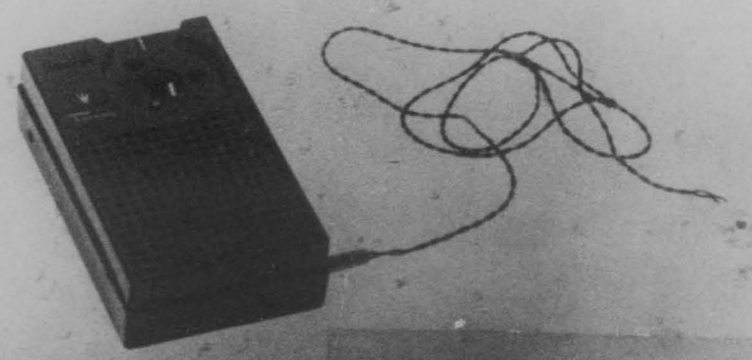

PHOTOGRAPH 1
Regency TR-1 receiver and earpiece. Tuning dial and volume control have been removed.

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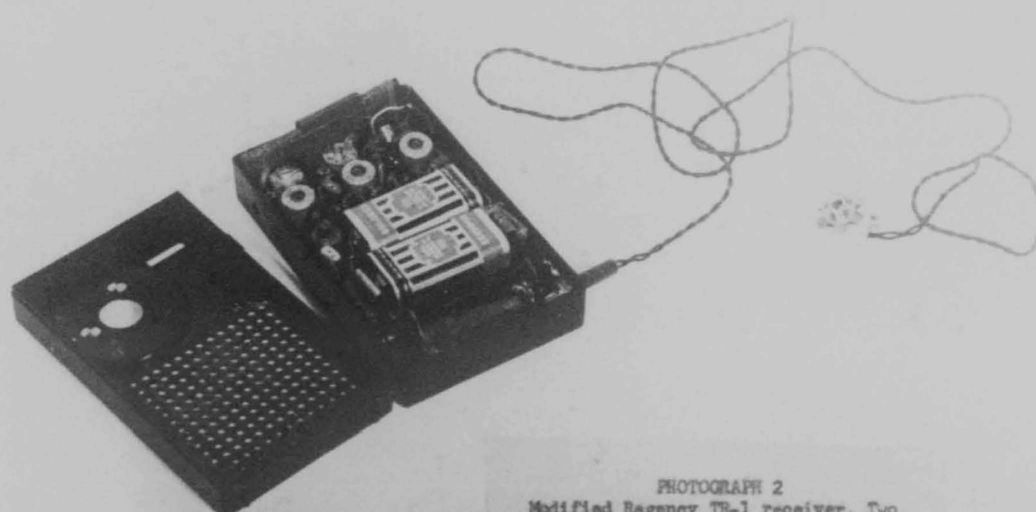

PHOTOGRAPH 2
Modified Regency TR-1 receiver. Two batteries are shown in place. There is room for a third below these.

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PHOTOGRAPH 2
Capehart-Farnsworth experimental transistor [illegible]
receiver. Plastic case and earphone not [illegible].

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PHOTOGRAPH 4
Experimental RCA transistor receivers and transcievers. Small units are receivers only. Large unit contains transmitter and reciever. Operating frequency [illegible] mc.

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HISTORICAL REPORT FOR THE MONTH OF NOVEMBER 1955

376th Wing Maintenance Control Unit

<u>Reports and Analysis and Control Unit</u>

1. The Wing average possessed aircraft was 57 for the month of November. The average in-commission rate was 84.35%. A total of 1605:55 hours were flown for an average of 28:10 hours per possessed aircraft. The Wing AOCP rate was 2.79% for the month of November.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had an average of 39 B-47 aircraft possessed for the month. The average in-commission rate was 82.99% for November compared to 91.63% for the previous month. There was a total of 1068:15 hours flown for an average of 27:23 hours per possessed aircraft. The AOCP rate was 1.36%, an increase over the 1.08% for the previous month.

b. KC-97 Aircraft: The Wing had an average of 18 KC-97 aircraft possessed for the month of November. The average in-commission rate was 87.24% for the month. There was a total of 537:40 hours flown for an average of 29:52 hours per possessed aircraft. The AOCP rate for the month was 5.83%.

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3. In November there were 224,510 man hours assigned with 153,274 manhours available for work. There were 10,835 manhours expended during the month on overtime or 7% of the available manhours. Of the total manhours available there were 66,478.6 hours expended on direct time or 43.3%. There were 78,706.1 manhours spent on Productive Indirect codes or 51.3% of the available manhours. There were also 8,089.5 manhours or 5.3% of the available time expended on Non-Productive work. Of the total manhours assigned there were 81,753.5 hours or 36.4% spent on absent codes.

a. The above figures are based upon a 44 hour week of which 4 hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

4. The malfunction figures are taken from the U-15 report which was compiled from 1 November thru 30 November. During this period there were 14 aborts and 2 malfunctions for B-47 aircraft and 11 aborts and no malfunctions for KC-97 aircraft.

5. A total of sixteen (16) B-47 engines were changed during the month of November as compared to seven (7) for the previous month. There were five (5) KC-97 engines changed during the month of November. The average engine time at change was 419:00 hours for B-47 and 710:00 hours for KC-97 aircraft.

TOC & RECORDS

1. During the month of November there were 124 TO's accomplished on B-47 aircraft and 16 on KC-97 aircraft.

2. There were four (4) new TO's received for B-47 aircraft and one (1) received on KC-97 aircraft.

3. There were 16 engine changes on B-47 aircraft and 5 engine changes on KC-97 aircraft

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SUPPLY LIAISON

1. Total cannibalizations for the month of November was 59. There were 36 cannibalizations for B-47 aircraft and 23 for KC-97 aircraft.

2. Following are the three (3) major line items that were AOCP during the month of November:

CLASS	STOCK NUMBER	NOMENCLATURE
05-C	6025-1845 x 4-03D	Altimeter
03-A	4013-322080	Prop. Syncronizer
03-I1	4879-8200-2	Valve

3. The ANFE rate was 11.06% for B-47 aircraft and 11.67% for KC-97 aircraft for November.

QUALITY CONTROL UNIT

1. During the month of November 1955, the Quality Control Unit inspected eleven (11) B-47 and three (3) KC-97 aircraft processed through Periodic Maintenance.Docks. The unit also performed flight line inspections on twelve (12) B-47 and five (5) KC-97 aircraft. There were twenty-one (21) engine installations inspected.

2. The unit requisitioned, received, and processed Technical Publications as outlined in SAC Manual 66-12.

3. The unit supervised eleven (11) KC-97 and nine (9) B-47 type aircraft test flights during the month of November.

4. M/Sgt R. H. Gentry and M/Sgt Mifkovic were lost through PCS during the month.

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QUALITY CONTROL UNIT CONT'D

5. Five (5) Unsatisfactory Reports, one hundred and twenty-four (124) Failure Reports, and twelve (12) Teardown Deficiency Reports were submitted for the month of November.

STANDARDIZATION TEAM

1. The Wing Standardization has conducted routine investigations pertaining to maintenance in both A&E and AFG.

2. M/Sgt Stafford investigated the personnel problem in various Field Maintenance Sections, pointing out shortages of personnel and initiated a program to have as many people that could be spared, go through the M.T.D. School.

3. M/Sgt Campbell has been assigned to the Stand Team as a 32170E, K-System Supervisor. He will conduct investigations on A&E aborts and also assume the functions of the Abort Board representative.

4. T/Sgt Blanchard spent numerous hours checking the post-flight procedures on the line for A-5 Gunnery System. This resulted in more Test Equipment being made available to the A-5 line personnel and also more emphasis being placed on better training for the postflight crews.

Averill F. Holman

AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

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HISTORICAL REPORT FOR THE MONTH OF DECEMBER 1955

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing average possessed aircraft was 61 for the month of December. The average in-commission rate was 87.11%. A total of 1461:10 hours were flown for an average of 23:57 hours per possessed aircraft. The Wing ANCP rate was 8:11% for the month of December.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had an average of 42 B-47 aircraft possessed for the month. The average in-commission rate was 86.91% for December compared to 82.99% for the previous month. There was a total of 1035:15 hours flown for an average of 24:36 hours per possessed aircraft. The ANCP rate was 0.00%, a decrease under the 1.36% for the previous month.

b. KC-97 Aircraft: The Wing had an average of 19 KC-97 aircraft possessed for the month of December. The average in-commission rate was 87.74% for the month. There was a total of 425:55 hours flown for an average of 23:40 hours per possessed aircraft. The ANCP rate for the month was 8.11%.

3. In December there were 262,155 man hours assigned with 146,246 manhours available for work. There were 16,895 manhours expended during the month on overtime or 11.55% of the available manhours. Of the total manhours available there were 52,002.8 hours expended on direct time or 35.5%. There were 68,350.1 manhours spent on Productive Indirect codes or 46.7% of the available manhours. There were also 25,898.7 manhours or 17.7% of the available time expended on Non-Productive work. Of the total manhours assigned there were 132,004.1 hours or 50.3% spent on absent codes.

a. The above figures are based upon a 44 hour week of which 4 hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

4. The malfunction figures are taken from the U-15 report which was compiled from 1 December thru 31 December. During this period there were 17 aborts and 5 malfunctions for B-47 aircraft and 5 aborts and 3 malfunctions for KC-97 aircraft.

5. A total of seven (7) B-47 engines were changed during the month of December as compared to sixteen (16) for the previous month. There were two (2) KC-97 engines changed during the month of December. The average engine time at change was 337:00 hours for B-47 and 470:00 hours for KC-97 aircraft.

TOC & RECORDS

1. During the month of December there were 283 TO's accomplished on B-47 aircraft and 118 on KC-97 aircraft.

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TOC & RECORDS CONT'D

2. There were four (4) new TO's received for B-47 aircraft and two (2) received on KC-97 aircraft.

3. There were seven (7) engine changes on B-47 aircraft and three (3) engine changes on KC-97 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of December was 61. There were 36 cannibalizations for B-47 aircraft and 25 for KC-97 aircraft.

2. Following are the five (5) major line items that were AOCP during the month of December:

CLASS	STOCK NUMBER	NOMENCLATURE
01F-FC	1AFB-5 40124-1	Valve
03-I1	4879-E200-2	Valve
08-A	7700-027304-63	Signal
01FC-97	1AFH-52544-124	Elbow's
05-D	6119-8DJ43BAE	Indicator
05-D	6119-8DJ43BAH	Indicator
03-A	4013-24260-601	Propeller

3. The ANFE rate was 5.13% for B-47 aircraft and 15.56% for KC-97 aircraft for December.

QUALITY CONTROL UNIT

1. During the month of December 1955 the Quality Control Unit inspected seven (7) B-47 aircraft processed through Periodic Maintenance Docks. This Unit performed flight line inspection on nine (9) B-47 and four (4) KC-97 aircraft. There were ten (10) engine installation inspected and fourteen (14) engine build up engines inspected.

2. This Unit supervised test flight of eleven (11) B-47, eight (8) KC-97 and eight (8) C-124 aircraft during the month.

3. The Unit requisitioned, received and processed Technical Publications as outlined in SAC Manual 66-12.

4. Five (5) Unsatisfactory Reports, one hundred and fifteen (115) failure reports and seven (7) Teardown Deficiency Reports were submitted during the month.

STANDARDIZATION TEAM

1. M/Sgt White, Radio Technician, lost from this section to overseas assignment.

2. A/2C Canales, Clerk, lost from this section to Reports and Analysis.

3. M/Sgt Campbell and M/Sgt Stafford TDY for approximately one (1) week on Texas League.

4. A-5 MEMP started 16 DEC 1955, approximately 25% completed.

Averill F. Holman
AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

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HISTORICAL REPORT FOR THE MONTH OF JANUARY 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing average possessed aircraft was 58 for the month of January. The average in-commission rate was 82.84%. A total of 1587:10 hours were flown for an average of 27:21 hours per possessed aircraft. The Wing AOCP rate was 2.63% for the month of January.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had an average of 40 B-47 aircraft possessed for the month. The average in-commission rate was 82.53% for January compared to 86.91% for the previous month. There was a total of 1031:15 hours flown for an average of 25:45 hours per possessed aircraft. The AOCP rate was 2.45%, an increase over the 0.00% for the previous month.

b. KC-97 Aircraft: The Wing had an average of 18 KC-97 aircraft possessed for the month of January. The average in-commission rate was 83.63% for the month. There was a total of 555:55 hours flown for an average of 30:53 hours per possessed aircraft. The AOCP rate for the month was 3.03%.

3. In January there were 234,322.6 man-hours assigned with 166,788.9 manhours available for work. There were 13,182.2 manhours expended during the month on overtime or 7.9% of the available manhours. Of the total manhours available there were 66,425.8 hours expended on direct time or 39.9%. There were 79,656.9 manhours spent on Productive Indirect Codes or 47.7% of the available manhours. There was also 20,722.9 manhours or 12.4% of the available time expended on Non-Productive work. Of the total manhours assigned there were 80,354.0 hours or 34.2% spent on absent codes. 19

a. The above figures are based upon a 44 hour week of which 4 hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

4. The malfunction figures are taken from the U-15 report which was compiled from 1 January thru 31 January. During this period there were 23 aborts and 19 malfunctions from B-47 aircraft and 11 aborts and 2 malfunctions from KC-97 aircraft.

5. A total of 2 B-47 engines were changed during the month of January as compared to seven(7) for the previous month. There were 4 KC-97 engines changed during the month of January. The average engine time at change was 54.00 hours for B-47 and 642.00 hours for KC-97 aircraft.

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TOC & RECORDS

1. During the month of January there were 454 TO's accomplished on B-47 aircraft and 35 on KC-97 aircraft.

2. There were nine (9) new TO's received for B-47 aircraft and three (3) received for KC-97 aircraft.

3. There were two (2) engine changes on B-47 aircraft and four (4) engine changes on KC-97 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of January was 40. There were 26 cannibalizations for B-47 aircraft and 14 for KC-97 aircraft.

2. Following are the twelve (12) major line items that were AOCP during the month of January:

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
03-F	4577-18401-11	Ref Unit	B-47
01-FPC	1AFB-3206380	Connector	B-47
05-G	2332-JG7021A36	Indicator	B-47
05-G	2366-162-0108-699	Indicator	B-47
16-T	3380-511125-2979	Relay	B-47
01-F	1AFE-9-18471	Bell Crank	B-47
03-C	4603-162341	Bracket	B-47
03-I-3	4841-AA2550	Box	KC-97
05-D	6134-25000-A6A1-1B1	Indicator	KC-97
03-H	4704-1054200-1	Magnetto	KC-97
03-A	4013-24260-601	Prop Blade	KC-97
01-FPC	1AFB-9-13381-1	Cylinder	KC-97

3. The ANFE rate was 15.92% for B-47 aircraft and 14.57% for KC-97 aircraft for January.

4. The AOCP rate was 3.26% for B-47 aircraft and 3.59 for KC-97 aircraft for January.

QUALITY CONTROL UNIT

1. During the month of January the Quality Control Unit of Maintenance Control conducted quality inspection on eleven (11) B-47 aircraft and five (5) KC-97 aircraft on Flight (In-commission) Line. Quality inspections were performed on six (6) B-47 aircraft and three (3) KC-97 aircraft processed through Periodic Maintenance Docks.

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QUALITY CONTROL UNIT (CONT'D)

2. This Unit supervised test flights on five (5) C-124 type aircraft, eleven (11) B-47 and eight (8) KC-97 aircraft during the month.

3. There were six (6) engine (unit) change installations inspected.

4. Publications were requisitioned, received, processed and distributed as directed in SAC Manual 66-12.

5. The new SAC Manual was received by this Unit 16 January 1956 and distribution was made to all organizations of this Wing.

STANDARDIZATION TEAM

1. Sixty-five (65) percent of maintenance personnel assigned to the 376th Bomb Wing completed WEMP Test during month of January.

2. A/2C Santos Canales re-assigned to this section as an administrative specialist.

Averill F. Holman
AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

HISTORICAL REPORT FOR THE MONTH OF FEBRUARY 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing had assigned 73 aircraft for the month of February. The Wing possessed an average of 61 aircraft for the month. The average in-commission rate was 83.37% a total of 1,817:20 hours were flown for an average of 30:18 hours per possessed aircraft. The Wing AOCP rate was 3.58% for the month of February.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had assigned 51 B-47 aircraft with an average of 42 aircraft possessed for the month. The average in-commission rate was 87.39% for February. Compared to 82.53% for the previous month. There was a total of 1,234:15 hours flown for an average of 28:00 hours per possessed aircraft.

b. KC-97 Aircraft: The Wing had assigned 22 KC-97 aircraft with an average of 19 aircraft possessed for the month. The average in-commission rate was 74.26% for the month. There was a total of 583:05 hours flown for an average of 30:00 hours per possessed aircraft:

3. In February there were 228,607 man hours assigned with 164,091 man hours available for work. There were 7,556 man hours expended during the month on overtime or 4.6% of the available man hours. Of the total man hours available there were 69,506 hours expended on direct time or 42.3%. There were 78,900 man hours spent on Productive Indirect Codes or 48.0% of the available man hours. There was also 15,686 man hours or 9.5% of the available time expended on Non-Productive work. Of the total man hours assigned there were 71,861 hours or 31.4% spent on absent codes.

a. The above figures are based upon a 44 hour week of which 4 hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

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4. The malfunction figures are taken from the U-15 report which was compiled from 1 February thru 29 February. During this period there were 15 aborts and 10 malfunctions for B-47 aircraft and 4 aborts and 0 malfunctions for KC-97 aircraft.

5. A total of 8 B-47 engines were changed during the month of February as compared to two(2) for the previous month. There were 3 KC-97 engines changed during the month of February. The average engine time at change was 308:00 hours for B-47 and 634:00 hours for KC-97 aircraft.

TOC & RECORDS

1. During the month of February there were three(3) engine changes on KC-97 aircraft and eight(8) engine changes on B-47 aircraft.

2. There were 634 average hours per KC-97 engines, and 308 average hours per B-47 engines.

3. During the month there were 24 TO's complied with on KC-97 aircraft, and 350 TO's complied with on B-47 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of February was 40. There were 21 cannibalizations for B-47 aircraft and 19 for KC-97 aircraft.

2. There were twenty-six(26) major line items that were AOCP during the month of February.

3. Following are the six(6) reoccur line items that were causing most AOCP's.

CLASS	STOCK NUMBER	NOMENCLAUTE	TYPE AIRCRAFT
03-I-3	4839-TF57300-6	Booster Pump	B-47
03-I-3	4839-TF57300-7	Booster Pump	B-47
03-I-3	4839-TF57300-14	Booster Pump	B-47
03-I-3	4839-TF57300-21	Booster Pump	B-47
05-D	6119-9888683	E.G.T. Harness	B-47
01F-KC	1AFH-5-28850-23	Bracket (Eng)	KC-97

4. The AOCP rate was 5.90% for B-47 aircraft and 3.64% for KC-97 aircraft for February.

QUALITY CONTROL UNIT

1. During the month of February 1956, the Quality Control Unit of Maintenance Control conducted quality inspections on nine(9) B-47 type aircraft and four(4) inspections on KC-97 type aircraft on flight line (In-Commission). Quality inspections were conducted on seven(7) B-47 type aircraft and two(2) on KC-97 aircraft processed through Periodic Maintenance Docks.

2. Five(5) jet engines and three(3) KC-97 engine changes installations were inspected by this unit.

3. Test Flights for twelve(12) B-47 type aircraft, ten(10) on KC-97 type aircraft and six(6) on C-124 type aircraft were processed by this unit.

4. Publications were requisitioned, received, processed and distributed as directed in SAC Manual 66-12.

STANDARDIZATION TEAM

1. A/1C Richard E. Custer was assigned to this section to replace A/1C Kearns as ECM Specialist, and M/Sgt Walter A. Rose was also assigned to this section to fill vacant 43171E slot.

2. Approximately ninety-seven(97) percent of aircraft and engine maintenance personnel assigned to the 376th Bomb Wing have been given WEMP Test.

3. Deficient areas disclosed by the WEMP Jet test are being trained out by use of the MTD school at this station. The KC-97 deficient areas most probably will be worked out by use of OJT in the near future.

Averill F. Holman
AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

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HISTORICAL REPORT FOR THE MONTH OF MARCH 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing had assigned seventy-three(73) aircraft for the month of March. The Wing possessed an average of sixty(60) aircraft for the month. The average in-commission rate was 88.63%, a total of 2,545:05 hours were flown for an average of 42:25 hours per possessed aircraft. The wing AOCP rate was 4.02% for the month of March.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had fifty-one(51) B-47 aircraft assigned with an average of fourty-one(41) aircraft possessed for the month. The average in-commission rate was 89.49% for March, compared to 87.39% for the previous month. There was a total of 1,619:00 hours flown for an average of 39:29 hours per possessed aircraft.

b. KC-97 Aircraft: The Wing had twenty-two(22) KC-97 aircraft assigned with an average of nine-teen(19) aircraft possessed for the month. The average in-commission rate was 87.78% for the month. There was a total of 926:05 hours flown for an average of 48:44 hours per possessed aircraft.

3. In March there were 218,508 manhours assigned with 156,032 manhours available for work. There were 11,888 manhours exended during the month on overtime and 7.6% of the available manhours. Of the total manhours available there were 70,087 hours expended on direct time or 44.9%. There were 82,000 manhours spent on Productive Indirect Codes or 52.5% of the available manhours. There was also 3,945 manhours or 2.6% of the available time expended on non-productive work. Of the total manhours assigned there were 73,722 hours or 33.7% spent on absent codes.

a. The above figures are based upon a fourty-four(44) hour week of which four(4) hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

4. The malfunction figures are taken from the U-15 report which was compiled from 1 March thru 31 March. During this period there were 14 aborts and 28 malfunctions for B-47 aircraft and 2 aborts and zero malfunctions for KC-97 aircraft.

Reports & Analysis and Control Unit. (Cont'd)

5. A total of 9 B-47 engines were changed during the month of March as compared to 8 for the previous month. There were 3 KC-97 engines changed during the month of March. The average engine time at change was 453:00 hours for B-47 and 550:00 hours for KC-97 aircraft.

TOC & RECORDS

1. During the month of March there were three(3) engine changes on KC-97 aircraft and nine(9) engine changes on B-47 aircraft.

2. There were 550 average hours per KC-97 engines, and 453 average hours per B-47 engines.

3. During the month there were 10 TO's complied with on KC-97 aircraft, and 143 TO's complied with on B-47 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of March was 39. There were 24 cannibalizations for B-47 aircraft and 15 for KC-97 aircraft.

2. There were four-teen(14) major line items that were AOCP during the month of March.

3. Following are the seven(7) reoccur line items that were causing most AOCP's.

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
01-F	1AFE-5-51523-2	Strut	B-47
01-F	1AFE-7-3657-227	Fairing	B-47
03-I	4839-TF57300-14	Pump	B-47
01-F	1AFE-12-2225-154	Radome	B-47
05-D	6119-988868303	Harness	B-47
05-D	6119-8DJ43BAE	Indicator	KC-97
05-A	6040-652191	Indicator	KC-97

4. The AOCP rate was 6.21% for B-47 aircraft and 4.86% for KC-97 aircraft during the month.

5. The ANFE rate was 9.21% for B-47 aircraft and 9.85% for KC-97 aircraft during the month.

QUALITY CONTROL UNIT

1. During the month of March, the Quality Control Unit of Maintenance Control conducted quality inspections on five(5) B-47 type aircraft, two(2) KC-97 type aircraft processed through the 376th Periodic Maintenance Docks, and two(2) C-124 type aircraft processed through the 3rd SSS Maintenance Docks.

2. This unit conducted flight line (In-commission) inspection on six(6) B-47 type aircraft, three(3) KC-97 type aircraft and one(1) C-124 type aircraft.

3. There were eleven(11) jet engine and three(3) reciprocating engine installations inspected by this unit.

4. Nine(9) B-47 type aircraft, seven(7) KC-97 type aircraft and six(6) C-124 type aircraft Test Flights were supervised by this unit.

5. Technical publications were requisitioned, processed and distributed in accordance with SAC Manual 66-12 and SAC Regulation 5-4.

6. A total of 908 Failure Reports and 2 Unsatisfactory Reports were submitted through the PIP Control Section of this unit.

STANDARDIZATION TEAM

1. M/Sgt Walter A. Rose was re-assigned to the Control Room from this section during the month of March.

2. Mr. Robert H. Kerbs, Boeing Service Engineer was transferred from the wing on 31 March.

3. Personnel of this section were used to support other activities due to "Operation Big Wind" on various assignments.

4. Boeing team visited this wing on 12 and 14 March, to check for production error on longeron splice in aft wheel well all aircraft. No production error was found on aircraft checked.

AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

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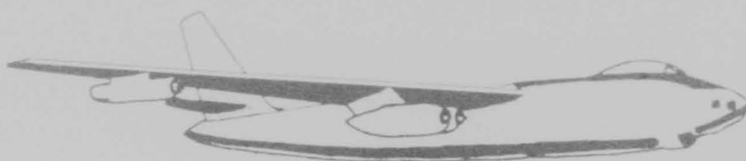

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HISTORY

OF THE

376TH BOMBARDMENT WING(M)

LIBERANDOS

FOR THE MONTH OF

1 APRIL - 31 AUGUST
1956

BARKSDALE AIR FORCE BASE
LOUISIANA

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3-4417-84

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(Unclassified)

HISTORY OF
376TH BOMBARDMENT WING, MEDIUM
1 April 1956 - 31 August 1956

ASSIGNED UNITS

Headquarters, 376th Bombardment Wing, Medium
512th Bombardment Squadron, Medium
513th Bombardment Squadron, Medium
514th Bombardment Squadron, Medium
376th Air Refueling Squadron
376th Field Maintenance Squadron
376th Armament and Electronics Maintenance Squadron
376th Periodic Maintenance Squadron
376th Tactical Hospital

THIS REPORT PREPARED BY:

Major Eugene M. Crook - Historical Officer
M/Sgt. Dunlap Castle - Historical Technician

APPROVED BY:

Stephen D. McElroy
STEPHEN D. McELROY
Colonel USAF
Commander

(Second Air Force, Strategic Air Command)

SECRET

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AUTHORITY

This Historical Report is prepared in accordance with the provisions of the following regulations and manuals:

Air Force Regulation 210-3, 11 March 1955
Air Force Manual 210-1, 1 December 1955
Strategic Air Command Regulation 210-1, 1956
Strategic Air Command Manual 210-1, 1951
Second Air Force Regulation 210-1, 1 July 1954

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TABLE OF CONTENTS

CHAPTER I

MISSION

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MISSION

There was no change in the mission of the 376th Bombardment Wing, Medium between the beginning of this historical reporting period, 1 April 1956, and the end of the period, 31 August 1956. As the mission was stated in its entirety in the preceding history of the Wing,* only a brief reiteration of the salient factors of the mission will be given in this report. (U)

The mission of the 376th Bombardment Wing, Medium, differs from the usual Strategic Air Command (SAC) bombardment wing mission of conducting long range bombardment operations, in that the primary mission of the Wing is to conduct tests and experiment in the development of tactics, equipment, and procedures for strategic bombardment operations. As a result of these tests the Wing is directed to recommend to Headquarters, SAC, requirements for equipment, including that necessary to counter guided missles, and the adoption of appropriate tactics and techniques by the Command. Also to develop and maintain capability for performing ECM cover and diversion in support of strategic bombardment operations. Also to determine the capability of existing electronics equipment for tactical employment by SAC and recommend to Headquarters, SAC adaptions and refinements which will increase the capability of existing equipment. In order to fulfill the provisions in the previous sentence the Wing was authorized to maintain a field laboratory for necessary operational engineering, and the laboratory activities would include short term design and modification of equipment for operational testing. The secondary mission of the Wing was to maintain a capability in normal strategic bombardment operations.[1] (S)

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*. History of the 376th Bombardment Wing Medium, 1 November 1955 - 31 March 1956, on file Hq., 376 BOMWGM.

1. 2AF Reg #23-8, 24 June 1955, (U); 2AF Ltr #23-5, 9 Sep 53, (S), on file 376 BOMWGM.

CHAPTER II

PERSONNEL

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PERSONNEL

General Personnel Analysis. Personnel statistics for manning in required specialties, reenlistment rates, and AWOL rates, for wings of the Strategic Air Command are computed on a standardized basis under the SAC Wing Management Control System.* This system was adopted by SAC "to provide a procedure by which the commander and his staff will be aided in determining effectiveness in reaching and maintaining prescribed and implied goals and the efficiency with which available resources are used". Also "to provide information on individual factors affecting the performance of wings so that corrective action can be instituted". (U)

The basis of computation is standardized to the per cent of maximum score (100) obtained, irrespective of the scoring table from which the percentage is procured. (U)

Manning in Required Specialties. In the tables listed below the airmen are shown in two categories, direct and indirect support. This was done to highlight airman manning in the critical direct support skills which included the following career fields:

30 -- Radio - Radar Systems

32 -- Armament Systems Maintenance

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* Reference SAC Technical Pamphlet # 170-1, January 1956, filed in Wg Adj Section, 376 BOMWGM.

33 -- Atomic Weapons

40 -- Intricate Equipment Maintenance (Deleted)*

42 -- Aircraft Accessories Maintenance

43 -- Aircraft and Engine Maintenance

293X4 -- Airborne ECM Operator (Deleted)*

472X0 -- Ground Powered and Support Equipment (Added)**

534X0 -- Airframe Repair (Added)** (U)

MIRS by Percentage[1] (U)

	Officers	Airmen (Direct Support)	Airmen (Indirect Support)
April	84.4	80.9	72.6
May	84.6	82.6	72.2
June	85.8	76.5	73.4
July	84.0	76.0	72.0
August	84.3	76.9	72.5
Average	84.62	78.96	72.54

MIRS by Per Cent of Maximum Score (U)

	Officers	Airmen (Direct Support)	Airmen (Indirect Support)
April	50	50	10

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* A revision of SAC Technical Pamphlet #170-1, received June 1956, deleted the 40 and 293X4 career field from the direct support and added the 472X0 and 534X0 AFSC's to direct support.

** Reference SAC Technical Pamphlet #170-1, January 1956, filed in Wg Adj Section, 376 BOMWGM.

1. SAC Management Control System Reports for April, May, June, July and August 1956, on file D/P, 376 BOMWGM.

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May	50	60	10
June	50	10	10
July	50	10	10
August	50	30	10
Average	50	32*	10*

Officers. Manning in required specialties (MIRS) for officers increased from 81.9 per cent in March 1956, to 84.4 per cent in April 1956, showing an increase of ten points in per cent of maximum score. The per cent of maximum score held constant at 50 points of the five month's period of this report, although the percentages varied from 84.0 per cent to 85.8 per cent. (U)

Airmen in Direct Support. The MIRS for airmen in direct support showed a sharp drop in per cent of maximum score from 60 points in May, to ten points in June. This was not a true reflection of the actual percentages, 82.6 per cent in May as against 76.5 per cent in June, but was caused by a revision in SAC Technical Pamphlet 170-1 which changed the maximum score to 150 from the previous score of 100. (U)

Airmen in Indirect Support. The MIRS for airmen in indirect support remained constant in per cent (10) of maximum score throughout the reporting period. There was a variation of 1.4 per cent between the July low of 72.0 per cent, and the June high of 73.4 per cent. This deviation did not affect

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* In the scoring system for airmen MIRS all percentages 74.8 and below are rated 10 which accounted for the identical figures.

the per cent of maximum score as all percentages of 74.8 and below are rated as 10 per cent. The average monthly percentage for airmen in indirect support was 72.54.[2] (U)

Personnel Gains and Losses. The consolidated figures for gains and losses for officers and airmen for the period are listed in the table below. (U)

Gains and Losses

	Officers		Airmen	
	Gains	Losses	Gains	Losses
April	27	18	42	50
May	14	14	43	66
June	14	14	56	71
July	15	11	50	39
August	11	20	42	61*
Total	81	77	233	287
Average	16.2	15.4	46.6	57.4

With the exception of July losses of airmen exceeded the gains for each month of the period. The gains and losses of officers were variable except May and June when the figures were the same for each month. (U)

Personnel Manning. Personnel manning figures are consolidated for the period.

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2. Ibid.

* Airmen losses in August 1956 included discharges for the month.

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Officer Manning

	Auth	Asgd	Effective Asgd and MIRS	Per Cent
April	448	388	372	83.0
May	447(4)*	391	374	83.7
June	445(4)	391	378	84.9
July	445(4)	392(3)*	367	82.5
August	445(4)	383(4)	372	83.6
Average	446(4)	389(4)	372.6	83.52

Airmen Support

Direct Support

	Auth	Asgd	Effect Asgd	No. MIRS	PerCent MIRS
April	1108	1084	1007	862	80.9
May	1105	1052	1007	881	82.6
June	1164	1168	1028	868	76.5
July	1164	1088	1026	882	76.0
August	1164	1063	1025	892	76.9

Indirect Support

	Auth	Asgd	Effect Asgd	No. MIRS	PerCent MIRS
April	555	499	448	387	72.6
May	563	508	453	394	72.2
June	492	477	402	350	73.4
July	492	457	405	347	72.2
August	491	463	407	351	72.5

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* Warrant Officers positions, indicated by parenthesis above, are excluded from computations in accordance with SAC Msg COA 34057, 25 Apr 1956, filed D/P, 376 BOMWGM.

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AWOL-Rate per 1000. The Wing scores for the AWOL rate per 1000 were based on consolidated data for all units of the Wing. The scores are listed in the table below. (U)

AWOL Rate per 1000

	Per Cent	Per Cent of Maximum Score
April	0.05	100
May	0.15	100
June	0.16	100
July	0.05	100
August	1.57	100

The apparent discrepancy in the above table as shown by the different percentages for the months with the per cent of maximum score remaining the same is explained as follows:

The scores are computed by dividing the total number going AWOL by the mean strength figures of the wing and multiplying that value by 1000. As the strength figures vary due to a number of different factors, the percentages vary. Under the scoring system for AWOL rates, the percentage zero to 2.3 per cent, rates 100 per cent of the maximum score. The highest figure for the five-month period was 1.57 per cent for August; therefore, every month rated 100 per cent of the maximum score. (U)

Reenlistment Rates. Reenlistment rates of the 376th Bombardment Wing, Medium, are given below: (U)

	Disch	Reenl	PerCent	PerCent of Max Score
April	36	9	25.00	30
May	50	9	18.7	20
June	61	14	23.8	10
July	39	7	19.5	20
August	45	8	19.5	20

Two important factors in the low enlistment rate are the non-allowability of a wing to reenlist personnel who are 18 months beyond their foreign service selective date (FSSD), or who have received a dislocation allowance within the current fiscal year.[3] (U)

Combat Crew Status

April: B-47 Crews.[4] There was a loss of one aircraft commander in April, but 12 co-pilots and two observers were gained. Crew member changes involved one aircraft commander, two co-pilots and three observers. There were two new crews formed during the month, both coded "IN" (incomplete, non-combat ready). Three crews were upgraded, two from "IN" to "N" (non-combat ready), and one from "N" to "R" (combat ready). (S)

Officer manning in AFSC's 1234B (Pilot, B-4), and 1245 (Pilot, AOB), remained critical. There were 132 authorized in April, 104 assigned with a projected gain of one for a

3. Ibid.
4. Bomb Air Trng Rpt (RCS: 3-SAC-T12), April 1956. Exhibit 1.

projected manning of 79.3 per cent. However, of the 105 assigned and/or projected, 43 were not qualified in tactical aircraft and were undergoing formal training. Officer manning in the Armament (AFSC 3244/3254) career field had become critical. Of 12 authorized, eight were assigned with a projected manning of 50 per cent. In the Supply (AFSC 6416/6424) career field the officer manning was due to become critical. Of 12 authorized, 11 were assigned during April with a projected loss of five and no known inputs for a projected manning of 50 per cent. (S)

The average number of combat/ready/lead and select crews assigned during April was 32.[5] (S)

May: B-47 Crews.[6] Crew members gained during May were three co-pilots and two observers, and the losses were two co-pilots and four observers. Changes of crew members involved five co-pilots and two observers. There were three "IN" crews and one "R" (combat ready) crew disbanded during May, with one "R" crew upgraded to "L" (lead) and one "L" crew downgraded to "R". The critical manning situation remained the same in May as during April. (S)

The average number of combat ready/lead/select crews assigned during May was 32.[7] (S)

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5. Ibid.
6. Bomb Air Trng Rpt (RCS: 8-SAC-T12) May 1956. Exhibit 2.
7. Ibid.

June: B-47 Crews.[8] Eight co-pilots and four observers were gained during the month, while losses were two aircraft commanders, two co-pilots and four observers. One new crew was formed during the month of June and coded "IN" (incomplete, non-combat ready). There were three "IN" crews and one "R" crew disbanded during the month of June. Six crews were downgraded - two "S" (select) crews to "L", two "L" crews to "R", one "R" crew to "N" (non-combat ready", and one "N" crew to "IN". Two crews were upgraded - one "R" crew to "L", and one "N" crew to "R". (S)

Officer manning in the Armament (32) career field still was critical in June, and the Supply career field was becoming critical. (S)

The average number of combat ready/lead/select crews assigned during June was 32.[9] (S)

July: B-47 Crews.[10] Gains during July were five aircraft commanders, eight co-pilots, and seven observers, all of whom were untrained. Losses were as follows: two aircraft commanders (one discharged from the Air Force and one transferred); two co-pilots (transferred); and seven observers (one DNIF due to heart attack, one awaiting courts-martial, and five transferred). There were eight new crews formed in July - five "IN" crews then three "N"

8. Bomb Air Trng Rpt (RCS: 8-SAC-T12), June 1956. Exhibit 3.
9. Ibid.
10. Bomb Air Trng Rpt (RCS: 8-SAC-T12), July 1956. Exhibit 4.

crews. There was one "R" crew disbanded during the month, one "R" crew downgraded to "N", one "L" crew downgraded to "R", and one "R" crew upgraded to "L".[11] (S)

The officer manning in the Armement and Supply fields was still critical and becoming critical, respectively. (C)

The Commander, 376th Bombardment Wing, Medium, commented in the Air Training Report for July as follows:

> Reference Annex 1, SAC Regulation 50-5, 13 April 1956. The subject of "N" crew members and "IN" crew members as outlined in the regulation is considered unsatisfactory in that reporting is extremely difficult. Crews may change categories several times each month during the course of upgrading. Recommend that the definition of an "IN" crew be defined as a crew of which one or more crew members have not satisfactorily completed the requirements of Annex XIII, SAC Regulation 51-19. In addition this definition will reflect a true reporting potential by crew category.[12] (S)

The average number of combat ready/lead/select crews assigned during July was 32. (S)

<u>August: B-47 Aircraft</u>.[13] Crew members gained during August, all untrained, were one aircraft commander, two co-pilots, and observer. The losses in crew members were one aircraft commander (combat ready), two co-pilots (combat ready), and one observer (combat ready). Crew member changes involved one aircraft commander, 18 co-pilots, and three observers. There were ten new crews formed in August, two

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11. <u>Ibid</u>.
12. <u>Ibid</u>.
13. Bomb Air Trng Rpt (RCS: 8-SAC-T12), August 1956. Exhibit 5.

"IN" crews and eight "N" crews. There was one "R" crew disbanded during the month, one "R" crew was downgraded to "N" due to change in co-pilot, one "IN" crew upgraded to "N", and four "N" crews were upgraded to "R". (S)

Officer manning in the armament career field still remained critical at the end of the historical reporting period, 31 August 1956. Of 11 authorized, seven were assigned with a projected loss of one, with no known input, for a projected manning of 54.5 per cent. Officer manning in the supply and personnel career fields was also critical. Of 14 authorized in the supply field, ten were assigned with a projected loss of one for a projected manning of 61 per cent. Six officers were authorized in the personnel career field with four assigned for an effective manning of 66.6 per cent. (S)

The average number of combat ready/lead/select crews assigned during August was 50.[14] (S)

<u>April: KC-97 Crews</u>.[15] During April gains in crew members were: two aircraft commanders, four pilots, and two radio operators. Losses in crew members were: one aircraft commander, two pilots, and three navigators. Changes in crew members involved one aircraft commander, four pilots,

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14. Ibid.
15. Refueling Trng Rpt (RCS 4-SAC-T12), April 1956. Exhibit 6.

two navigators, and three radio operators. There were no new crews formed in April, nor were there any changes in status of crews. The average number of combat ready crews assigned during the month of April was 20.[16] (S)

May: KC-97 Crews.[17] Crew members gained in May were three pilots, one engineer, and one radio operator; losses were two pilots, one engineer, and one radio operator. Changes in crew members involved one pilot, two engineers, two radio operators, and two boom operators. (S)

The shortage of navigator replacements described in the previous historical report was still critical.* It was anticipated that six of 25 assigned navigators would be lost because of acceptance to pilot training school. Also, one navigator was due for separation from the Air Force in September 1956. (S)

The average number of combat ready crews during May was 20.[18] (S)

June: KC-97 Crews.[19] Crew members gained during June were one aircraft commander, four pilots, two engineers, and one radio operator. These gains were off-set by 14 losses which included: two aircraft commanders, four pilots, one

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16. Ibid.
17. Refuel Trng Rpt (RCS: 9-SAC-U30), May 1956. Exhibit 7.
18. Ibid.
19. Refuel Trng Rpt (RCS: 9-SAC-T12), June 1956. Exhibit 8.
* History, 376 BOMWGM, 1 Nov 55 - 31 Mar 56, on file, 376 BOMWGM.

engineer, five radio operators, and two boom operators. Crew member changes involved two aircraft commanders, five pilots, two engineers, eight radio operators, and two boom operators. One "T" crew was downgraded to "M" status as there was no combat ready radio operator available to replace one who had been discharged from the service. A critical shortage of radio operators was predicted. Radio losses forecast due to discharges were: one in July, one in August, three in September, one in October, and one in November. Available radio operators would be: August - 24, September - 23, October - 20, November - 19, and December - 18.[20] (S)

The maintenance section of the 376th Air Refueling Squadron during June was operating with 27 personnel short of the 107 authorized. Effective manning was 75 per cent. The shortage was concentrated in the "5" and "7" level AFSC's. Because of under-manning and low skill levels, the maintenance capability to produce flying hours and sorties to support the EWP and to comply with SAC Regulation 50-8 and 51-19 was seriously hampered. By the month of October 1956, 20 maintenance personnel were due for discharge and effective manning would then be 56 per cent.[21] (S)

The average number of combat ready crews during June was 19.[22] (S)

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20. Ibid.
21. Ibid.
22. Ibid.

July: KC-97 Crews.[23] Crew members gained during July included two aircraft commanders, four pilots, two navigators, two engineers, and one radio operator. Crew member losses were three aircraft commanders, four pilots, two engineers, six radio operators, and two boom operators. Crew member changes involved six aircraft commanders, 13 pilots, two navigators, six engineers, 12 radio operators, and three boom operators. There were three "T" crews downgraded to "M" crews during July, and two "M" crews were upgraded to "T".[24] (S)

The two combat ready navigators lost during July were replaced by non-ready navigators. Seven additional navigators were qualified and had applied for pilot training (mentioned previously) and were projected as possible losses before the end of 1956. If this were to occur the number of assigned navigators would be reduced to 17. During July the effective manning of the maintenance section dropped to 73.8 per cent as compared to 75 per cent for June 1956. The "7" level AFSC authorization continued to be 50 per cent manned. The projected manning after the 376th Air Refueling Squadron returned from TDY in September, would be 72 per cent. Eleven airmen (A/3C) with "3" level AFSC's, just finishing school training, had been received

23. Refuel Trng Rpt (RCS: 9-SAC-T12), July 1956. Exhibit 9.
24. Ibid.

by the squadron during July. Those airmen constituted 15 per cent of the effective manning of the maintenance section.[25] (S)

The average number of combat ready crews during July was 18.[26] (S)

(Editorial Note)

The 376th Air Refueling Squadron left Barksdale AFB for overseas temporary duty on 28 August 1956. That part of this historical report which is based on the data obtained from the Refueling Air Training Report for the month of August 1956 will be described in the History of the 376th Bombardment Wing, Medium, for September 1956, due to the unavoidable delay that will occur in the submission of the refueling report.

25. Ibid.
26. Ibid.

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CHANGES IN KEY PERSONNEL (U)

Between the beginning of this historical reporting period (1 April 1956), and the end of the period (31 August 1956), there were certain changes in key personnel of the 376th Bombardment Wing, Medium with only one position change affecting the roster.

The personnel changes were as follows:

Deputy Commander. Colonel Robert T. Calhoun, Deputy Commander, was transferred to Maxwell Air Force Base, Alabama on permanent change of station to attend the Air War College, effective 30 July 1956. He was succeeded as Deputy Commander by Colonel William B. Colson, formerly Director of Operations for the 376th Wing.

Director of Operations. When Colonel William B. Colson was designated as Deputy Commander on 30 July 1956, he was succeeded as Director of Operations by Lt. Colonel Clarance L. Lollar, formerly Deputy Director of Operations.

Wing Adjutant. The Adjutant of the Wing, Major William H. Murphy , was transferred to Headquarters, Second Air Force, as Deputy Chief of Staff on 24 July 1956. He was succeeded as Adjutant by Major Eugene M. Crook, reporting from Maxwell Air Force Base, Alabama.

Chief of Maintenance. Lt. Colonel Averill F. Holman, Chief of Maintenance was succeeded on 2 July 1956, by Lt. Colonel George R. Brendle who had been Squadron Commander, 514th Bombardment Squadron. Lt. Colonel Holman,in turn, was designated Squadron Commander of the 514th in place of Lt. Colonel Brendle.

Directorate of Comptroller. The Comptroller of the 376th Wing, Lt Colonel Richard W. Stillwagon, was transferred to the 805th Air Base Group, Barksdale Air Force Base, on 23 July 1956, Major Raymond B. Nelson, from the 805th Air Base Group became the Comptroller of the 376th Wing.

Directorate of Countermeasures, Tests, and Tactics. The title of Acting Director, Directorate of Countermeasures, Tests and Tactics, which had been reflected in the roster of Key Personnel on 1 April 1956, was deleted. This left only one listing on the roster for the directorate, that of the Director, Lt. Colonel John C. Peck, who had returned from advanced flying school at Wichita, Kansas, on 23 June 1956.

Headquarters Squadron Section. Major Russell U. Fairbanks Jr., Commander, Headquarters Squadron Section, was succeeded by Captain Carl A. Barr, formerly Adjutant of the 376th Armament and Electronics Squadron, effective 7 May 1956. Major Fairbanks was assigned as Wing Logistics Officer.

376th Tactical Hospital. Major Charles C. Dugan, Commander, 376th Tactical Hospital, resigned from the United States Air Force on 2 July 1956, and was succeeded by Captain David C. Hull.

Roster of Key Personnel
1 April 1956

Wing Commander	McElroy, Stephen D.	Colonel
Deputy Commander	C alhoun, Robert T.	Colonel
Wing Adjutant	Murphy, William H.	Major
Dir. of Operations	Colson, William B.	Colonel
Dir. of Intelligence	Kolpin, Shirley A.	Lt. Colonel
Dir. of Materiel	Milner, Robert S.	Lt. Colonel
Chief of Maint.	Holman, Averill F.	Lt. Colonel
Maint. Control Officer	Carlisle, Joe L.	Major
Dir. of Safety	Kelleher, James F.	Major
Dir. of Comptroller	Stillwagon, Richard W.	Lt. Colonel
Dir. of Personnel	Torma, Joseph J.	Lt. Colonel
Dir. of Tests and Tactics	Peck, John C.	Lt. Colonel
Dep. Dir.(Acting Dir.)	Hall, Richard G.	Lt. Colonel

Commanders of Assigned Units

Hq. Sq. Sec.	Fairbanks, Russell U. Jr.	Major
512th Bomb Sq.	Brand, Dudley V.	Major
513th Bomb Sq.	Grammas, George T.	Major ~~Lt. Colonel~~
514th Bomb Sq.	Brendle, George R.	Lt. Colonel
376th Air Ref. Sq.	Lack, Wendell D.	Lt. Colonel
376th A&E Maint Sq.	Matthews, Edward E.	Lt. Colonel
376th Per. Maint Sq.	Lamb, Chester R.	Major
376th Field Maint Sq.	Hunt, Seaborn M.	Major
376th Tac. Hospital	Dugan, Charles C.	Major

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Roster of Key Personnel
31 August 1956

Wing Commander	McElroy, Stephen D.	Colonel
Deputy Commander	Colson, William B.	Colonel
Wing Adjutant	Crook, Eugene M.	Major
Dir. of Operations	Lollar, Clarence L.	Lt. Colonel
Dir. of Materiel	Milner, Robert S.	Lt. Colonel
Dir. of Intelligence	Kolpin, Shirley A.	Lt. Colonel
Chief of Maint.	Brendle, George R.	Lt. Colonel
Maint. Control Officer	Carlisle, Joe L.	Major
Dir. of Safety	Kelleher, James F.	Major
Dir. of Personnel	Torma, Joseph J.	Lt. Colonel
Dir. of Comptroller	Nelson, Raymond B.	Major
Dir. of Tests and Tactics	Peck, John C.	Lt. Colonel

COMMANDERS OF ASSIGNED UNITS

Hq. Sq. Sec.	Barr, Carl A.	Captain
512th Bomb Sq.	Brand, Dudley V.	Major
513th Bomb Sq.	Grammas, George T.	Major ~~Lt. Colonel~~
514th Bomb Sq.	Holman, Averill F.	Lt. Colonel
376th Air Ref. Sq.	Lack, Wendell D.	Lt. Colonel
376th A&E Maint Sq.	Matthews, Edward E.	Lt. Colonel
376th Per. Maint Sq.	Lamb, Chester R.	Major
376th Field Maint. Sq.	Hunt, Seaborn M.	Major
376th Tac. Hospital	Hull, David C.	Captain

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CHAPTER III

OPERATIONS

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OPERATIONS

This chapter will follow the same format as the operations chapter in the previous historical report,* and will consist of two parts under the heading of Operations; and Countermeasures, Test, and Tactics. The part on Operations will include the training flights as a composite phase of the operating accomplishment of the wing mission. Projects of the Directorate of Countermeasures, Tests, and Tactics (DCTT) are included as part of the Operations Chapter because all phases of DCTT are an integral part of the primary mission of the wing, and all the flight tests required are performed as part of the operational activities of the 376th Bombardment Wing, Medium.(Uncl)

PART I

OPERATIONS

April: B-47 Aircraft.

The hours flown during April by the B-47 aircraft of the 376th BOMWGM performing missions ordered by higher headquarters were:[1]

Electronics Countermeasure Tests	184.30
Ferrying aircraft-modification depots	18.20
Fly-over participation "Holiday in Dixie	6.30

During the month of April 1956, nine aircraft sorties of six hours duration each were lost due to local weather conditions.(C)

Another factor which would affect future training was the projected increase in operational requirements with no effective increase in the manning of the tactical squadron maintenance organizations. The average manhour cost per sortie for the 376 BOMWGM (April 1956) was 31.9 hours less than the SAC average.[2] Further reduction would affect the quality of maintenance. The

*. History of the 376th Bombardment Wing, Medium 1 November 1955-31 March 1956, on file HQ 376 BOMWGM.
1. Bomb Air Trng Rpt (RCS:3-SAC-T12) April, 1956, Exhibit 1.
2. IBID

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limitation imposed by manning in the tactical squadrons indicated a capability of a maximum of ten sorties per day or 220 sorties.[3] (S)

Aircraft availability would also affect the number of sorties produced. Although the IRAN (inspect, repair as necessary) in-put for fiscal year 1957, was unknown (April 1956) an estimate of B-47 aircraft in-put each month would involve ten to 14 aircraft in the program.[4] Those would be all "Blue Cradle" modified aircraft. Eight of the B-47 aircraft currently assigned in April 1956, were not cradle modified. Those aircraft made no contribution to the Wing EWP and Test and Tactics program nor could they be fully utilized for training.(S)

Non-Combat Ready Crew Training -April. In April 82 sorties for a total of 452 hours were flown as "5X time" in training staff personnel and non-combat ready crew personnel. An average of 20.8 crew members were available for SAC Reg 51-19 training during the month of April. They flew a total of 828.3 hours for an average of 39.8 hours per available crew member. In addition to the above, 54 hours scheduled were cancelled due to weather and 51 hours were cancelled due to maintenance. Since all "IN" (incomplete, non-combat ready) crew members were scheduled to the maximum, it was impossible to make up that time by rescheduling. One crew member was DNIF (duty not involving flying) for 17 days and two others were DNIF for eight days each, resulting in further loss of "IN" crew flying time. (S)

3. IBID
4. IBID

Training programmed during April was projected toward maximum training under SAC Reg 51-19 for both pilots and observers. Ninety-one precent of the over-all projected program was accomplished; however, observer training requirements were under-flown due to the increased need for the up-grading of co-pilots. Air refueling and co-pilots transition received the major portion of available flying time. Seven co-pilots completed aircraft commander upgrading and at the end of April were awaiting qualified co-pilot replacement necessary prior to formation of new crews. (C)

The average number of combat ready/lead and select crews assigned during April was 32. A total of 463 hours (excluding test flight time) was flown for an average of 14.28 hours per crew.[5] (S)

May: B-47 Aircraft.

Hours flown during May 1956, performing missions ordered by higher headquarters were:[6]

Ferrying aircraft	23.45
Armed Forces Day Flyover Practice	25.50
total	49.35

During May a total of nine sorties were lost due to weather. The AOCP rate for the month of May was excessive (6.51 percent), which resulted in the cancellation of nine sorties.[7] This lack of supply support resulted in 23 cannabalizations in order to prevent losing even more missions. Drag angle modification resulted in the loss of 71 aircraft days while the aircraft were at a depot for repair. (S)

Refueling data-May. There were 33 refueling sorties scheduled and confirmed for the month of May. There were 33 sorties airborne, and 29 effected

5. IBID
6. Bomb Air Trng Rpt, (RCS: 8-SAC-T12), May 1956, Exhibit 2.
7. IBID

complete electronic rendezvous. There were 32 sorties transferring the required fuel, with one tanker abort.(S)

Non-combat ready crew members-May. An average of 29.3 non-combat ready crew members were available for training during May 1956. They flew a total of 1019.05 hours for an average of 34.8 hours per available crew member. In addition to the above, four pilots were taking advanced flying training at McConnell AFB, ten pilots were taking local MTD training, and five observers were taking Phase II training at McConnell AFB. (S)

Sixty-five sorties for a total of 373 hours were flown as "5X Time" in training staff personnel and non-combat ready crew members. Eleven pilots presently assigned co-pilots on combat ready/lead/select crews had been checked out as aircraft commanders but could not be used as such until new assigned pilots were qualified to replace them.(C)

The average number of combat ready/lead/select crews assigned during May was 32. A total of 661 hours (excluding test flight time) was flown for an average of 20.5 hours per crew.[8] (S)

June: B-47 Aircraft.

During June 1956, hours flown performing missions ordered by higher headquarters were:[9]

Ferrying aircraft	13.55

The AOCP rate for June (9.56 percent), was extremely high as compared to May (65 percent). A total of 12 sorties was lost during June due to AOCP shortages. An average of two aircraft were undergoing drag angle repairs during June resulting in a loss of 60 aircraft days during the month.(S)

8. IBID
9. Bomb Air Trng Rpt (RCS: 8-SAC-T12) June 1956, Exhibit 3.

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Refueling data-June. There were 77 sorties scheduled and confirmed. Airborne sorties were 74, with 70 sorties transferring required fuel, and 49 effecting complete electronic rendezvous. There were three aircraft malfunctions, three tanker aborts, and one radio failure.[10] In mass night cell refueling there were 24 confirmed and airborne sorties; with two sorties effecting complete rendezvous, and 21 sorties transferring required fuel.[11] (S)

Non-combat ready crew members-June. An average of 39.2 non-combat ready crew members were available for training during the months of May and June. They flew a total of 2024.05 hours for an average of 67 hours per available crew member. (S)

The average number of combat ready/lead/select crews assigned during May and June was 32. A total of 1279 hours (excluding test flight time) was flown for an average of 39.58 hours per crew. (S)

July: B-47 Aircraft.*

The total hours flown performing missions ordered by higher headquarters during May, June, and July were:

Ferrying aircraft to and from Depot	77.40
Armed Forced Day Flyover (Practice)	25.50
Tests and Tactics directed Missions	118.55
ECM Support Missions in conjunction with Operation "Devil Fish"	44.10

10. IBID
11. IBID

* . In compiling the operational activities for July, there will be some unavoidable duplication of figures as the Bomb Air Trng Rpt (RCS:8-SAC-T12) July 1956, constitutes the end of a training quarter, and includes certain averages for the three months of May, June, and July and is not susceptible to figures for July alone.

Support of Operation "Cactus Plant"	7.10
Operation "Corn Belt"	112.10
total	385.55

There were four air refueling sorties lost during July due to restrictive directives from SAC and Second Air Force pertaining to magnetic inspection of KC-97 aircraft propellers.* (S)

Another message,** imposed a restriction limiting KC-97 aircraft to a maximum gross weight take-off of 155,000 pounds which reduces the amount of JP-4 fuel that can be off-loaded, to B-47 receivers, thereby reducing sortie duration by approximately one hour. This restriction caused the loss of approximately 50 hours.[12] (S)

The AOCP rate for the month of July was 6.75 percent as compared to 9.56 percent for June and 6.51 percent for May. A total of 42 sorties was lost during May, June, and July due to the AOCP shortage.(S)

Refueling Data-May, June, July. There were 127 refueling sorties scheduled and confirmed for the three month period. There were 112 sorties airborne, with 67 effecting complete electronic rendezvous and 102 transferring required fuel. There were six aborts due to aircraft malfunctions, six tanker aborts, and one radio failure. For missions requiring mass night cell refueling there were 46 confirmed sorties, 44 airborne sorties, seven sorties effecting complete rendezvous, and 36 sorties transferring required fuel.[13] (S)

Non-combat ready crews, May, June, July. An average of 40 non-combat ready

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*. SAC Msg DM4C, 11-25-53648, 27 June 1956; 2AF Msg "Zippo" 07-040, 7 July 56; on file HQ 376 BOMWGM.
**. SAC Msg D01842, 9 July 1956, on file HQ 376 BOMWGM.
12. Bomb Air Trng Rpt (RCS:8-SAC-T12), July 1956, Exhibit 4.
13. IBID

crew members was available for training during the months of May, June, and July. They flew a total of 3142.55 hours for an average of 78.5 hours per available crew member. In addition to the above, 16 pilots were taking advanced flying training at McConnell AFB, 12 pilots were taking local MTD training, and 13 observers were attending the Phase II training course at McConnell AFB. Two-hundred eleven sorties for a total of 1130 hours were flown as "5X time" in training staff personnel and non-combat ready crew members. Ten pilots assigned as co-pilots on combat ready/lead/select crews had been checked out as aircraft commanders but could not be used as such until newly assigned pilots were qualified to replace them(S)

The average number of combat ready/lead/select crews during May, June, and July were 32. A total of 2364 hours (excluding test flight time), was flown for an average of 73.53 hours per crew.[14] (S)

August: B-47 Aircraft.[15]

During August hours flown performing missions ordered by higher headquarters were:

Ferrying aircraft to and from Depot	24.15
Tests and Tactics directed Missions	9.10
Bombing Competition	100.10
ECM Support Missions in conjunction with Operation "Devil Fish"	20.30
total	154.05

A SAC message* which limited the KC-97 aircraft to maximum gross weight take-off of 155,000 pounds, thereby reducing the amoung of JP-4 fuel that

14. IBID
15. Bomb Air Trng Rpt (RCS:8-SAC-T12), August 1956, Exhibit 5.
* . SAC Msg DO 1842, 9 July 1956, on file D/O, 376 BOMWGM.

could be off-loaded to receivers, created a loss of approximately 50 hours. A total of 17 sorties were lost due to aircraft being ACCP. Three of the 17 sorties were lost on one aircraft, ACCP for approximately three weeks for a "fuel probe." One "probe" was received from the depot in an unserviceable condition and had to be returned to supply channels. Estimated date of delivery for this item was 15 to 30 days. The shortage of aircraft parts had made it necessary to utilize excessive cannabalization procedures, resulting in extra man-hours in the maintenance sections.[16] (S)

A requirement to schedule all KC-97 aircraft through the Warner-Robins Air Materiel Area Depot, Georgia, resulted in the loss of approximately eight air refueling sorties.[**] (S)

Refueling data- August. There were 41 refueling sorties scheduled and confirmed during August. The breakdown of sorties was: (S)

1. Number of sorties:
   - (a) Airborne - 37
   - (b) Effecting complete electronic rendezvous - 31
   - (c) Transferring required fuel - 36
2. Number of aborts due to:
   - (a) Adverse weather - 0
   - (b) Aircraft malfunction - 3
   - (c) Electronic rendezvous equipment malfunction - 1
   - (d) Refueling equipment malfunction - 0
   - (e) Other causes. No tanker available - 1

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16. IBID
**. Msg 2AF to 376 BOMWGM, DM4F2-5209, 30 July 1956, on file Hq 376 BOMWGM.

Crew Training. An average of 56 non-combat ready crew members were available for training during the month of August. They flew a total of 159.45 hours for an average of 28.5 hours per available crew member. Ninety-two sorties for a total of 471 hours were flown as "5X time" in training staff personnel and non-combat ready crew members.(S)

The average number of combat ready/lead/select crews assigned during August was 32, with a total of 708 hours (excluding test flight time) being flown for an average of 22 hours per crew.[17] (S)

April: KC-97 Aircraft.

During the month of April the hours flown performing missions ordered by higher headquarters were:[18]

Ferry Flights (IRAN)	5.00
Tests and Tactics missions	41.20
Passenger and cargo	18.30
Fly-over (Holiday in Dixie)	51.45
Operation Dog House	13.45
total	130.20

Non-combat ready crews - April. An average of 54.4 crew members and non-assigned personnel under the provisions of SAC Regulation 51-19 were available for training during April. They flew a total of 1930.30 hours for an average of 42.31 hours per man. There were no "M" status (all crew members checked out, but not considered combat ready), crews assigned.(S)

Special Training Accomplished. There were 401 hours programmed, with 530

17. IBID
18. Refueling Trng Rpt (RCS: 4-SAC-T12), April 1956, Exhibit 6 .

hours accomplished for a percentage of 132 percent. Ninety sorties were programmed, with 107 sorties accomplished for a total of 119 percent. The nature of the programmed missions was planned to realize maximum crew member training under SAC Regulation 51-19. The concentration of flying time was utilized for maximum progression for pilots and boom operators under 51-19.[19] (C)

The average number of combat ready crews assigned during April was 20. A total of 386 hours (excluding test hops) was flown for an average of 22.7 hours per crew excluding (Standardization crews.).[20] (S)

May: KC-97 Aircraft.

During May hours flown performing missions ordered by higher headquarters were:[21]

Fire Power Demonstration - Eglin AFB	8.15
Armed Forces Day Display	27.10
Ferry Flights	9.15
total	44.40

Refueling Data-May. There were 61 refueling sorties scheduled and confirmed for May:[22] (S)

1. Number of sorties
   a. Airborne - 47
   b. Effecting complete electronic rendezvous - 44
   c. Transferring required fuel - 47
2. Number of aborts due to:
   a. Adverse weather - 0

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19. IBID
20. IBID
21. Refueling Trng Rpt (RCS:9-SAC-T12), May 1956, Exhibit 7.
22. IBID

b, Aircraft malfunction - 9

c. Electronic rendezvous equipment malfunction -0

d. Refueling equipment malfunction -2

e. Other causes. Receiver cancellation - 3

During the month of May the average number of combat ready crews was 20. The average hours flown by combat ready crews was 19.35 (excluding standardization crews.).

June: KC-97 Aircraft.

During June hours flown performing missions ordered by higher headquarters were:[23] (S)

Ferry Flights (IRAN)	15.15
PIO Flight	7.15
Operation "Bright Lad"	73.20
total	95.50

The AOCP rate for June was 11.11 percent compared to 7.91 percent for May and 6.84 percent for April. The major AOCP-AOC items were propeller system components, flight instruments, and air refueling system components. Three air refueling missions and two tests and tactics missions were lost because of the AOCP items. An additional two refueling missions were aborted for fame vibrations which resulted in AOC.[24] (S)

Refueling Data-June.

There were 149 refueling sorties scheduled and confirmed for June:[25]

1. Number of sorties.

   a. Airborne - 124

   b. Effecting complete electronic rendezvous - 88

23. Refueling Trng Rpt (RCS: 9-SAC-T12), June 1956, Exhibit 8.
24. IBID
25. IBID

c. Transferring equipment malfunction - 3

d. Refueling equipment malfunction - 3

e. Other causes. Receiver cancellation - 3

3. Mass night cell refueling.

a. Confirmed sorties - 24

b. Airborne sorties - 24

c. Sorties effecting complete rendezvous - 12

d. Sorties transferring required fuel - 21

The average number of combat ready crews was 19 for the month. The average hours flown by combat ready crews was 22.50 (excluding standardization crews).

July - KC-97 Aircraft.

During July hours flown performing missions ordered by higher headquarters were:[26]

Ferry Flights (IRAN)		8.15
Operation Corn Belt		77.50
	total	86.05

Refueling Data.

There were 217 refueling sorties scheduled and confirmed for July:[27] (S)

1. Number of sorties

a. Airborne sorties - 177

b. Effecting complete electronic rendezvous - 177

c. Transferring required fuel - 162

2. Number of aborts due to:

a. Adverse weather - 0

26. Refueling Trng Rpt (RCS: 9-SAC-T12), July 1956 , Exhibit 9 .
27. IBID

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b. Aircraft malfunction - 29

c. Electronic rendezvous equipment - 2

d. Refueling equipment malfunction -6

e. Other causes. Receiver cancellation - 3

3. Mass night cell refueling

a. Confirmed sorties - 62

b. Airborne sorties - 56

c. Sorties effecting complete rendezvous - 56

d. Sorties transferring required fuel - 51

The average number of combat ready crews was 18 for July. The average hours flown by the combat ready crews was 27.4 (excluding standardization crews).[25] (S)

(Editorial Note)

The 376th Air Refueling Squadron left Barksdale AFB for overseas temporary duty on 28 August 1956. That part of this historical report which is based on the data obtained from the Refueling Air Training report for the month of August 1956, will be described in the History of the 376th Bombardment Wing, Medium for September 1956, due to the unavoidable delay that will occur in the submission of the refueling report.

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28. IBID

PART II

COUNTERMEASURES, TESTS AND TACTICS

The Directorate of Countermeasures, Tests and Tactics (DCTT), 376th Bombardment Wing, Medium, was charged with an important part in implementing the mission of the wing. To this Directorate was assigned the responsibility of developing and testing both tactics and electronic countermeasures techniques. Also, maintain a field laboratory for necessary operational engineering. Laboratory activities would include short term design and modification of equipment for operational testing. The Directorate would also determine the capability of existing electronics equipment for tactical employment by SAC and recommend adaptions and refinements which would increase the capability of existing equipment.* (S)

A summary of the projects undertaken and carried out by DCTT for the historical reporting period 1 April through 31 August 1956, is given below:

Test Project Number 34, "Development of an Unattended Communications Jammer" [1] (S)

This project was initiated 2 June 1953. The estimated date of completion of this project is March 1957. (U)

Summary. The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look

*Mission of 376 BOMWGM fully stated page 1, History 376 BOMWGM, 1 November 1955 - 31 March 1956, files 376 BOMWG.

1. Report, 376 BOMWGM to 2AF, Subj: Test Progress Report (RCS: SAC-U30), 9 May 1956; hereafter cited as SAC-U30-April, Exhibit 10.

through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources; a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes, and when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously.[2] (S)

Prior to finalizing arrangements for the proposed test coordinated with the United States Navy, a local flight test was flown during April in a C-47 type aircraft. Project 34 equipment was installed, plus an AN/APR-4 and an AN/ARC-3 receiver. A BC-640 VHF ground transmitter transmitting a tape recorded message was used as the signal to be locked-on and jammed. Failure in the jamming equipment during the flight caused cancellation of the test before complete results could be observed. However, it was found that a lock-on error existed. Because of this, the U.S. Navy was notified proposed flight tests would be postponed until corrections could be made in the jammer.[3] (C)

At the end of this historical period the SAC representative at DCTT indicated that this project would be cancelled. The system under development in this project is a slow-moving mechanical system; recent developments in rapid electrically tuned systems appear so much more promising that additional effort should not be expended on the mechanically tuned system.[*] (U)

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2. IBID
3. IBID
*. For full details of the work on this project, refer to SAC-U30-April Exhibit 10, SAC-U30-May, Exhibit 11, SAC-U30-June, Exhibit 12, and SAC-U30-July, Exhibit 13.

Test Project Number 35, "Development of VHF Communications Jammer using Increductors".[4] (S)

This project was initiated on 1 April 1954. The estimated date of completion is April 1957.(U)

Summary. Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver.[6] (S)

The IP-130/UPM-17 spectrum analyzer is being used to examine the output from the receiver oscillator and transmitter. This piece of test equipment, was received during May, and appears to be very useful for this type work. The spectrum of the receiver oscillator and transmitter were found to be very broad, approximately 200 to 400 kilocycles for the oscillator and 500 kilocycles or more for the transmitter. The spectrums of these two circuits may have to be reduced before accurate lock-on can be obtained.[7] (S)

4. SAC-U30-April, Exhibit 10.
5. Rpt, 376 BOMWGM, to 2AF, subj; Test Progress Report(RCS:SAC-U30), 7 June 1956; hereafter cited as SAC-U30-May, Exhibit 11.
6. IBID
7. IBID

The search-and-lock-on receiver uses six XH-146 increductor saturable reactors in the RF section. The receiver is built in six sections; master sweep circuits, master control circuits, RF circuits, master multivibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis and all are mounted as plug-in units in an 11 inch standard ECM rack. Space remains for additional circuitry required for identification capability or other modifications which may be necessary. Extension cables have been made for all units so they may be removed for testing and alignment. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, and then tune the transmitter to the same frequency and begin jamming. The jamming period may be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds with a flyback time of 100 milliseconds, allowing five complete scans per second. Under these conditions, if there were only one signal in the swept band it would be jammed for a maximum of three seconds at intervals of not more than 400 milliseconds.[8] (S)

An AT-190/AP antenna has been shortened and the matching section changed so it may be used with the transmitter. The modified antenna was filled with foaming plastic and checked for proper operation with the transmitter. The antenna was found to be electrically suitable. It has been test flown for a period of 13 hours in an AB-109 mount located near the ATO compartment of a B-47 aircraft; so far no mechanical deterioration is evident.

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8. Rpt, 376 BOMWGM to 2AF, subj; Test Progress Report (RCS:SAC-U 30), 7 August 1956, hereafter cited as SAC-U30-July, Exhibit 13.

These test flights will continue until a total of 50 hours flight time is reached, after which the antenna, if still electrically and mechanically satisfactory, will be mounted on a B-47 bomb bay door for additional flight testing.[9] (C)

A trip was made by the project engineer to Wright Air Development Center (WADC) during June. Purpose of the visit was to determine test results obtained with the CGS Laboratories search-and-lock-on system purchased by WADC. The equipment was not available, having been returned to the manufacturer for modification. It will not be returned to WADC until after the beginning of 1957. One flight test had been run wherein successful jamming was obtained by manually adjusting the transmitter lock-on circuitry for minimum error during the test. No other tests were run because of instability and excessive lock-on errors.[10] (S)

Test Project Number 36, "S-Band RF Systems." (S)

This project was initiated on 1 November 1954, and there is no estimated date of completion as it was set-up on a continuous basis.[11] (U)

Summary. In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6, and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated.[12] (S)

9. IBID
10. IBID
11. Rpt, 376 BOMWGM to 2AF, Subj; Test Progress Report, (RCS:SAC-U30), 12 July 1956, hereafter cited as SAC-U30-June, Exhibit 12 .
12. IBID

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Laboratory tests and measurements have continued in an effort to improve efficiency of the transmission lines and radiation patterns of S-band antennas. A study of all domestic and foreign cable manufacturers designs is now being made by WADC to determine the state of the art in cables with low loss and high temperature characteristics. This study should be completed within one year. A detailed account of the different phases of this project for April, May, June and July will be found in the supporting documents in the appendix to this history.*

Test Project Number 37, "AN/ALQ-3 Suitability Test". (S)

This project was initiated on 2 May 1955, with an estimated date of completion for October 1956.(U)

Summary. The purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Six complete AN/ALQ-3 systems have been delivered to the 376th Bombardment Wing, Medium for use on these tests. A total of 47 equipments are scheduled for delivery to the Wing; at the end of July 39 systems had arrived: (C)

a. Systems 6,7,8,9,10 and 23 are being used for test.(C)

b. Twenty-six systems are still in crates in the 376th A&E Squadron Supply Room.(C)

c. Seven systems were shipped in accordance with SAC message DM 3A6 52274, 22 June 1956. One system was shipped to White Sands Proving Ground, four to Evans Signal Laboratory, and two to Fort Huachuca Signal Laboratory.[13] (C)

Two B-47 "Blue Cradles" had been modified for installation of the AN/ALQ-3. This modification consisted of mounting two Cannon connectors in

*. Account of this project will be found in SAC-U30-April, Exhibit 10; SAC-U30-May, Exhibit 11 ; SAC-U30-June, Exhibit 12; and SAC-U30-July, Exhibit 13.

13. SAC-U30-July, Exhibit 13.

the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes had been necessary, only the additions described.[14] (U)

The following changes have been made in the project test program by Headquarters, SAC: Tests of the AN/ALQ-3 against EW and GCI radars are waived, limiting testing of the AN/ALQ-3 to tracking type radars only. No modifications of the AN/ALQ-3 will be accomplished to permit operation against EW/GCI radars.[15] (C)

Four flight tests were scheduled for April, two for May, four for June, and one for July. Complete data on those flights is given in the supporting documents in the appendix to this historical report.*

One flight was planned for 30 July at the Little Rock, Arkansas, RBS site using an AN/ALQ-3 equipped KC-97 aircraft. Results of this test have not been evaluated and reduced as yet, and will be described in the next history. Purpose of that test was to verify or negate data obtained from previous KC-97 tests of the AN/ALQ-3. The majority of the earlier tests were made with systems 1 and 2 which were later found to be below equipment specifications regarding accuracy of transmitter lock-on. The 30 July test used system 7 which had given the best results during the B-47 tests.[16] (S)

Test Project Number 38, "AN-ALQ-7 Suitability Test".[17] (S)

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14. IBID
15. IBID
*. SAC-U30-April, Exhibit 10; SAC-U30-May, Exhibit 11; SAC-U30-June, Exhibit 12; and SAC-U30-July, Exhibit 13.
16. SAC-U30-July, Exhibit 13.
17. SAC-U30-April, Exhibit 10.

This project was initiated on 15 August 1955, with an estimated date of completion in May 1956.

Summary. The purpose of this project was to test and evaluate tactical use of the AN/ALQ-7 countermeasures system.(S)

No conclusions could be drawn from the work performed on this project during April 1956, because very little data was collected; however, due to the great number of system malfunctions which had repeatedly occurred in the AN/ALQ-7 system since the beginning of the test project, it was concluded that the system in its present design is not stable enough for practical use in the field.[18] (C)

The Directorate of Countermeasures, Tests and Tactics recommended on the basis of test results obtained that the AN/ALQ-7 not be considered for procurement in its present state. This recommendation was primarily based on the general unreliability of the equipment and not on its jamming effectiveness against precision tracking of ground-based and airborne radars.[19] (C)

The flight tests of the AN/ALQ-7 were concluded on 20 April 1956. Bench tests were performed and the final report on this project has been written and is included in the supporting documents in the appendix to this historical report.[20] (U)

Test Project Number 39, "Flight Test of QRC-18(t)".[21] (S)

This project was initiated on 15 August 1955, with an estimated date of completion of June 1956.(U)

Summary. Purpose of this project was to test tactical suitability of the QRC-18(t). Essentially the QRC-18(t) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications.

18. IBID
19. IBID
20. Final Report Test Project Number 38, July 1956, Exhibit 14.
21. SAC-U30-April, Exhibit 10.

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The modification consists of different sweep units designed to give sweep widths of 1 percent, 2 percent, or 4 percent of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS.[22] (S)

During this project 35 sweep jamming and 19 spot jamming runs were made in an attempt to jam reception on an airborne R77B/ARC-3 receiver from a 50-watt VHF ground transmitter. Sweep jamming, using from one to three AN/ALT-7 transmitters modified with GRC-18(t), was not effective against VHF voice communications. Results of the spot jamming runs indicate the AN/ALT-7 transmitter is apparently capable of spot jamming communications, but the possibility of doing so is limited by narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of available ECM receivers.[23] (S)

All testing on this project has been completed, and the final report is included in the supporting documents in the appendix to this historical report.[24] (U)

Test Project Number 10, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters." (C)

This project was initiated on 14 September 1955, with an estimated date of completion for September 1956.[25] (U)

Summary. Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of an AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as

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22. SAC-U30-June, Exhibit 12.
23. Final Report Test Project Number 39, July 1956, Exhibit 15.
24. IBID
25. SAC-U30-April, Exhibit 10.

possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means.[26] (C)

Electrical tests and measurements were made on the third model of the cavity device for measuring sweep frequency limits.* With the present mechanical arrangement, considerable amount of spurious responses were obtained as the jammer frequency swept slowly across the S-band. These responses were not due to cavity response effects but rather to RF leakage voltages to the crystal diode by way of meters and connecting cables. Spurious responses from the powerful RF fields in the vicinity of the jammer antenna cause erroneous reading on the indicating meters which may be mistaken for true resonance readings. To eliminate these undesirable responses, RF chokes are being installed in the meter leads, by-pass condensers incorporated into the crystal diode housing, and better shielding within the metal inclosure is being added.[27] (C)

Further description of this project will be continued in the next historical report. (U)

Test Project Number 41, "X-Band Interference, Code Name Spotlight."[28] (C)

This project was initiated on 29 March 1956, with an estimated date of completion for March 1957. (U)

Summary. Primary purpose of this project is to determine extent of X-band jamming interference to other airborne electronic systems and what measures can be taken to reduce the effects of such interference. The secondary purpose is to determine effectiveness of X-band sweep jamming against

26. IBID
*. See page 42, History 376 BOMWGM, 1 November 1955 to 31 March 1956, on file Hq. 376 BOMWGM.
27. SAC-U30-July, Exhibit .13.
28. IBID

radar-equipped AI aircraft to include determination of optimum sweep jamming rates and bandwidths.* (S)

Test Project Number 42, "Attenuation of UHF Air-to-Air Transmission" (C)

This project was initiated on 15 March 1956, and the estimated date of completion is not presently known. (U)

Summary. The purpose of this project is to determine optimum method of attenuating transmitted signals in UHF frequency band and optimum attenuated UHF communications ranges for all tactical operations; enroute cells, refueling rendezvous, and refueling formations.[29] (C)

No work was accomplished on hardware for this test project during July. Changeover relays, ordered for use on the attenuator for this project, have not yet been received. Batteries for use with the AN/URC-4 survival transceivers were received and authorization for ordering crystals for these sets was obtained. Different crystals are required so the transceivers may be operated on frequencies other than the distress frequency.[30] (C)

This project will be described further in the next historical report.

Test Project Number 43, "Pre-flight and Post-flight Procedures for use by B/RB-47 Wings of this Command"[31] (C)

This project was initiated on 16 April 1956, with an estimated date of completion for July 1956. (U)

Summary. Purpose of this test project is to prepare optimum pre and post-flight procedures for ECM equipments used by B/RB-47 wings. Procedures will cover AN/ALT-6, AN/ALT-8, and AN/ALT-7 transmitters, AN/APS-54 receivers, and AN/ALE-1 chaff dispenser as used in B/RB-47 Aircraft Phases III, IV, and

*. Full report of tests since inception of this project will be found in SAC-U30-April, Exhibit 10; SAC-U30-May, Exhibit 11; SAC-U30-June, Exhibit 12; and SAC-U30-July, Exhibit 13.
29. SAC-U30-April, Exhibit 10.
30. SAC-U30-July, Exhibit 13.
31. SAC-U30-June, Exhibit 12.

IVA with or without the pod.[32] (C)

Final report on this test project is being prepared for printing and distribution. Procedures for ECM pre and post-flights have been divided into four maintenance phases.* (U)

Test Project Number 44, "Improved B-47 Passive Detection Capability Using Installed Radar Components.[33] (U)

This project was initiated on 11 June 1956, and the estimated date of completion is not presently known. (U)

Summary. Purpose of this test project is to determine utility of the antenna and waveguide components in presently installed active radar systems, B-47 aircraft, as elements of a passive detection system.[34] (S)

A conference was held at Barksdale AFB on 30 July 1956, at which time the proposed test program was reviewed with a representative from Headquarters SAC (DOPLT). Following the conference, the test program was completed, and has been submitted for SAC approval.[35] (U)

Test Project Number 45, "Test of X-Band Antennas for AN/APS-54". (U)

This project was initiated on 8 June 1956, with an estimated date of completion for March 1957. (U)

Summary. The purpose of this test project is to determine capability of an experimental X-band antenna detector for the AN/APS-54, which is designed to receive X-band signals only.[37] (S)

The test program for this project has been submitted to SAC for Approval. (U)

Test Project Number 46, "Test of Phase V ECM Capsule."[38] (S)

This project was initiated 13 September 1955, and the estimated date of

32. IBID
* . Four phases described on page 22, SAC-U30-June, Exhibit 12.
33. SAC-U30-July, Exhibit 13.
34. IBID 36. IBID
35. IBID 37. IBID 38. IBID

completion is presently not known.(U)

Summary. Purpose of this project is to test the tactical suitability of Phase ECM capsule.(S)

A briefing on this test project was presented to the SAC Penetration Panel and other SAC staff personnel 7 and 8 August 1956. At the conclusion of that meeting an effort was to be made to determine what further testing is required on the capsule.[39] (C)

Test Project Number 32, "Cell Support Test".[40] (S)

This test project was initiated on 17 February 1955, and there is no estimated date of completion as it is on a continuous basis.(U)

Summary. Purpose of this project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars.[41] (S)

Missions were flown on this project during April, May, and July. Because of the small number of flying hours allotted for June it was decided by DCTT to allocate those hours to further complete Test Project Number 37. The missions flown on Test Project Number 32 are described in detail in the supporting documents in the appendix of this history.* (U)

39. IBID
40. SAC-U30-April, Exhibit 10.
41. IBID
* : SAC-U30-April, Exhibit 10; SAC-U30-May, Exhibit 11; and SAC-U30-July, Exhibit 13.

CHAPTER IV

MAINTENANCE

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MAINTENANCE

April

B-47 Aircraft. The 376th Bombardment Wing, Medium had 51 B-47 aircraft assigned during April with an average of 41 aircraft possessed for the month. The average in-commission rate was 87.25 percent. There was a total of 991:05 hours flown for an average of 24:10 hours per possessed aircraft.[1] (U)

KC-97 Aircraft. The Wing had 22 KC-97 aircraft assigned during April with an average of 19 aircraft possessed for the month. The average in-commission rate was 83.30 percent. There was a total of 546:10 hours flown for an average of 28:45 hours per possessed aircraft.[2] (U)

Maintenance Man-hours. There were 211,121.7 man-hours assigned during April with 151,319.5 man-hours available for work. There were 4,364.4 man-hours expended during the month on overtime which was 2.9 percent of the available man-hours. Of the total man-hours available, there were 68,595.7 hours expended on direct time or 45.3 percent. There were 80,132.9 man-hours spent on productive indirect codes or 53.0 percent. There was also 2,591.1 man-hours or 1.7 percent of the available time expended on non-productive work. Of the total man-hours assigned, there were 63,690.3 hours or 30.2 percent spent on absent codes.[3] (U)

Aborts and Malfunctions. During April there were nine aborts and 13 malfunctions for B-47 aircraft and seven aborts and zero malfunctions for KC-97 aircraft.[4] (U)

Engine Changes. There were ten engine changes for B-47 aircraft during April and four changes for KC-97 aircraft. The average engine time at

1. 376 BOMBWGM Maintenance Report for April 1956, hereafter cited as 376 Main Rpt - April. Exhibit 16
2. Ibid
3. Ibid
4. Ibid

change was 420 hours for B-47 aircraft and 397 hours for KC-97 aircraft.

Technical Order Compliance. During the month there were 42 Technical Orders complied with on KC-97 aircraft and 416 Technical Orders complied with on B-47 aircraft.

Supply Liaison. There were 36 total cannibalizations for the month of April, 16 for B-47 aircraft and 20 for KC-97 aircraft. Ten major line items were AOCP during the month. The AOCP rate was 1.92 percent for B-47 aircraft and 6.84 percent for KC-97 aircraft. The ANFE (aircraft not fully equipped) rate was 10.49 percent for B-47 aircraft and 18.03 percent for KC-97 aircraft. (U)

Quality Control Unit. During April the Quality Control Unit conducted quality inspections on seven B-47 aircraft, three KC-97 aircraft processed through 376th Periodic Maintenance Squadron docks, and two C-124 aircraft processed through 3rd Strategic Support Squadron docks. Flight line (In-commission) inspections were conducted on 13 B-47 aircraft, five KC-97 aircraft, and three C-124 aircraft. There were eight jet engine and two reciprocating engine installations inspected during the month. Nine B-47, 10 KC-97, and three C-124 test flights were supervised by the Quality Control Unit.[5] (U)

B-47 Aircraft.[6] The May ing had 50 B-47 assigned during May with an average of 41 aircraft possessed. The average in-commission rate was 83:25 percent for the month. There was a total of 1,224:50 hours flown for an average of 29:52 hours per possessed aircraft. (U)

KC-97 Aircraft. There were 22 KC-97 aircraft assigned for the month with an average of 16 aircraft possessed. The average in-commission rate was 74:67 percent. There was a total of 464:20 hours flown for an average of

5. Ibid

6. 376 BOMWGM Maintenance Report for May 1956, hereafter cited as 376 Main Rpt - May. Exhibit 17

29:01 hours per possessed aircraft. (U)

Maintenance Man-hours. In May there were 208,709:7 man-hours assigned with 157,322:5 mon-hours available for work. There were 7,307:7 man-hours expended during the month on overtime or 4.65 percent of the available man-hours. Of the total man-hours there were 67,754:1 hours expended on direct time or 43.07 percent. There were 86,693.2 man-hours spent on productive indirect codes or 55.11 percent. There were also 2,875:7 man-hours or 1.83 percent expended on non-productive work. Of the total man-hours assigned there were 57,665:1 hours or 27.63 percent spent on non-available codes. (U)

Aborts and Malfunctions. For the month there were 19 aborts and 29 malfunction for B-47 aircraft and seven aborts and three malfunctions for KC-97 aircraft. (U)

Engine Changes. A total of six B-47 engines were changed during May, with an average time at change of 389 hours. There were three KC-97 engines changed with an average time at change of 334 hours. (U)

Technical Order Compliance. During May there were 58 technical orders complied with on KC-97 aircraft and 387 on B-47 aircraft. (U)

Supply Liaison. Total cannibalizations for May was 56, with 23 for B-47 aircraft, 32 for KC-97 aircraft and one C-124 aircraft. There were 57 major line items that were AOCP during the month, with an AOCP rate of 6.51 percent for B-47 aircraft and 7.91 percent for KC-97 aircraft, computed on a daily basis. The ANFE rate was 14.22 percent for B-47 and 7.22 percent for KC-97 aircraft. (U)

Quality Control Unit. During May there were conducted quality inspections on 13 B-47 aircraft, six KC-97 aircraft, and three C-124 aircraft on the flight line (In-commission). Quality inspections were conducted of four

B-47, three KC-97, and three C-124 aircraft processed through Periodic Maintenance docks. The Unit processed and supervised test flights on 13 B-47, five KC-97, and nine C-124 aircraft during the month. There were four jet and four reciprocating engine change installations inspected during the month.[7] (U)

June[8]

B-47 Aircraft. The Wing had 50 B-47 aircraft assigned during June with an average of 41 aircraft possessed. The average in-commission rate was 81.34 percent for June, compared to 83.25 percent for May. There was a total of 1,117:50 hours flown for an average of 27:16 hours per possessed aircraft. (U)

KC-97 Aircraft. The Wing had 22 KC-97 aircraft assigned during June with an average of 17 aircraft possessed. The average in-commission rate for the month was 79.84 percent. There was a total of 525:50 hours flown for an average of 30:56 hours per possessed aircraft. (U)

Maintenance Man-hours In June there were 193,467:8 man-hours assigned with 147,395:9 man-hours available for work. There were 7,813:5 man-hours expended during the month on overtime or 5.30 percent of the available man-hours. Of the total man-hours available there were 66,417:4 hours, or 45.06 percent, expended on direct time. There were 79,780:4 man-hours spent on productive indirect codes or 54.12 percent. There were also 1,198:1 man-hours or 0.8 percent spent on non-productive work. Of the total man-hours assigned there were 53,038:6 hours or 27.41 percent spent on non-available codes.

Aborts and Malfunctions. During June there were 26 aborts and 35 malfunctions for B-47 aircraft, and nine aborts and one malfunction for

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7. Ibid
8. 376 BOMWGM Maintenance Report for June 1956, hereafter cited as 376 Main Rpt - June. Exhibit 18

KC-97 aircraft.

Engine Changes. A total of five B-47 and 6 KC-97 engines changed during the month of June, The average time at change was 361 hours for B-47 and 303 hours for KC-97 aircraft. (U)

Supply Liaison. The total cannibalizations for the month of June was 24, with 33 for B-47 aircraft and 21 for KC-97 aircraft. -here were eight major line items that were AOCP during the month. The AOCP rate was 9.56 percent for B-47 aircraft and 11.11 for KC-97 aircraft. The ANFE rate was 9.56 percent for B-47 aircraft and 22.[illegible]2 percent for KC-97 aircraft. (U)

Quality Control Unit. During the month of June, the 376th Bombardment Wing, Medium, Quality Control Unit conducted quality inspections of 12 B-47 aircraft, five KC-97 aircraft and three C-124 aircraft on the flight line (In-commission). Quality inspections were conducted on four B-47, two KC-97, and two C-124 aircraft processed through Periodic Maintenance docks. The Unit processed and supervised test flights on 11 B-47, 18 KC-97, and four C-124 aircraft during the month. There were five jet and five reciprocating engine changes installations inspected during the month.[9] (U)

July [10]

B-47 Aircraft. The Wing had 50 B-47 aircraft assigned with an average of 42 aircraft possessed for the month of July. The average in-commission rate was 80.82 percent. There was a total of 1,234.45 hours flown for an average of 29.24 hours per possessed aircraft.(U)

KC-97 Aircraft. The Wing had 22 KC-97 aircraft assigned during July with an average of 18 aircraft possessed for the month. The average in-commission rate was 80.42 percent. There was a total of 590.15 hours flown for an average of 32.48 hours per possessed aircraft. (U)

9. IBID 10. 376 BOMWG Maintenance Report for July 1956, hereafter cited as 376 Main Rpt - July, Exhibit 19.

Maintenance Man-hours. In July there were 209,057.4 man-hours assigned with 160,272.9 man-hours available for work. There were 11.032.9 man-hours expended during the month on overtime, or 6.9 percent, of the available man-hours. There were 71.504.7 hours , or 44.6 percent, spent on direct time. There were 85,406.0 man-hours spent on productive indirect codes, or 53.29 of the available man-hours. There were also 3,362.2 man-hours,or 2.10 percent, expended on non-productive work. Of the total man-hours assigned there were 59,455.1 hours, or 28.44 percent, spent on non-available codes.(U)

Aborts and Malfunctions. During July there were 21 aborts and 28 malfunctions for B-47 aircraft and five aborts and one malfunction for KC-97 aircraft.(U)

Engine Changes. There were seven B-47 engines changed during July, and two KC-97 engines were changed. The average engine time a t change was 313 hours for B-47 aircraft and 138 hours for KC-97 aircraft.(U)

Supply Liaison. There were 48 B-47 and 14 KC-97 aircraft cannibalizations during July. Nine major line items were AOCP during the month. The AOCP rate was 6.75 percent for B-47 and 5.73 for KC-97 aircraft. The ANFE rate was 8.33 percent for B-47 aircraft and 19.54 percent for KC-97 aircraft.(U)

Quality Control Branch. During July the 376th Bombardment Wing, Medium, Quality Control Branch conducted quality inspections on 11 B-47 aircraft, four KC-97 aircraft, and three C-124 aircraft on the flight line (In-commission). Quality inspections were conducted on seven B-47, two KC-97, and three C-124 aircraft processed throught Periodic Maintenance docks. The Branch processed and supervised test flights on 15 B-47, four KC-97, and four C-124 aircraft during July. There were one jet and two reciprocating engine change installations inspected during the month.[11] (U)

11. IBID

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August[12]

B-47 Aircraft. The Wing had 52 B-47 aircraft assigned during August with an average of 39 aircraft possessed for the month. The average in-commission rate was 82.39 percent. There was a total of 1192.55 hours flown for an average of 30.35 hours per possessed aircraft.(U)

KC-97 Aircraft. The Wing had 21 KC-97 aircraft assigned during August with an average of 19 aircraft possessed for the month. The average in-commission rate was 87.4 percent. There was a total of 597.30 hours flown for an average of 31.27 hours per possessed aircraft. (U)

Maintenance Man-Hours. In August there were 200,520.0 man-hours assigned with 165,665.1 manhours available for work. There were 10,252.3 man-hours expended during the month on overtime or 6.18 percent of the available man-hours. Of the total man-hours available there were 80,322.3 hours, or 48.48 percent, expended on direct time. There were 83,517.3 man-hours spent on productive indirect codes or 50.41 percent of the available man-hours. There were also 1,826.4 man-hours, or 1.10 percent, spent on non-productive work. Of the total man-hours assigned there were 44,968.5 hours, or 22.42 percent, spent on non-available codes.

Aborts and Malfunctions. During August there were 22 aborts and 28 malfunctions for B-47 aircraft, and 15 aborts and one malfunction for KC-97 aircraft. (U)

Engine Changes. A total of nine B-47 and five KC-97 engines were changed during August. The average engine time at change was 624 hours for B-47

12. 376 BOMWGM Maintenance Report for August, 1956, hereafter cited as 376 Main Rpt - August, Exhibit 20 .

and 507 hours for KC-97 aircraft.(U)

Supply Liaison. There were 41 B-47 and 17 KC-97 aircraft cannibalized during the month. Rate of climb indicators and fuel system components caused the majority of ACCP's for the month. The ACCP rate was 2.45 percent for B-47 and 1.01 percent for KC-97 aircraft during August. The ANFE rate was 8.89 precent for B-47 and 16.19 percent for KC-97 aircraft for the month. (U)

Quality Control Branch. During the month of August the Quality Control Branch conducted quality inspections on 11 B-47, five KC-97, and three C-124 aircraft on the flight line (In-commission). There were quality inspections conducted on seven B-47, one KC-97, and three C-124 aircraft processed through Periodic Maintenance docks. The Branch processed and supervised test flights on 14 B-47, 15 KC-97, and seven C-124 aircraft. There were 13 jet and three reciprocating engine change installations inspected during the month.[13] (U)

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13. IBID

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APPENDIX

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SUPPORTING DOCUMENTS

EXHIBIT NUMBER	DESCRIPTION
1	Bomb Air Trng Rpt; April 1956 (RCS:3-SAC-T12), 376 BOMWGM. (S)
2	Bomb Air Trng Rpt; May 1956 (RCS:8-SAC-T12), 376 BOMWGM. (S)
3	Bomb Air Trng Rpt; June 1956 (RCS:8-SAC-T12), 376 BOMWGM. (S)
4	Bomb Air Trng Rpt; July 1957 (RCS;8-SAC-T12), 376 BOMWGM. (S)
5	Bomb Air Trng Rpt; August 1956 (RCS:8-SAC-T12), 376 BOMWGM. (S)
6	Refuel Air Trng Rpt; April 1956 (RCS:4-SAC-T12), 376 BOMWGM. (S)
7	Refuel Air Trng Rpt; May 1956 (RCS:9-SAC-T12), 376 BOMWGM. (S)
8	Refuel Air Trng Rpt; June 1956 (RCS:9-SAC-T12), 376 BOMWGM. (S)
9	Refuel Air Trng Rpt; July 1956 (RCS:9-SAC-T12), 376 BOMWGM. (S)
10	Test Progress Rpt, 376 BOMWGM(RCS:SAC-U30), for April 1956, dated 9 May 1956.(S)
11	Test Progress Rpt, 376 BOMWGM(RCS:SAC-U30), for May 1956, dated 7 June 1956.(S)
12	Test Progress Rpt, 376 BOMWGM(RCS:SAC-U30), for June 1956, dated July 1956. (S)
13	Test Progress Rpt, 376 BOMWGM(RCS:SAC-U30), for July 1956, dated 7 August 1956.(S)
14	Final Report, Test Project # 38, July 1956, 376 BOMWGM.(S)
15	Final Report, Test Project # 39, July 1956, 376 BOMWGM. (S)

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EXHIBIT NUMBER	DESCRIPTION
16	Maintenance Rpt, 376 BOMWGM, April 1956 (U)
17	Maintenance Rpt, 376 BOMWGM, May 1956 (U)
18	Maintenance Rpt, 376 BOMWGM, June 1956 (U)
19	Maintenance Rpt, 376 BOMWGM, July 1956 (U)
20	Maintenance Rpt, 376 BOMWGM, August 1956 (U)

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1

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of April 1956 - RCS: 3-SAC-T12

I concur with the remakrs of the Wing Commander.

FOR AND IN THE ABSENCE OF

John W. Carroll Col USAF

M. A. PRESTON
Brigadier General, USAF
Commander

6-1360-4

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMBOMWGM, 376TH
INITIALS [illegible]
8 May 1956

WING COMMANDER'S REMARKS

PART V

Bombardment Air Training Report for April 1956
(RCS: 3-SAC-T12)

PART V.

6. Wing Commander's Remarks - Part V.

a. Hours flown performing missions ordered by higher headquarters:

(1)	ECM Tests	164:30
(2)	Ferrying aircraft to and from Modification Depot:	18:20
(3)	Fly-over participation "Holiday in Dixie"	6:30
	TOTAL	208:50

b. Weather or local conditions affecting training:

(1) During the month of April, nine (9) aircraft sorties of 6 hours duration each were lost due to local weather conditio

c. Directives imposed by AMC or SAC on aircraft:

(1) None

d. Combat crew member gains or losses:

(1) Gains: 12 Co-Pilots
2 Observers

(2) Losses: 1 AIRCOM

e. Crew member changes:

(1) One AIRCOM

(2) Two Co-Pilots

(3) Three Observers

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(4) Another factor which will affect future training is the projected increase in operational requirements with no effective increase in the manning of the Tactical Squadron maintenance organizations. The average manhour cost per sortie for the Wing is 31.9 hours less than the SAC average. Further reduction would effect the quality of maintenance. The limitation imposed by manning in the Tactical Squadrons indicates a capability of a maximum of 10 sorties per day or 220 sorties.

(5) Aircraft availability will also affect the number of sorties produced. Although the IRAN in-put for fiscal year 1957 is unknown an estimate of two (2) B-47 aircraft each month in-put will involve 10 to 14 aircraft in the program. These are all Blue Cradle modified aircraft. Eight of the aircraft presently assigned are not cradle modified. These aircraft make no contribution to the Wing EWP and Test and Tactics program nor can they be fully utilized for training.

(6) Officer manning in AFSC's 1234B and 1245 remains critical. At present, of the 132 authorized, 104 are assigned with a projected gain of one for a projected manning of 79.3%. However, of the 105 assigned and or projected, 43 are not qualified in tactical aircraft and are undergoing formal training.

(7) Officer manning in the Armament career field (3244/3254 has become critical. At the present, of twelve (12) authorized, eight (8) are assigned with a projected loss of two for a projected manning of 50 percent.

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Wing Commander's Remarks, 376th Wing Air Training Report for April 1956

f. New Crews:

(1) IN 63 formed, 20 April 1956

(2) IN 89 formed, 23 April 1956

g. Crew Status Changes:

(1) N42 to R42, Upgraded

(2) IN61 to N61, Upgraded

(3) IN62 to N62, Upgraded

h. Standardization Crews:

(1) S09, Wing Standardization Crew.

(2) S11, S1[illegible], and [illegible] are Squadron Standardization Crews.

i. Additional Materiel and Personnel Problems:

(1) The ANFE rate of 1[illegible].49 for April seriously affected the capability of the Wing Maintenance organization to furnish the required aircraft to meet operational requirements. Much of this high rate can be attributed to the A-5 gunnery system components.

(2) Radar scope cameras, returned from IRAN with the MA-7A systems cannot be used with the 10" scopes. Navigation flights cannot be scored. This renders six aircraft in-effective for this phase of training.

(3) Lack of parts for the MA-7A system has prevented completion of required Mock-up. Until the Mock-up is in operation, it is not possible to determine the cause of malfunctions in th aircraft systems. After the mock-up is completed, avail-ability of parts and test equipment will be the determining factor.

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(8) Officer manning in the Supply career field (AFSC's 6416/6424) is due to become critical. Of the twelve (12) authorized, eleven (11) are presently assigned with a projected loss of five (5) and no known input for a projecte manning of 50%.

(9) Effective manning in the airman career fields considered critical are indicated below:

AFSC	AUTH	ASGD P	KNOWN LOSSES	PROJECTED MANNING
204	11	7	1	55%
401	3	1	0	33 1/3%
423	79	51	3	61%
451	5	2	0	40%
462	34	27	4	68%
534	49	27	2	51%
603	24	14	1	54%
702	96	63	1	65%
903	3	1	0	33 1/3%

NOTE: Number airman assigned in April - 42
Number airman lost in April - 65

j. SAC Minimum Training Requirements not Accomplished:

(1) Not applicable.

k. Non-Combat Ready Crews Capable of Deploying:

(1) This paragraph rescinded per Second Air Force message DOTC 3432, 23 January 1956.

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Wing Commander's Remarks, 376th Wing Air Training Report for April 1956

1. Non-Combat Ready Crew Training:

(1) Eighty-two (82) sorties for a total of 452 hours were flown as 5X time in training Staff personnel and non-combat ready crew personnel. An average of 20.8 crew members were available for 51-19 training during the month of April. They flew a total of 828.3 hours for an average of 39.8 hours per available crew member. In addition to the above, 54 hours scheduled were cancelled due to weather and 51 hours were cancelled due to maintenance. Since all IN crew members were scheduled to the maximum, it was impossible to make up this time by rescheduling. One crew member was DNIF for 17 days and two others were DNIF for eight days each, resulting in further loss of IN crew flying time. The following non-combat ready crews are estimated to be combat ready on dates indicated:

(a)	IN 21	To be disbanded due to AIRCOM grounded indefinately.
(b)	IN 60	1 August 1956
(c)	IN 63	1 September 1956
(d)	IN 86	1 September 1956
(e)	IN 89	1 August 1956
(f)	IN 59	1 November 1956
(g)	N 61	1 August 1956
(h)	N 62	1 August 1956

NOTE: The apparent excessive time interval in projected upgrading is due to the fact that the above listed crews are actually serving as training pool crews for the purpose of training non-combat ready co-pilots to combat ready status. This is required in order that combat ready co-pilots schedule for upgrading can be replaced without hindering the EWP commitment.

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Wing Commander's Remarks, 376th Wing Air Training Report for April 1956

m. Field Training Operations:

(1) Test of Facilities: None.

(2) Exercise: None.

(3) Maneuvers: None.

n. Special Training Month Remarks:

(1) Training programmed during April was projected toward maxim training under SAC Regulation 51-19 for both pilots and observers ninety one percent of the overall projected program was accomplished; however, observer training requirements were under flown due to the increased need for co-pilots upgrading. Air refueling and co-pilots transition received the major portion of available flying time.

(2) Seven co-pilots completed aircraft commander upgrading and are now awaiting qualified co-pilot replacement necessary prior to forming new crews.

o. Comments or Recommendation of the Wing Commander:

(1) The average number of combat/ready/lead and select crews assigned during April was 32. A total of 463 hours (excluding test flight time) was flown for an average of 14:28 hours per crew.

(2) The average number of assigned aircraft during April was 51. The average number of aircraft in IRAN Modification during April was eight. An average of two aircraft were undergoing Drag Angle repairs. The average number of possessed aircraft was 41.

(3) Reference Second Air Force message DOTG 2628, 14 June 1955,

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Wing Commander's Remarks, 376th Wing Air Training Report for April 1956

Subject: Report of Injuries Sustained Due to Judo:

(a) None.

(4) Reference Second Air Force message DOTR 5616, 26 August 1955, Subject: Restricted Refuelings:

(a) None.

Stephen D. McElroy
STEPHEN D. MC ELROY
Colonel, USAF
Commander

Secret

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

2

Division Commander's Remarks

Section J

Air Training Report for the Month of May, 1956 - RCS: 8-SAC-T12

I concur with the remarks of the wing Commander.

Stephen D. McElroy
STEPHEN D. McELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMBOMWGM, 376TH
INITIALS
8 June 1956

WING COMMANDER'S REMARKS

PART IV.

Medium Jet ECM Support Air Training Report for May 1956
(RCS: 8-SAC-T12)

PART IV.

6. Wing Commander's Remarks - Part IV.

a. Hours flown performing missions ordered by higher headquarters:

(1) Ferry aircraft: 23:45

(2) Armed Forces Day Flyover Practice: 25:50

TOTAL 49:35

b. Weather or local conditions:

(1) A total of 9 sorties were lost due to weather.

c. Air Traffic control delay information.

ATC DELAYS

TYPE	TOTAL NUMBER	TOTAL TIME
Depart	23	4:07
Arrivals	None	None
Total	23	4:07

DELAYS AFFECTING UNIT MISSIONS

DATE	TYPE	TOTAL ACFT INVOLVED	TOTAL TIME INVOLVED

"Not Applicable this reporting period."

DELAYS OVER 30 MINUTES

DATE	TYPE	TIME LOST	REASON FOR DELAY
2 May 1956	Departure	33 minutes	Could not get ATC clearance due to WX.

Secret

d. Restrictive Directives:

(1) Not applicable for this reporting period.

e. Combat crew member gains and losses:

(1) Crew members gained:

3 Co-Pilots

2 Observers

(2) Crew members lost.

2 Co-Pilots

4 Observers

f. Crew member changes:

Five co-pilots

Two observers

g. New crews:

(1) Not applicable for this reporting period.

h. Crew status changes:

(1) IN21 disbanded, 1 May 1956.

(2) IN60 disbanded, 22 May 1956.

(3) IN59 disbanded, 22 May 1956.

(4) R78 disbanded, 1 May 1956.

(5) L02 to R02, 31 May 1956. Downgraded.

(6) R52 to L52, 24 May 1956. Upgraded.

i. Standardization crews:

(1) S11 1 December 1954

(2) S09 9 January 1956

(3) L08 30 April 1956

(4) S16 30 July 1955

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(5) S69 30 April 1956

(6) S70 18 November 1954

j. Additional materiel and personnel problems:

(1) The ACCP rate for the month of May was excessive (6.51%) resulting in the cancellation of nine (9) sorties. This lack of supply support resulted in 23 cannabalizations in order to prevent losing even more missions.

(2) Drag angle modification resulted in the loss of 71 aircraft days while the aircraft were at the depot for repair.

(3) Officer manning in the Armament career field (AFSC's 3244/3254) is considered critical of the twelve (12) authorized, eight (8) are presently assigned with a projected loss of two (2) and no known inputs for a projected manning of 50%.

(4) Effective manning in the airman career fields considered critical are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
204	11	6	0	54%
423	79	56	2	68%
451	5	2	0	40%
603	24	13	1	50%
672	1	0	0	0%
903	3	1	0	33%
907	1	0	0	0%
908	1	0	0	0%

Secret

k. Refueling Data:

(1) Number of refueling sorties scheduled and confirmed: 33

(2) Number of sorties:

(a) Airborne: 33

(b) Effecting complete electronic rendezvous: 29

(c) Transferring required fuel: 32

(3) Number of aborts due to:

(a) Adverse weather: None

(b) Aircraft malfunction: None

(c) Electronic rendezvous equipment malfunction: None

(d) Refueling equipment malfunction: None

(e) Other causes: 1 Tanker Abort.

(4) Mass night cell refueling:

(a) Not applicable for this reporting period.

l. Comments or recommendation of the wing commander:

(1) The average number of combat ready/lead/select crews assigned during May was 32. A total of 661 hours (excluding test flight time) was flown for an average of 20.5 hours per crew.

(2) The average number of assigned aircraft during May was 50. The average number of aircraft in IRAN modification during May was 9. The average number of possessed aircraft was 41. A total of 1206 hours was flown for an average of 29.4 hours per possessed aircraft.

(3) An average of 29.3 non-combat ready crew members were available for training during the month of May. They

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S E C R E T

Wing Commander's Remarks, 376th Wing Air Training Report for May 1956

flew a total of 1019.05 hours for an average of 34.8 hours per available crew member. In addition to the above, four pilots were undergoing advanced flying training at McConnell AFB, ten pilots were undergoing local MTD training and five observers were undergoing phase II training at McConnell AFB.

(4) Sixty-five (65) sorties for a total of 373 hours were flown as EX time in training staff personnel and non-combat ready crew members. Eleven pilots presently assigned co-pilots on combat ready/lead/select crews have been checked out as aircraft commanders but cannot be used as such until newly assigned pilots are qualified to replace them.

(5) Reference "2AF message DOTO 10132, 19 April 1956, Subject: Hi Jinks RBS Runs. The following information is submitted:

(a) Thirty-two (32) combat ready crews and one non-combat ready crew have been checked out. No crews programmed to be checked out in June 1956. No difficulties encountered as of this date.

Stephen D. McElroy

STEPHEN D. MC ELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

3

Division Commander's Remarks

Section J

Air Training Report for the Month of June , 1956 - RCS: 8-SAC-T12

I concur with the remarks of the Wing Commander.

Stephen D. McElroy
STEPHEN D. McELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMBOMWGM, 376TH
INITIALS Murphy
9 July 1956

WING COMMANDER'S REMARKS

PART IV

Medium Jet ECM Support Air Training Report for May - June 1956
(RCS: 8-SAC-T12)

PART IV.

6. Wing Commander's Remarks - Par 5 IV.

a. Hours flown performing missions ordered by higher headquarters:

(1) Ferry aircraft: 37:10

(2) Armed Forces Day Flyover (Practice): 25:50

Total 63:00

b. Weather or local conditions:

(1) A total of 9 sorties were lost due to weather during the month of May 1956.

c. Air Traffic control delay information:

ATC DELAYS

TYPE	TOTAL NUMBER	TOTAL TIME
Depart	30	5:09
Arrivals	None	None
Total	30	5:09

DELAYS AFFECTING UNIT MISSIONS

DATE	TYPE	TOTAL ACFT INVOLVED	TOTAL TIME INVOLVED

"Not applicable this reporting period."

DELAYS OVER 30 MINUTES

DATE	TYPE	TIME LOST	REASON FOR DELAY
2 May 56	Departure	33 minutes	Could not get ATC clearance due to weather.

Secret

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d. Restrictive Directives:

(1) Not applicable for this reporting period.

e. Combat crew member gains and losses:

(1) Crew members gained:

8 Co-Pilots

4 Observers

(2) Crew members lost:

2 AIRCOM

2 Co-Pilots

4 Observers

f. Crew member Changes:

Five AIRCOM

Seven Co-Pilots

Three Observers

g. New crews:

(1) One new crew formed during the month of June:

IN 64 13 June 1956

h. Crew Status changes:

(1) IN 21 disbanded, 1 May 1956.

(2) IN 60 disbanded, 22 May 1956.

(3) IN 59 disbanded, 22 May 1956.

(4) R 78 disbanded, 1 May 1956.

(5) L 02 to R 02, 31 May 1956. Downgraded.

(6) L 06 to R 06, 20 June 1956. Downgraded.

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(7) S37 to L37, 11 June 1956. Downgraded.

(8) R45 to N45, 7 June 1956. Downgraded.

(9) S82 to L82, 11 June 1956. Downgraded.

(10) N86 to IN86, 18 June 1956. Downgraded.

(11) R52 to L52, 24 May 1956. Upgraded.

(12) N61 to R61, 7 June 1956. Upgraded.

i. Standardization crews:

(1) S16 30 July 1955

(2) S09 9 January 1956

(3) L08 30 April 1956

(4) L37 25 April 1956

(5) S69 30 April 1956

(6) S70 18 November 1956

j. Additional materiel and personnel problems:

(1) The AOCP rate for the month of June (9.56%) was extremely high as compared to May (6.51%). Primary items short were refrigeration units, fuel cells and baffles (stock number AFE-7-3674-24-25). A total of 21 sorties were lost during May/June due to AOCP shortages.

(2) An average of two aircraft were undergoing drag angle repairs during June resulting in a loss of 131 aircraft days during May/June.

(3) Officer manning in armament 32 career field (~~AFSC's 3244/3264~~) still remains critical. Of the ~~twelve (12)~~ 11 authorized, eight (8) are presently assigned with a projected loss of one and no known input for a projected manning of ~~58.3~~ 63.6 percent.

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(4) Officer manning in the Supply career field is also becoming critical. Of the twelve (12) authorized, eight (8) are presently assigned with a projected loss of one and no known input for a projected manning of 58.3 percent.

(5) Effective manning in the airman career fields considered critical are indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
204	11	7	0	64
401	3	2	0	67
422	33	25	3	67
451	4	1	0	25
603	24	15	2	54
702	96	69	2	70
903	3	1	0	33

k. Refueling Data:

(1) Number of refueling sorties scheduled and confirmed: 77

(2) Number of sorties:

(a) Airborne: 74

(b) Effecting complete electronic rendesvous: 49

(c) Transferring required fuel: 70

(3) Number of aborts due to:

(a) Adverse weather: N one

(b) Aircraft malfunction: Three

(c) Electronic rendezvous equipment malfunction: None

(d) Refueling equipment malfunction: None

(e) Other causes: Three (3) tanker aborts. One radio failure.

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(4) Mass night cell refueling:

(a) Confirmed sorties: 24

(b) Airborne sorties: 24

(c) Sorties effecting complete rendezvous: 2

(d) Sorties transferring required fuel: 21

1. Comments of recommendation of the wing commander:

(1) The average number of combat ready/lead/select crews assigned during May/June 1956 was 32. A total of 1279 hours (excluding test flight time) was flown for an average of 39:58 hours per crew.

(2) The average number of assigned aircraft during May/June was 50. The number of aircraft in IRAN modification during May/June was 11. The average number of possessed aircraft was 41. A total of 2313 hours was flown for an average of 56:25 hours per possessed aircraft.

(3) An average of 39.2 non-combat ready crew members were available for training during the months of Man and June. They flew a total of 2024:05 hours for an average of 67 hours per available crew member. In addition to the above, seven pilots were undergoing advanced flying training at McConnell AFB, eleven pilots were undergoing local MTD training and six observers were undergoing Phase II training at McConnell AFB.

(4) One-hundred forty-four (144) sorties for a total of 765 hours were flown as SX time in training staff personnel

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and non-combat ready crew members. Eleven pilots presently assigned co-pilots on combat ready/lead/select crews have been checked out as aircraft commanders but cannot be used as such until newly assigned pilots are qualified to replace.

(5) Reference Annex I, SAC Regulation 50-5, dated 13 April 1956. The subject of "M" crew members and "IN" crew members as outlined in the regulation is considered unsatisfactory in that reporting is extremely difficult. Crews may change categories several times each month during the course of upgrading. Recommend that the definition of an "IN" crew be defined as a crew of which one or more crew members have not satisfactorily completed the requirements of Annex XIII, SAC Regulation 51-19. In addition, this definition will reflect a true reporting potential by crew category.

(6) Reference Second Air Force message DOTO 10132, 19 April 1956, Subject: Hi Jinks RBS Runs. The following information is submitted:

(a) Thirty-two (32) combat ready crews and one non-combat ready crew have been checked out. No crews programmed to be checked out in July 1956. No difficulties encountered, as of this date.

Stephen D. McElroy
STEPHEN D MC ELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of July, 1956
RCS: 8-SAC-T12

4

I concur with the remarks of the Wing Commander.

A J Russell

A. J. RUSSELL
Colonel, USAF
Commander

6-2096-4

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376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: CO, 376TH
INITIALS
9 August 1956

WING COMMANDER'S REMARKS

Section IV

Air Training Report for month of July 1956

RCS: 8-SAC-T12

a. Hours flown performing missions ordered by higher headquarters:

(1)	Ferrying Aircraft to and from Depot:	77:40
(2)	Armed Forces Day Flyover (Practice)	25:50
(3)	Test & Tactics Directed Missions	118:55
(4)	ECM Support Missions in Conjunction with Operation "Devil Fish"	44:10
(5)	Support of Operation "Cactus Plant"	7:10
(6)	Operation "Corn Belt"	112:10
	TOTAL	385:55

b. Weather or local conditions:

(1) A total of nine (9) sorties were lost due to weather during the month of May 1956.

c. Air traffic control delay information:

ATC DELAYS

TYPES	TOTAL NUMBER	TOTAL TIME
Departure	33	5:32
Arrivals	None	None
Total:	33	5:32

DELAYS AFFECTING UNIT MISSIONS

"Not applicable this reporting period"

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

DELAYS OVER 30 MINUTES

DATE	TYPE	TIME LOST	REASON FOR DELAY
2 May 1956	Departure	33 minutes	Could not get ARTC clearance due to weather.

d. Restrictive directives:

(1) Reference SAC message DMAC 11-25-53648, dated 27 June 1956 and Second Air Force message "Zippo" 07-040, dated 7 July 1956 pertaining to magnetic inspection of KC-97 aircraft propellers. The restriction imposed by this message caused the lost of four (4) air refueling sorties.

(2) Reference SAC message DO1560, dated 9 July 1956, which is an amendment t to messages cited above. The restriction limiting KC-97 aircraft to a maximum gross weight take-off of 155,000 pounds reduces the amount of JP-4 fuel that can be off-loaded to B-47 receivers, thereby reducing sortie duration by approximately one hour. This restriction has caused the loss of approximately 50 hours.

e. Combat crew member gains and losses:

(1) Crew members gained:

Five AIRCOM (Untrained)

Eight Co pilots (Untrained)

Seven Observers (Untrained)

(2) Crew members lost:

Two AIRCOM (Combat Ready). One discharged and one transferred to Turner AFB.

Two Co Pilots (Non-combat Ready). Two transferred to 301st Bomb Wing.

Seven Observers. One DNIF due to heart attack, one awaiting courts martial, one transferred to SEG FLA., one transferred to Wright-Patterson, one to 4AD, one to Lowry AFB and one transferred to Loring AFB.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

g. New crews:

(1) IN64 13 June 1956

(2) IN22 23 July 1956

(3) N23 27 July 1956

(4) IN24 31 July 1956

(5) IN65 25 July 1956

(6) N66 25 July 1956

(7) IN90 25 July 1956

(8) IN91 26 July 1956

(9) N92 26 July 1956

h. Crew status changes:

(1) IN 21, Disbanded, 1 May 1956

(2) IN 60, Disbanded, 22 May 1956

(3) IN 59, Disbanded, 22 May 1956

(4) R78, Disbanded, 1 May 1956

(5) R51, Disbanded, 30 July 1956

(6) L02 to R02, 31 May 1956. (Downgraded due to observer change).

(7) R02 to N02, 31 July 1956. (Downgraded due to observer DNIF, heart attack and no qualified replacement available)

(8) L06 to R06, 20 June 1956. (Downgraded for failure to maintain proficiency standards)

(9) L15 to R15, 20 July 1956. (Downgraded for failure to maintain proficiency standards)

(10) R54 to L54, 23 July 1956. Upgraded.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

i. Standardization crews:

(1) S16 30 July 1955

(2) S09 9 January 1956

(3) L08 30 April 1956

(4) L37 25 April 1956

(5) S69 30 April 1956

(6) S70 18 November 1954

j. Additional materiel and personnel problems:

(1) The AOCP rate for the month of July was 6.75% as compared to 9.56% for June and 6.51% for May. Primary items in short supply continue to be refrigeration units (S/N [illegible]577-18401-11). A total of 42 sorties were lost during May/June/July due to AOCP shortages.

(2) An average of two aircraft were undergoin drag angle repairs during June resulting in a loss of 131 aircraft days during May/June.

(3) Officer manning in armament (32) career field still remains critical. Of the eleven (11) authorized, eight (8) are presently assigned with a projected loss of one and no known input for a projected manning of 63.6 percent.

(4) Officer manning in the Supply career field is also becoming critical. Of the twelve (12) authorized, eight (8) are presently assigned with a project loss of one and no known input for a projected manning of 58.3 percent.

(5) Effective manning in the airman career fields considered critical are indicated below:

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
204	11	7	0	64
401	3	2	0	67
422	33	25	3	67
451	4	1	0	25
603	24	15	2	54
702	96	69	2	70
903	3	1	0	33

k. Refueling data:

(1) Number of refueling sorties scheduled and confirmed: 127

(2) Number of sorties:

(a) Airborne: 112

(b) Effecting complete electronic rendezvous: 67

(c) Transferring required fuel: 102

(3) Number of aborts due to:

(a) Adverse weather: None.

(b) Aircraft malfunction: Six

(c) Electronic rendezvous equipment malfunction: None

(d) Refueling equipment malfunction: Two

(e) Other causes: Six tanker aborts, one radio failure.

(4) Mass night cell refueling:

(a) Confirmed sorties: 46

(b) Airborne sorties: 44

(c) Sorties effecting complete rendezvous: 7

(d) Sorties transferring required fuel: 36

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Sec. T

Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

1. Comments or recommendations of the wing commander:

(1) The average number of combat ready/lead/select crews assigned during May/June/July 1956 was 32. A total of 2364 hours (excluding test flight time) was flown for an average of 73.53 hours per crew.

(2) The average number of assigned aircraft during May/June/July was 50. The number of aircraft in IRAN modification during May/June/July was 11. The average number of possessed aircraft was 41. A total of 3494 hours was flown for an average of 85.22 hours per possessed aircraft.

(3) An average of 40 non-combat ready crew members were available for training during the months of May/June/July. They flew a total of 3142:55 hours for an average of 78.5 hours per available crew member. In addition to the above, 16 pilots were undergoing advanced flying training at McConnell Air Force Base, 12 pilots were undergoing local MTD training and 13 observers were undergoing Phase II training at McConnell Air Force Base.

(4) Two-hundred eleven (211) sorties for a total of 1130 hours were flown as 5X time in training staff personnel and non-combat ready crew members. Ten (10) pilots presently assigned co-pilots on combat ready/lead/select crews have been checked out as aircraft commanders but cannot be used as such until newly assigned pilots are qualified to replace them.

(5) Reference Annex I. SAC Regulation 50-5, dated 13 April 1956. The subject of "N" crew members and "IN" crew members as outlined in the regulation is considered unsatisfactory in that reporting is extremely difficult. Crews may change categories several times each month

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during the course of upgrading. Recommend that the definition of an "IN" crew be defined as a crew of which one or more crew members have not satisfactorily completed the requirements of Annex XIII, SAC Regulation 51-19. In addition this definition will reflect a true reporting potential by crew category.

(6) Reference Second Air Force message DOTO 10132, 19 April 1956. Subject: Hi Jinks RBS Runs. The following information is submitted:

(a) Thirty (30) combat ready crews and three (3) non-combat ready crews have been checked out. No crews programmed to be checked out in July 1956. No difficulties were encountered during this reporting period.

(7) New combat ready crews:

(a) N02 1 November 1956

(b) IN22 1 January 1957

(c) N23 31 August 1956

(d) IN24 31 December 1956

(e) N45 30 September 1956

(f) N63 30 September 1956

(g) IN64 1 November 1956

(h) IN65 1 December 1956

(i) N66 30 September 1956

(j) N36 6 August 1956

(k) N89 15 August 1956

(l) IN90 1 January 1957

(m) IN91 1 January 1957

(n) N92 1 November 1956

Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for July 1956

(8) The following "Big River" activity was accomplished on dates indicated, however confirmation has not been received from the sites as of the date of this report:

CREW NO	NCA	SNA	DATE
S69	1		26 Jul 56
S70		1	10 Jul 56
S80	1	1	26 Jul 56
R61	1		26 Jul 56
N89	1		24 Jul 56
(*) TOTALS	4	2	

(*) NOTE: These totals were not repeat were not included on the SAC Form 50a

for William B. Olson
STEPHEN D. MC ELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Air Training Report for the Month of August, 1956

(RCS: 8-SAC-T12)

5

I concur with the remarks of the Wing Commander.

A. J. Russell

A. J. RUSSELL
Colonel, USAF
Commander

6-2385-4

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376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRE
AUTH: COMBOMWGM, 376T
INITIALS [illegible]
10 September 1956

WING COMMANDER'S REMARKS

SECTION IV

Air Training Report for month of August 1956

RCS: 8-SAC-T12

a. Hours flown performing missions ordered by higher headquarters:

(1) Ferrying aircraft to and from depot:	24:15
(2) Test & Tactics directed missions:	9:10
(3) Bombing Competition:	100:10
(4) ECM Support Missions in conjunction with Operation "Devil Fish"	20:30
TOTAL	154:05

b. Weather or local conditions:

(1) Not applicable this reporting period.

c. Air Traffic control delay information:

ATC DELAYS

TYPES	TOTAL NUMBER	TOTAL TIME
Departures	7	1:32
Arrivals	0	0
Total	7	1:32

DELAYS AFFECTING UNIT MISSIONS

"Not applicable this reporting period"

DELAYS OVER 30 MINUTES

DATE	TIME	TIME LOST	REASON FOR DELAY
20 Aug 56	Departure	38 minutes	Could not get ARTC clearance due to weather

d. Restrictive directives:

(1) Reference SAC message DO 1842, dated 9 July 1956, which limits KC-97 aircraft to maximum gross weight take-off of 155,000 pounds, thereby

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reducing the amount of JP-4 fuel that can be off-loaded to receiver. This limitation created a loss of approximately 50 hours.

e. Combat crew members gained:

(1) Crew members gained:

One AIRCOM (Untrained)

Two Co-Pilots (Untrained)

One Observer (Untrained)

(2) Crew members lost:

One AIRCOM (Combat Ready). Transferred to March AFB.

Two Co-Pilots (Combat Ready). Released from active duty.

One Observer (Combat Ready). Transferred to Turner AFB.

f. Crew member changes:

(1) One aircraft commander.

(2) Eighteen co-pilots.

(3) Three observers.

g. New crews formed:

(1) N26 1 August 1956

(2) N25 1 August 1956

(3) IN27 14 August 1956

(4) N67 14 August 1956

(5) IN93 1 August 1956

(6) N94 1 August 1956

(7) N96 1 August 1956

(8) N97 1 August 1956

(9) N98 1 August 1956

(10) N99 1 August 1956 (redesignated from crew N63)

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for August 1956

h. Crew status changes:

(1) R79, Disbanded, effective 1 August 1956 (and reformed as N98)

(2) R68, to N68, 31 August 1956. Downgraded. (Due to change in Co-Pilot)

(3) N26 to R26, 29 August 1956. Upgraded.

(4) IN64 to N64, 21 August 1956. Upgraded.

(5) N95 to R95, 6 August 1956. Upgraded.

(6) N86 to R86, 3 August 1956. Upgraded.

(7) N23 to R23, 31 August 1956. Upgraded.

i. Standardization crews:

(1) S16 30 July 1955

(2) S09 9 January 1956

(3) L08 30 April 1956

(4) L37 25 April 1956

(5) S69 30 April 1956

(6) S70 18 November 1954

j. Additional materiel and personnel problems:

(1) The AOCP rate for the month of August was held to 2.38% as compared to 6.75% for July; however, a total of 17 sorties were still lost due to aircraft being AOCP. Three of the 17 sorties were lost on one aircraft, AOCP for approximately three weeks for a fuel probe. One probe was received from the depot in an unserviceable condition and had to be returned to supply channels. Estimated date of delivery for this item is 15 to 30 days. The shortage of aircraft parts has made it necessary to utilize excessive cannabalization procedures, resulting in extra manhours in the maintenance organization.

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(2) The recent requirement to schedule all KC-97 aircraft through the Warner Robins Materiel Area Depot for propeller modification created considerable confusion and resulted in the complete loss of approximately eight (8) air refueling sorties, in addition to having to continually change the tail number schedule. The requirement to schedule three KC-97 aircraft per day into Warner-Robins Air Materiel Depot commencing 9 August 1956 was received in Second Air Force message DM4F2-5209, dated 30 July 1956. This schedule was cancelled by telephone and another established for three aircraft per day commencing 15 August 1956 until all 19 aircraft were processed through the depot. This schedule was confirmed by Second Air Force message DM4F2-3028, dated 15 August 1956. At approximately 2300 hours, 15 August 1956 a telephone message was received to schedule three additional aircraft into San Antonio Air Materiel Depot to arrive not later than 0700, 16 August 1956. As a result the Air Refueling schedule established for training new aircraft commanders had to be rescheduled on a daily basis.

(3) Officer manning in the armament career field still remains critical. Of the eleven authorized, seven are presently assigned with a projected loss of one and no known input for a projected manning of 54.5 percent.

(4) Officer manning in the supply and personnel career fields is also critical. Of 14 authorized in the supply field, ten are presently assigned with a projected loss of one for a projected manning of 61 percent. Six officers are authorized in the personnel career field with only four assigned for an effective manning of 66.6 percent.

(5) Effective manning in the airman career fields considered critical are

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indicated below:

AFSC	AUTH	ASGD	KNOWN LOSSES	PROJECTED MANNING
204X0	11	6	0	54.5%
30170	13	6	2	46.1%
42172	4	1	0	25.0%
42370	9	2	0	22.2%
43131B	24	16	0	66.0%
43131E	28	17	0	60.0%
432X0	63	43	1	66.6%
47250	17	5	4	6%
64151	41	25	2	56%

k. Refueling data:

(1) Number of refueling sorties scheduled and confirmed: 41

(2) Number of sorties:

(a) Airborne: 37

(b) Effecting complete electronic rendezvous: 31

(c) Transferring required fuel: 36

(3) Number of aborts due to:

(a) Adverse weather: 0

(b) Aircraft malfunction: 3

(c) Electronic rendezvous equipment malfunction: 1

(d) Refueling equipment malfunction: 0

(e) Other causes: 1 No tanker available.

(4) Mass night cell refueling:

"Not applicable this reporting period"

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for August 1956

1. Comments or recommendation of the wing commander:

(1) The average number of combat ready/lead/select crews assigned during August was 32. A total of 708 hours (excluding test flight time) was flown for an average of 22 hours per crew.

(2) The average number of assigned aircraft during August was 50. The average number of aircraft in IRAN modification during August was 7. The average number of possessed aircraft was 39. A total of 1228 hours was flown for an average of 31:29 hours per possessed aircraft.

(3) An average of 56 non-combat ready crew members were available for training during the month of August. They flew a total of 1596:45 hours for an average of 28.5 hours per available crew member.

(4) Ninety-two (92) sorties for a total of 471 hours were flown as 5X time in training staff personnel and non-combat ready crew members.

(5) Reference Second Air Force message DOTO 10132, 19 April 1956. Subject: Hi Jinks RBS Runs. The following information is submitted

(a) Thirty-one (31) combat ready crews and seven non-combat ready crews have been checked out. A program is now in force to qualify all aircraft commanders in "Hi Jinks" RBS runs in conjunction with the SAC Regulation 51-19 training program. No difficulties were encountered during this reporting period.

(6) New combat ready crews:

(a) N68 1 March 1957. Crew was regressed due to co-pilot being reassigned to a select crew. AIRCOM projected for combat ready crew to replace known loss. Observer projected to staff position. Crew will be retrained through SAC Regulation 50-43 training.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for August 1956

(b) N02 1 November 1956.

(c) IN22 1 March 1957. New reporting date received on AIRCOM indicating 90 day delay in completing "Blue Flame" training program.

(d) IN24 31 December 1956.

(e) N25 21 September 1956.

(f) N45 12 October 1956. Observer lost five missions. Crew change projected in September to provide a more qualified observer.

(g) N61 1 September 1956.

(h) N62 5 October 1956.

(i) N64 20 November 1956. Combat ready date readjusted due to loss of sorties on crew.

(j) IN65 1 December 1956.

(k) N66 12 October 1956. Additional training required for Observer to satisfactorily complete standardization check.

(l) N89 7 September 1956. Observer required additional traini[ng] to satisfactorily complete standardi-zation check.

(m) IN90 1 February 1957. New reporting date received on AIRCO[M]

(n) IN91 1 February 1957. AIRCOM diverted to 37th Air Division. New AIRCOM programmed in October 195[6]

(o) N92 1 November 1956.

(p) N94 30 September 1956.

(q) N96 15 December 1956.

(r) N97 1 March 1957

(s) N98 6 September 1956.

(t) N99 9 November 1956.

(u) N67 15 November 1956.

(v) IN27 1 April 1957. Quota for advanced Jet school not assigned for AIRCOM.

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Wing Commander's Remarks, 376th Bombardment Wing Air Training Report for August 1956

(w) IN93 15 October 1956.

(7) Reference Second Air Force message DOTG 4660, dated 22 August 1956 published as an interim change to SAC Regulation 50-46. To receive credit for the flight simulator transition course, crew personnel must be scheduled as an integral crew. Recommend this requirement be delete as it is considered impractical until such time that personnel can be made available for training as an integral crew. This will delay co-pilots presently receiving training in the local MTD's until Aircraft Commanders, now in training on advanced Jet Flying School, return to their home station. In addition, aircraft commander and co-pilot combinations are given a thorough emergency procedure check in addition to the usual standardization check prior to being declared combat ready.

(8) Reference SAC message DOCEN 17484, dated 31 August 1956, which directed implementation of Annex I, SAC Regulation 51-6, effective 1 September 1956. This wing anticipates no problem in conducting Random Chaff and Max Dispense Out runs. However, Little River Runs will present a problem in the third training quarter because the Wing must coordinate direct with Air Defense Command units on scoring, alerting, and clearance procedures prior to conducting these type runs.

(9) Reference Second Air Force message DOTB 12724, dated 17 August 1956, no facility exists for scoring big river chaff runs; however, this training requirement still exists in accordance with Annex VIII, SAC Regulation 50-8. Big River runs should be deleted as a training requirement effective 1 September 1956. If precision line of position radar navigation legs are to be substituted for Big River runs, this organization should receive immediate authorization to permit training to

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begin early in the record scoring quarter.

Stephen D. McElroy
STEPHEN D. MC ELROY
Colonel, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of April, 1956

(RCS: 4-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

FOR AND IN THE ABSENCE OF

John W. Carroll Col USAF
M. A. PRESTON
Brigadier General, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMDR 376TH BOMWGM
INITIALS: [signature]
Date: 8 May 1956

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of April 1956
(RCS: 4-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

[signature]
STEPHEN D. MC ELROY
Colonel, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the month of April 1956
(RCS: 4-SAC-T-12)

PART III

6. Squadron Commander's Remarks - PART III

a. Hours flown performing missions ordered by Higher Headquarter

(1)	3 sorties for IIA Ferry Flights	5:00
(2)	6 sorties for Test and Tactics	41:20
(3)	3 sorties for passenger and cargo	18:30
(4)	11 sorties for Fly over (Holiday in Dixie)	51:45
(5)	3 sorties for Dog House	13:45
(6)	Total hours flown for Higher Headquarters Flights	130:20

b. Weather and local conditions affecting training:

(1) None

c. Restrictive Directives:

(1) None

d. Crew Members Gains and Losses:

(1) Crew Members Gained

(a) Two aircraft commanders

(b) Four pilots

(c) Two radio operators

(2) Crew Members Lost

(a) One aircraft commander

(b) Two pilots

(c) Three navigators

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PART III - 376 - BW (M) Squadron Commanders remarks for the month of April 195[illegible]

e. Crew Member Changes:

(1) One Aircraft Commander

(2) Four Pilots

(3) Two Navigators

(4) Three Radio Operators

f. New Crews

(1) None

g. Crew Status Changes

(1) None

h. Standardization Crews

(1) T-02

(2) T-03

(3) T-06

i. Additional Material and Personnel Problems:

(1) The AOCP rate for April was 6.84 compared to 4.01 for month of March (see para n(4)).

j. SAC Minimum Training Accomplishments Not Completed:

(1) Not Applicable

k. Non-Combat Ready Crews Capable of Deploying in an Emergency:

(1) Rescinded in accordance with Second Air Force message DCTC 34[illegible]

l. Non-Combat Ready Crew Training:

(1) No H Status crew assigned.

(2) An average of 45.4 51-19 crew members and non-assigned 51-19 personnel were available during April. They flew a total 1930:18 hours for an average of 42:31 per man.

Secret

PART III - 376 - BW (M) Squadron Commanders remarks for the month of April 1956

(3) Estimate of date Non-Combat Ready crews will be Combat Ready:

(a) IN - 31 1 Oct. 56

(b) IN - 32 1 Oct. 56

(c) IN - 33 1 Oct. 56

(d) IN - 34 1 Oct. 56

(e) Up - grading delayed in order to replace T crew losses.

n. Special Training Month Remarks:

(1) Analysis of Special Training Month Accomplishments:

ITEM	PROGRAMMED	ACCOMPLISHED	PER CENT
Flying Hrs	401	530	132
Sorties	90	107	119
Transition and Pilot Proficiency	155	136	88
Navigation	56	36	70
Grid	7	7	100
Night Celestial	16	0	0
Day Celestial	16	5	31
Radar Legs	10	11	110
Radar Approaches	7	16	228
Rendezvous	27	32	119
Total Hook-ups	728	1200	165
Dry	520	1053	202
Wet	208	147	71

(2) The program for April was based on a total of 401 hours and 90 sorties. The nature of the programmed missions was changed in order to realize maximum crew member training under 51-19.

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PART III - 376 - BW (M) Squadron Commanders remarks for the month of April 1956

(3) Check-out requirements for 51-19 Boom Operators and receiver requirements reflect the great number of dry hook-ups and lack of wet hook-ups accomplished.

(4) Celestial proficiency work was sacrificed to increase air refueling contacts, which has resulted in half of the Boom Operators completing 99 per cent of their 51-19 check-out requirements.

(5) A major portion of navigation sorties were diverted to Higher Headquarters.

(6) Due to three aircraft aborts and one mission diverted to Higher Headquarters, dual transition flights were three sorties short of commitment.

n. Comments or Recommendations of the Squadron Commander:

(1) The average number of Combat Ready Crews assigned during the month of April was 20. A total of 386 hours (excluding Test Hops) was flown for an average of 22.7 hours per crew (excluding Standardization crews).

(2) The average number of aircraft possessed by the Squadron during April was 18. The average time flown per aircraft was 29.5 hours.

(3) Concentration of Flying Training was utilized for maximum progression on 51-19 pilots and boom operators.

(4) The AOCP rate of 6.84 was largely due to the lack of raw R-4360-59 engines.

Wendell D. Lack

WENDELL D. LACK
Lt Colonel, USAF
Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of May, 1956

(RCS: 9-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

Stephen D. McElroy
STEPHEN D. McELROY
Colonel, USAF
Commander

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HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

CLASSIFICATION: SECRET
AUTH: COMDR 376TH BOMWGM
INITIALS:
Date: 7 June 1956

WING COMMANDER'S REMARKS

PART IV

Refueling Air Training Report for the Month of May 1956
(RCS: 9-SAC-T12)

PART IV:

7. I concur with comments of the Squadron Commander.

STEPHEN D. MC ELROY
Colonel, USAF
Commander

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376th BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the month of May 1956
(RCS: 9-SAC-T12)

PART III

6. (b). Squadron Commander's Remarks - PART III

(1). Hours flown performing missions ordered by higher headquarter.

(a)	Fire Power Demonstration Elgin AFB	8:15
(b)	Armed Forces Display	27:10
(c)	IRAN Ferry Flights	9:15
	Total	44:40

(2). Weather or local conditions.

(a) Not applicable for this reporting period.

(3) Air Traffic Control delay information.

(a) ATC delays.

TYPE	TOTAL NUMBER	TOTAL TIME
Departure	2	:28

(b) Delay affecting unit missions.

1 Not applicable for this reporting period.

(c) Delays over 30 minutes.

1 Not applicable for this reporting period.

(4) Restrictive directives.

(a) Not applicable for this reporting period.

(5) Combat crew member gains and losses.

(a) Crew members gained.

1 Three pilots.

Secret

Secret

PART III - 376 - BW (M) Squadron Commanders Remarks for the month of May 1956

2. One engineer.

3. One radio operator.

(b) Crew member lost.

1. Two pilots.

2. One engineer.

3. One radio operator.

(6) Crew member changes.

(a) One pilot.

(b) Two engineers.

(c) Two radio operators.

(d) Two boom operators.

(7) New crews.

(a) Not applicable this reporting period.

(8) Crew status changes.

(a) Not applicable for this reporting period.

(9) Standardization crews.

(a) T02 1 March 1955

(b) T03 1 April 1956

(c) T06 1 July 1955

(10) Additional material and personnel problems.

(a) The AOCP rate for May was 7.91 compared to 6.84 for April.

(b) The aircraft in commission rate for the month was 74.67 percent.

(c) The shortage of navigator replacements mentioned in the January and February T-12 is still

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PART III - 376 - BW (M) Squadron Commanders Remarks for the month of May 1956

critical. In the near future, it is anticipated that 6 of 25 assigned navigators will be lost because of acceptance to Pilot Training School. Also, one navigator is due for separation in September.

(d) Of 25 assigned engineers and 30 radio operators, 2 and 4, respectively, will be lost to the squadron by 1 August 1956 because of discharges and PCS moves. These losses will cause an "M" crew disbandment effective 1 August 1956.

(11) Refueling data.

(a) There were 61 refueling sorties scheduled and confirmed.

(b) Number of sorties.

1. Airborne. 47

2. Effecting complete electronic rendezvous. 44

3. Transferring required fuel. 47

(c) Number of aborts due to:

1. Adverse weather. 0

2. Aircraft malfunction. 9

3. Electronic rendezvous equipment malfunction. 0

4. Refueling equipment malfunction. 2

5. Other causes. Receiver cancellation. 3

(d) Mass night cell refueling. Not applicable for the reporting period.

(12) Comments or recommendations of the Squadron Commander:

(a) Average number of combat ready crews was 20. Total hours flown by combat ready crews (excluding standardization crews) 19:35.

(b) Average number aircraft possessed was 16.5 with 29:00 hours flown per aircraft.

(c) Overall expected crew member losses, in the near future, has been pointed out in paragraph 6b(10) above. In respect to these losses, utilization

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PART III - 376 - BW (M) Squadron Commanders Remarks for the month of May 1956

of "M" crew members to replace expected "T" crew member shortages precludes the upgrading of any "M" crew until 1 September 1956.

Edward C Davis

EDWARD C DAVIS
Major, USAF
Acting Commander

Secret

SECRET

376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of June, 1956

(RCS: 9-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

Stephen D. McElroy
~~STEPHEN D. McELROY~~
Colonel, USAF
Commander

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CLASSIFICATION: [illegible]
AUTH: [illegible]
INITIALS: [illegible]
DATE: 6 July 1953

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57[illegible] [illegible] WING [illegible]
Barksdale Air Force Base
Louisiana

WING CO[illegible]DER'S [illegible]

PART IV

[illegible]efueling Air Training Report for the Month of June 1953
([illegible] : [illegible]-[illegible]-[illegible])

PART IV:

7. I concur with com[illegible] of [illegible] [illegible]dron Commander.

[illegible]
[illegible] D. [illegible]
Colonel, USAF
Commander

[illegible]

376th BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the month of June 1956
(RCS: 9-SAC-T12)

PART III

6. (b). Squadron Commander's Remarks - PART III

(1). Hours flown performing missions ordered by higher headquarters.

(a) Fire Power Demonstration Eglin AFB (May)	8:15
(b) IRAN ferry flights	15:15
(c) Armed Forces display (May)	27:10
(d) P I O flight	7:50
(e) Operation "Bright Lad"	73:20
Total	131:50

(2). Weather or local conditions.

(a) Not applicable for this reporting period.

(3). Air Traffic Control delay information.

(a) ATC delays

TYPE	TOTAL NUMBER	TOTAL TIME
Departure	17	6:26

(b) Delay affecting unit missions.

1. DATE	TYPE	TOTAL ACFT INVOLVED	TOTAL TIME INVOLVED
7 Jun	Departure	7	2:20
29 Jun	Departure	7	2:30

(c) Delays over 30 minutes.

1. Not applicable for this reporting period.

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PART III - 376 - BW (M) Squadron Commanders Remarks for the month of June 1956.

(4) Restrictive directives.

(a) Not applicable for this reporting period.

(5) Combat crew member gains and losses.

(a) Crew members gained.

1. One aircraft commander

2. Four pilots

3. Two engineers

4. One radio operator

(b) Crew members lost.

1. Two aircraft commanders

2. Four pilots

3. One engineer

4. Five radio operators

5. Two boom operators

(6) Crew member changes.

(a) Two aircraft commanders

(b) Five pilots

(c) Two engineers

(d) Eight radio operators

(e) Two boom operators

(7) New crews

(a) Not applicable for this reporting period

(8) Crew status changes

(a) T-07 downgraded to M-07 effective 27 June 56. Combat ready radio operator unavailable to replace one discharged

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PART III - 376 - EW (L) Squadron Commanders Remarks for the month of June 1956.

(9) Standardization crews.

(a) T02 1 March 55

(b) T03 1 April 56

(c) T06 1 July 55

(10) Additional material and personnel problems.

(a) The AOCP rate for June was 11.11 compared to 7.91 for May and 6.84 for April. The major AOCP AOC items were propeller system components, flight instruments and air refueling system components. Three air refueling missions and two test and tactics missions were lost because of the AOCP items. An additional two refueling missions were aborted for frame vibrations which resulted in AOC.

(b) The aircraft in commission rate for the month was 80.20 percent.

(c) Although not definitely forcast as losses, seven navigators who have qualified for and are awaiting pilots school could be lost to the organization before the end of 1956. If this loss should occur, the number of navigators would be reduced to seventeen.

(d) A critical shortage of radio operators in the near future is predicted. Forecast radio operator losses due to discharges are as follows: one in July, one in August, three in September, one in October and one in November. Available radio operators as of the first of the following months is as follows: August, 24; September, 23; October, 20; November, 19; and December, 18.

(e) The maintenance section of the squadron is presently operating with 27 personnel short of the 107 authorized. Effective manning is 75 percent. The shortage is concentrated in the 5 and 7 level AFSC's. Because of undermanning and low skill levels, the maintenance capability to produce flying hours and sorties to support the EWP and to comply with SAC Regulations 51-19 and 50-8 is seriously hampered. Within the next 90 days 20 maintenance personnel are due for discharge and effective manning will then be 56 percent.

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PART III - 376 - ST (-) Squadron Commanders Remarks for the month of June 1956.

(11) Refueling data.

(a) There were 149 refueling sorties scheduled and confirmed.

(b) Number of sorties.

1. Airborne 124.

2. Effecting complete electronic rendezvous 88.

3. Transferring required fuel 116.

(c) Number of aborts due to:

1. Adverse weather. 0

2. Aircraft malfunction. 19

3. Electronics rendezvous equipment malfunction. 2

4. Refueling equipment malfunction. 3

5. Other. Receiver cancellation. 3

(d) Mass night cell refueling.

1. Confirmed sorties. 24

2. Airborne sorties. 24

3. Sorties effecting complete rendezvous. 12

4. Sorties transferring required fuel. 21

(12) Comments or recommendations of the squadron commander.

(a) The average number of combat ready crews was 19. Average hours flown by combat ready crews (excluding standardization crews) was 22:50.

(b) The average number of aircraft possessed was 18 with an average of 26:20 hours flown per aircraft.

(c) Unless immediate action is taken to relieve the critical shortage of maintenance and radio operator personnel, the capabilities of the squadron will be seriously limited.

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PART III - 376 - BM (M) Squadron Commanders Remarks for the month of June 1956.

(13) New combat ready crews.

(a) The crews listed below are projected for disbandment unless radio operators are made available to man non-ready and combat -ready crews.

1. [illegible]-31 - Upgrade 1 Sep 56, and then disband 1 Oct 56.

2. [illegible]-32 - Disband 1 Oct 56.

3. [illegible]-33 - Disband 1 Sep 56.

4. [illegible]-34 - Disband 1 Oct 56.

5. [illegible]-07 - Upgrade 1 Aug 56.

Edward C Davis

EDWARD C DAVIS
Major, USAF
Acting Commander

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376TH AIR REFUELING SQUADRON
376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

Division Commander's Remarks

Section J

Refueling Air Training Report for the Month of July, 1956

(RCS: 9-SAC-T12)

I concur with the remarks of the Squadron and Wing Commanders.

A J Russell

A. J. RUSSELL
Colonel, USAF
Commander

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SECRET

376TH BOMBARDMENT WING, MEDIUM
Barksdale Air Force Base
Louisiana

WING COMMANDER'S REMARKS

Section IV of

AIR TRAINING REPORT FOR MONTH OF JULY 1956

RCS: 9-SAC-T12

I concur with the remarks of the Squadron Commander.

STEPHEN D. MC ELROY
Colonel, USAF
Commander

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376th BOMBARDMENT WING (M)
Barksdale Air Force Base
Louisiana

PART III

Air Training Report for the month of July 1956
(RCS: 9-SAC-T12)

PART III

6. (b) Squadron Commander's Remarks - PART III

(1). Hours flown performing missions ordered by higher headquarters.

(a) Fire Power Demonstration (May)	8:15
(b) IRAN ferry flights	18:20
(c) Armed Forces display (May)	27:10
(d) PIO flight (June)	7:50
(e) Operation "Bright Lad" (June)	73:20
(f) Operation "Corn Belt"	77:50
Total	212:45

(2). Weather or local conditions.

(a) Not applicable for this reporting period.

(3). Air Traffic Control delay information.

(a) ATC delays

TYPE	TOTAL NUMBER	TOTAL TIME
Departure	18	6:30

(b) Delays affecting local missions.

1. DATE	TYPE	TOTAL ACFT INVOLVED	TOTAL TIME INVOLVED
7 Jun	Departure	7	2:20
29 Jun	Departure	7	3:30

(c) Delays over 30 minutes.

1. DATE	TYPE	TIME LOST	REASON FOR DELAY
31 Jul	Departure	3:10	Error by ATC on flight plans.

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PART III - 376 - BW (M) Squadron Commander's Remarks for the month of July 1956.

(4) Restrictive directives.

(a) 7 July SAC Zippo 07-003 (Restricted take-off weight to 135,000 lbs. gross.)

(b) 9 July SAC Message DO 1842 (Rescinded SAC Zippo 07-003 Restricted take-off weight to 155,000 lbs. gross and total number of personnel per flight to ten.)

(5) Combat crew members gains and losses.

(a) Crew members gained.

1. Two aircraft commanders

2. Four pilots

3. Two navigators

4. Two engineers

5. One radio operator

(b) Crew members lost.

1. Three aircraft commanders

2. Four pilots

3. Two engineers

4. Six radio operators

5. Two boom operators

(6) Crew member changes.

(a) Six aircraft commanders

(b) Thirteen pilots

(c) Two navigators

(d) Six engineers

(e) Twelve radio operators

(f) Three boom operators

(7) New Crews.

(a) Not applicable for this reporting period.

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PART III - 376 - BW (M) Squadron Commanders Remarks for the month of July 1956.

(8) Crew status changes.

(a) T-07 downgraded to M-07 effective 27 June 56.

(b) T-17 downgraded to M-17 effective 31 July 56. Combat ready aircraft commander transferred.

(c) T-23 downgraded to M-23 effective 17 July 56. Combat ready radio operator unavailable to replace one discharged.

(d) M-23 upgraded to T-23 effective 31 July 56. Upgrading due to crew change of radio operator.

(e) M-34 upgraded to T-34 effective 31 July 56. 51-19 radio operator checked out as combat ready.

(9) Standardization Crews

(a) T-02 1 March 55

(b) T-03 1 April 56

(c) T-06 1 July 55

(10) Additional Material and personnel problems.

(a) The AOCP rate for July was 5.73 compared to 11.11 for June and 7.91 for May.

(b) The aircraft in commission rate for the month was 79.22 percent.

(c) The two combat ready navigators lost this month were replaced by non-ready navigators. Seven additional navigators are qualified and have applied for pilot training and are projected as possible losses before the end of 1956. If this should occur the number of assigned navigators would be reduced to 17.

(d) The maintenance section of this squadron is presently operating with an effective manning of 73.8%. The 7 level AFSC authorization continues to be 50% manned. Upon return to this station from projected TDY, overall manning will be 72 percent. Eleven A/3C's with 3 level AFSC's have just arrived from school. These airmen constitute 15 percent of the effective manning.

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PART III - 376 - BW (M) Squadron Commander's Remarks for the month of July 56.

(11) Refueling data.

(a) There were 217 refueling sorties scheduled and confirmed.

(b) Number of sorties.

1. Airborne 177

2. Effecting complete electronic rendezvous 117

3. Transferring required fuel 162

(c) Number of aborts due to:

1. Adverse weather. 0

2. Aircraft malfunction. 29

3. Electronic rendezvous equipment malfunction. 2

4. Refueling equipment malfunction. 6

5. Other. Receiver cancellation. 3

(d) Mass night cell refueling.

1. Confirmed sorties. 62

2. Airborne sorties. 56

3. Sorties effecting complete rendezvous. 58

4. Sorties transferring required fuel. 51

(12) Comments or recommendations of the Squadron Commander.

(a) The average number of combat ready crews was 18. Average hours flown by combat ready crews(excluding standardization crews) was 27.4

(b) The average number of aircraft possessed was 18 with an average of 27.9 hours flown per aircraft.

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Preliminary tests were made on this device and it was taken to WADC for evaluation in February. No information has been received from WADC to date on results of the evaluation. (CONFID)

(3) Work is continuing on design and construction of a third model of the cavity test equipment. This model employs three S-band cavities having precision micrometer tuning drives. The three cavities are to be used to set the upper frequency limit, lower frequency limit and center frequency of swept jamming transmitters. Provisions for monitoring transmitter modulation will also be incorporated in the test set. Two types of crystal holders, loop, and coaxial coupler units were designed and built for the cavities. The coupler units fit into the cavities and sample the resonant energy for display on an indicator. Meters will be used as indicators. Provisions will also be made to monitor the rectified RF energy from the cavities, with either headphones or a meter, as an indication of the degree of modulation of the jamming transmitter. (CONFID)

(4) Further tests were conducted on the possibility of using a moving hot spot on a lamp filament as a frequency measuring method. Five types of commercially available lamps were tried:

Specimen 1 - Westinghouse 750 watt, 120 volt projection lamp.

Specimen 2 - General Electric #49, two volt, 60 ma lamp.

Specimen 3 - General Electric 100 watt, 12 volt lamp.

Specimen 4 - #1477 pilot lamp bulb.

Specimen 5 - General Electric 100 watt, 120 volt lamp.

These specimens have various filament sizes and construction. The physical placement inside the evacuated bulb and bead support and connecting wire construction of each is quite different. Several methods of exciting the lamp filaments were used. One method was by

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Classification: SECRET
Auth: COMDR 376BOMWG M
Initials: Rt. Wolt
Date: 9 May 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT 9 May 1956

SUBJECT: Test Progress Report (RCS: SAC-U30)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 30 April 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 34, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Estimated date of completion: March 1957.

c. Hours flown: 8:00.

d. Summary:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic

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oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) Prior to finalizing arrangements for the proposed test coordinated with the U.S. Navy, a local flight test was flown during April in a C-47 type aircraft. Project 34 equipment was installed, plus an AN/APR-4 and an AN/ARC-3 receiver. A BC-640 VHF ground transmitter transmitting a tape recorded message was used as the signal to be locked on and jammed. Failure in the jamming equipment during the flight caused cancellation of the test before complete results could be observed. However, it was found that a lock-on error existed. Because of this, the U.S. Navy was notified proposed flight tests would be postponed until corrections could be made in the jammer. (CONFID)

(3) The local flight test indicated need for further design on the jammer to increase jamming signal effectiveness. Poor effectiveness is caused by a lock-on error of 30 to 120 kilocycles. The signal to be jammed, when intercepted by the system receiver, remains in the receiver bandpass, but this is not close enough to give effective jamming because the transmitter signal does not lock-on sufficiently close to the victim carrier. The error in frequency is caused by a small mechanical overshoot on weak signals and undershoot on strong signals. (CONFID)

(4) Several corrective measures are being investigated to eliminate or compensate for the lock-on error. The simplest method of compensating for the small tuning error is to frequency modulate the jamming transmitter signal at a slow rate with a deviation of approximately 100 to 150 kilocycles. A reactance-tube modulator is being designed and constructed to test effectiveness of this method during May. In the event frequency modulation proves unsatisfactory, a mechanical automatic frequency control circuit will be constructed and tested. (CONFID)

(5) Several types of noise and tone modulation signal sources were constructed during April and a circuit providing a wobble tone with a randomly changing pitch was incorporated in the jammer. Jamming effectiveness of this modulation will be tested, together with the frequency compensating device. (CONFID)

3. Test Project Number 35, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Estimated date of completion: April 1957.

c. Hours flown: none.

d. Summary:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a fly-back time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus no reason to continue jamming it. If there

were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multivibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension cables have been made for all units so they may be removed from the receiver rack for testing and aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. (SECRET)

(4) First checks of the receiver lock-on sensitivity show minimum signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 DB at the high frequency range and 110 DB at the low frequency range. Gate and pause circuits have been adjusted so pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the lock-on circuits has been reduced by turning down the threshold control; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is completed and checked. All memory, lock-on, and receiver gate circuits are operating. A transmitter gate has been built and is operating. Necessary cables and connectors have been added to the receiver and transmitter, and the two units inter-connected. The system has been tested over the entire band and will lock-on any frequency in the range from 96 to 158 megacycles. Further tests show accuracy of lock-on is not satisfactory at some frequencies. At some frequencies the error of lock-on is as great as 400 kilocycles. It was originally believed this

error was in the transmitter lock-on circuitry, but further testing showed the majority of the error was in the receiver. In addition to the initial lock error, a drift of approximately 200 kilocycles during lock time was found to be caused by an AFC circuit leakage. This circuitry, as well as the receiver lock-on circuitry, has been modified to improve lock-on accuracy. A delay of approximately 10,000 microseconds was designed into the receiver gate-off signal to allow the AFC circuit this much time for action. With the present system this delay does not seem sufficient. The trouble appears to be caused by a delay of 600 to 1000 microseconds for the sweep lock information to get from the source to the actual tuned circuits in the receiver. This would cause the receiver to start locking-on slightly before it is on frequency but not actually stop sweeping until past the correct frequency by several hundred kilocycles. It is believed this delay exists but due to a lack of suitable test equipment for measuring very low frequency waveforms with abrupt points, it has been impossible to verify. For several months this headquarters has requested authority to procure a two-gun oscilloscope, with long persistence screen capable of frequency response from zero to four megacycles, for time sequence studies of this type waveform. Such an instrument would greatly facilitate development progress on this project. (CONFID)

(5) Considerable research has been done in an effort to find a suitable antenna for use on this and other VHF projects. The AT-190 antenna with modification is electrically satisfactory but not suitable aerodynamically for B-47 operation. Modification to the antenna for improving electrical characteristics for these frequencies consists of shortening the antenna slightly and moving the position of the shorting slug inside the antenna. Inclosure 1 shows the measured voltage-standing-wave ratio of the normal AT-190 antenna, of the same antenna after it has been modified by being shortened by one inch, and of the modified shortened antenna after the internal shorting slug has been readjusted. Each modification improved antenna characteristics at the high frequency end (around 150 megacycles) of the VHF band.

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In addition to the VSWR checks, the antenna was checked by observing operation of the jamming transmitter when operating into the antenna as a load. Transmitter performance was good over the entire band when the modified antenna was used. Tests conducted under 376th Bomb Wing Auxiliary Project 25 showed the normal AT-190 antenna will not hold up under flight conditions encountered in B-47 operation; vibration and stress causes the antennas to crack and break. Attempts will be made to alleviate this difficulty either by encapsulating the antenna in a fiberglass covering or by filling the antenna with a suitable plastic to absorb vibration. Encapsulated or filled antennas will be prepared and test flown on B-47 aircraft. Fifteenth Air Force suggested a means to alleviate the mechanical difficulties of the AT-190 antennas by removing the outer extruded metal shell of the antenna and using only the inner rod and tubing as an antenna. To check the electrical characteristics of such an arrangement, the shell of the modified antenna was removed and the VSWR measured. Results are shown on the graph of Inclosure 1. This should be compared with the curve for the same antenna on Inclosure 2. The antenna without the shell appears to operate well with a ratio below two-to-one up to about 135 megacycles, but rises at the higher frequencies. With the shell on the antenna, the ratio remains below two-to-one up to about 155 megacycles. Also, the antenna without shell appears to have a more restricted coverage at the low frequency end of the band. This narrowing of the bandwidth when the shell is removed is to be expected because the broad band characteristic of the AT-190 is mainly due to the large surface area provided by the shell. If operation were to be restricted to frequencies inside the narrower band, this antenna would be suitable. (CONFID)

4. Test Project Number 36, "S-Band RF Systems" (SECRET)

a. Date initiated: 1 November 1954.

b. Estimated date of completion: Continuous.

c. Hours flown: 84:55.

d. Summary:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) A B-47 aircraft Blue Cradle installation was completed wherein six AN/ALT-6 transmitters each feed RF output into an S-band waveguide approximately 28 inches long, including a 90° H-plane band, and radiate through apertures in the bomb bay doors. For comparison purposes, another B-47E Blue Cradle installation was made with six AN/ALT-6 transmitters each feeding RF output through QRC-27(t) transmission systems and radiating from AT-520 antennas installed in AB-109 antenna receptacles on the bomb bay doors. (CONFID)

(3) Two flight tests were scheduled during April using the installations described. The first was flown 4 April at 34,000 feet altitude against the AN/FPS-10 radar at Bartlesville, Okla. Four transmitters were operated on slow sweep (20 megacycles per second) in each aircraft with frequency limits of 2700 to 3100 megacycles. On each aircraft, two of the six transmitters were carried as spare back-up equipment in case of malfunctions. Each aircraft was to make 200 NM radial inbound and outbound runs, plus runs passing tangential to the radar site at distances of 50, 100 and 150 NM. This flight course was chosen so tests could be compared to previous tests using the helix, diamond, and QRC-27(t) antennas. (SECRET)

(4) Little usable information was obtained from the 4 April test because aircraft equipped with the AT-520 antennas aborted before takeoff due to fuel leaks. The waveguide-equipped aircraft flew the mission alone; photographs and logs were obtained from observers at the radar site. It was the site observer's opinion that the jamming equipment was not operating normally because

the power output appeared to be lower than normal, judging from intensity of jamming strobes on the radar as compared to results of previous tests. This may have been due to leaving the waveguide terminations open rather than covered with Teflon blocks as was done on a similar mission flown 16 March. Post-flight equipment operational checks revealed no equipment malfunctions. This flight test will be re-scheduled at a future date. (CONFID)

(5) The second test mission was a local flight scheduled for 24 April. This was postponed to 30 April due to aircraft being AOCM. Bad weather on 30 April made it necessary to re-schedule the flight for 4 May. Results of the flight will be reported in the next monthly report. Additional tests are scheduled to obtain more information, and similar flight tests are to be made using AN/ALT-6A transmitters. (CONFID)

(6) Laboratory measurements, studies and experiments are being conducted to further improve effectiveness of the waveguide installation. Tests are also being conducted as part of this test project in compliance with Headquarters SAC 1st Indorsement to letter by Fifteenth Air Force, DM4MEE, subject: "Antennas for AN/ALT-8 ECM Jammer in Phase IVA Aircraft", dated 6 March 1956. An answer to this letter will be written upon completion of investigation and test. (CONFID)

5. Test Project Number 37, "AN/ALQ-3 Suitability Test". (SECRET)

a. Date initiated: 2 May 1955.

b. Estimated date of completion: October 1956.

c. Hours flown: 65:00.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Six complete AN/ALQ-3 systems have been delivered to the 376th Bomb Wing for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing; to date, 22 systems have arrived. Their status is as follows: (CONFID)

(a) Systems #1 and #2 have been modified by the W. L. Maxson field engineer using new sub-units obtained from the factory and should now meet operational specifications (CONFID)

(b) Systems #6, #7, #8, #9, #10 and #23 are being used for test. (CONFID)

(c) Fourteen systems are still in crates in the 376th Armament and Electronics supply room. (CONFID)

(2) Two B-47E Blue Cradles have been modified for installation of the AN/ALQ-3. This modification consists of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes have been necessary, only the additions described. (UNCL)

(3) Four flight tests were conducted during April with the AN/ALQ-3 installed in a B-47E aircraft and flown against multiple precision tracking radars of the MSQ type at Eglin AFB, Fla. Purpose of these tests was to determine protection afforded a single AN/ALQ-3 equipped aircraft from multiple precision tracking radars in a target complex. A breakdown of the scheduled missions follows: (SECRET)

(a) Missions for 9, 12, 13 and 23 April were cancelled by AFOTC scheduling because of higher priority and over-ride priority missions.

(b) 10 April, four hours range time, single B-47 aircraft operating against radars at sites 3A, 4 and 5, Santa Rosa Island, Eglin AFB.

(c) 24 April, four hours range time, single B-47 aircraft operating against radars at sites 4 and 5, Santa Rosa Island, Eglin AFB.

(d) 26 and 27 April, four hours range time, single B-47 aircraft operating against sites 4 and 5, Santa Rosa Island, and site 32, Eglin AFB.

(4) The mission of 10 April consisted of radial runs only because of bad weather over the planned track for tangential runs. A total of four runs were made with the aircraft at 35,000 feet altitude. Information gathered during this mission is shown in graphic form in Inclosures 3, 4, 5 and 6. Radar operation was restricted to B-2 (fully automatic tracking) or A-1 (fully manual operation). No radar smoothing was used. Normal method of radar operation during the mission was to operate in A-1 (manual), searching for aircraft; when aircraft was acquired, radar switched immediately to B-2 (automatic). When the AN/ALQ-3 jammed the radar sufficiently to prevent tracking in B-2 mode, radar was switched to A-1 and the operator attempted to reacquire the target. (SECRET)

(5) In the following discussion of results obtained on the 10 April mission, reference is made to the graphs of each run. On these graphs the operation or jamming of each radar is plotted against time. Manual operation (A-1) is indicated by the broken lines, and automatic operation (B-2), by solid lines. Periods during which jamming occurred on each radar are indicated by the notation Jx along the line. (SECRET)

(a) Referring to the graph for Run 1, Inclosure 3, a line is shown for each of the three radars of site 3A, 4, and 5. The radar site and frequency of operation for each radar are indicated at the left of each line. The run began at 1225C when the aircraft was 24 nautical miles from the center of the radar complex and inbound. Before the AN/ALQ-3 equipment was turned on at 1225:44, the radar at site 5 was searching for the aircraft and radars at sites 3A and 4 were tracking the aircraft in B-2 (full automatic). When jamming equipment was turned on, site 3A received jamming but continued to track in full automatic until 1227:20, or a period of one minute, 36 seconds. During the same time, site 4 was tracking the aircraft in B-2 and was not being hampered by jamming. At 1227:20, site 3A switched to full manual operation in an attempt to re-acquire the aircraft and had noticeable jamming until 1228:30. At this time the AN/ALQ-3 receiver broke-lock on the radar at site 3A and picked up the radar signal from site 4. Jamming against site 4 continued until 1230:50. During this period the radar at site 4 could not track the aircraft in B-2, even though it was able to switch to the B-2 mode four times during the two minutes and 20 second period. Each time the radar switched to B-2, the jamming caused it to break-lock (this is indicated on the graph by the notation A-1 Jx, B-2, A-1 four times). At 1231 jamming reappeared at site 3A, allowing site 4 to track in B-2 mode. At 1231:24, jamming caused site 4 to break-lock and go to manual operation. During the remainder of the run, no radar was tracking the aircraft and no jamming was observed (it should be kept in mind that the AN/ALQ-3 locks-on and jams only tracking signals which illuminate the aircraft). The radar at site 5 was operated in A-1 mode during the entire run and was not able to acquire the aircraft. Quality of tracking at site 3A, when operating in B-2 and tracking through jamming, could not be determined because Esterline-Angus tapes were not available at this site. (SECRET)

(b) The same system is used on the graphs of Runs 2, 3 and 4 to show tracking conditions during the runs. Broken lines indicate manual operation (A-1), solid lines automatic operation (B-2), and short intervals of broken and solid lines indicate rapid changing from B-2 to A-1 mode because of jamming. Notes under each line indicate type of tracking and whether jamming was present. (SECRET)

(c) As a summary of the data obtained from the four runs, the aircraft was within the range of the radar complex, with the AN/ALQ-3 equipment operating, for a total of 40 minutes. During this time the aircraft was acquired and tracked in full automatic (B-2) a total of 14 times, with average time of track being approximately two minutes when B-2 operation was held sufficiently long to provide smooth firing data. Each radar could have tracked the aircraft for a maximum total time of 40 minutes, or a combined time for the three radars of 120 minutes. (SECRET)

(6) Missions conducted on 24, 26 and 27 April included both radial and tangential runs by the single AN/ALQ-3 equipped B-47 aircraft. Voice tape recordings and Esterline-Angus tapes of target azimuth, elevation and altitude were obtained from each site. Data from these tests has not been reduced; therefore, results of the tests will be reported in the next monthly test progress report. (CONFID)

(7) Six AN/ALQ-3 missions are tentatively planned for May, four using a single AN/ALQ-3 equipped aircraft against a single tracking radar, and two using two AN/ALQ-3 equipped aircraft against multiple precision tracking radars. (CONFID)

6. Test Project Number 38, "AN/ALQ-7 Suitability Test." (SECRET)

a. Date initiated: 15 August 1955.

b. Estimated date of completion: May 1956.

c. Hours flown: 81:00.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-7 countermeasures system. The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width and pulse repetition frequency meet pre-set system requirements. The equipment covers the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this band. The receiver automatically scans the pre-set frequency range, detects and analyzes the received radar signal. If the radar signal pulse width and recurrence rate are within the pre-set limits, the receiver locks on and tracks the signal. The transmitter then tunes itself to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. Look-through is incorporated to monitor the radar signal during jamming. The transmitter uses two klystrons to cover the frequency range and has a power output up to 400 watts. Two AN/ALQ-7

systems were built by the manufacturer as experimental models. Both systems are now under test at this station. (SECRET)

(2) Aircraft used for test missions is an RB-47E with the AN/ALQ-7 installed in Section 43, station 1099 to 1166. Both receiving and transmitting antennas are mounted on the bottom of the aircraft. (CONFID)

(3) Results of previous missions against the M-33 precision tracking radar indicate the AN/ALQ-7 is capable of initiating a receiver lock-on and transmitter jamming condition out to maximum range of the radar, which is 100,000 yards or 50 nautical miles. It will continue to provide jamming of the M-33 beyond maximum range of the radar provided the aircraft is illuminated by the radar. On these previous missions, jamming intensity varied considerably between missions but varied very little during any one mission. On several of the missions the radar operators could track aircraft part of the time through the jamming, but at other times encountered considerable difficulty in maintaining correct radar range. Skill of the range operator greatly influenced quality and accuracy of the tracking data. On other missions, intensity of the AN/ALQ-7 jamming signal was such that operators could not track aircraft. Attempts were made to confuse the AN/ALQ-7 by changing radar frequency during jamming. The AN/ALQ-7 was able to follow these frequency changes about 90% of the time. (SECRET)

(4) A system was devised during an early mission by the M-33 elevation operator to cause the AN/ALQ-7 to cease jamming and go into the search phase. By quickly changing radar elevation about 100 mils, the operator caused the AN/ALQ-7 to lose the radar signal and go into the search phase. If the radar target is then immediately re-acquired in elevation, the target can be tracked from seven to ten seconds before the AN/ALQ-7 can again find the radar signal and begin jamming. This long delay in resumption of jamming is due, in part, to failure of the image reject circuit to operate properly. The AN/ALQ-7 should re-acquire the radar signal and provide jamming in approximately

three seconds. It was noted this system would only work when the radar target was at medium or long ranges. At short ranges changing elevation of the radar would not cause the AN/ALQ-7 to lose the radar signal, with the result that the jamming continues. (SECRET)

(5) In tests made against the AN/APS-23 airborne navigational radar located in the same aircraft as the AN/ALQ-7, it was found jamming encountered by the AN/APS-23 was periodic and the AN/ALQ-7 would not lock-on and continuously jam the radar. The AN/ALQ-7 would not continuously jam the navigational radars in nearby aircraft because these radars do not continuously illuminate the jamming aircraft. (SECRET)

(6) Four missions were scheduled to be flown during April: (CONFID)

(a) 3 April - This mission was flown at Perrin AFB, Tex., to check effectiveness of the AN/ALQ-7 against AI radars in F-86D type aircraft, and to check degradation of the A-5 fire control system as a result of interference from the AN/ALQ-7. The mission resulted in an air abort due to malfunction of the AN/ALQ-7. No data was obtained. (CONFID)

(b) 6 April - This mission was a repeat of (a) above. The AN/ALQ-7 malfunctioned again in that when the transmitter tuned to the frequency of the receiver and started jamming, the receiver would break lock and start searching the band. The AN/ALQ-7 transmitter was turned OFF and the test was continued using only the receiver. It was found that when the fighter was flown in a 90 degree sector centered to the rear of the AN/ALQ-7 equipped RB-47 aircraft, with the AI radar locked on the RB-47, the AN/ALQ-7 receiver would initiate and maintain a lock-on as the fighter's altitude was varied from below the RB-47 to 5000 feet above it. The distance between the two aircraft during these tests was approximately five nautical miles. Due to the malfunction that existed in the AN/ALQ-7, no other data was obtained. (CONFID)

(c) 11 April - This mission was scheduled to be flown at Eglin AFB to check effectiveness of the AN/ALQ-7 against the M-33 X-band precision tracking radar. The mission was cancelled due to an aircraft malfunction. (CONFID)

(d) 17 April - The first part of this mission was flown to determine amount and type of interference encountered by navigational and fire control radars in other B-47 aircraft flying in various formation positions with respect to the jammer equipped aircraft. The second part was to be flown at Perrin AFB to determine effectiveness of the AN/ALQ-7 against AI radars in F-86D type aircraft, and to check the degradation of the A-5 fire control system as a result of interference from the AN/ALQ-7. The mission resulted in an air abort due to malfunction of the AN/ALQ-7. No data was obtained on either part of the mission. (CONFID)

(7) A great deal of trouble has been experienced from malfunctions of the AN/ALQ-7 equipment. These have occurred in various components of the system, and undoubtedly some failures can be attributed to faulty initial installation of components. A great number of the AN/ALQ-7 components are subminiature type, including tubes, connectors and wiring, and can be considered rather delicate. Indications at the present time, however, are that the troubles encountered are due in part to design characteristics which lead to failure of various components of the system. During the past month only one system, made up of two AN/ALQ-7 systems available, has been operational at any one time. This poor operating record cannot be due to lack of experienced maintenance personnel as one field engineer and one field technician representing the manufacturer, both thoroughly familiar with the equipment, have made every effort to keep the systems operating. (CONFID)

(8) No conclusions can be drawn from the work performed on this project during the past month because very little data was collected;

however, due to the great number of system malfunctions which have repeatedly occurred in the AN/ALQ-7 system since the beginning of the test project, it is concluded that the system in its present design is not stable enough for practical use in the field. (CONFID)

(9) The following recommendation is made on the basis of test results obtained to date. Recommend the AN/ALQ-7 not be considered for procurement in its present state. This is primarily based on the general unreliability of the equipment and not on its jamming effectiveness against precision tracking ground-based and airborne radars. (CONFID)

(10) The flight tests of the AN/ALQ-7 were concluded on 20 April. Bench tests of the AN/ALQ-7 are now being performed. The final report on this project is now being written and will be completed in May. (UNCL)

7. Test Project Number 39, "Flight Test of QRC-18(t)". (SECRET)

a. Date initiated: 15 August 1955.

b. Estimated date of completion: June 1956.

c. Hours flown: 81:35.

d. Summary:

(1) Purpose of this project is to test tactical suitability of the QRC-18(t). Essentially, the QRC-18(t) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

(2) Five flight tests were flown during April. KC-97 aircraft were used on two of the tests and B-47's on the other three. Two aircraft were used on each test, one simulated the bombing aircraft carrying the jammers, and the other, the fighter. Aircraft

maintained a 25-mile separation while flying nose-to-tail over a course extending approximately 175 miles from the ground station for KC-97 flights and 250 miles from the ground station for B-47 flights. On KC-97 flights the bomber flew at 19,000 feet altitude and the fighter at 18,000 feet. On B-47 flights the bomber flew at 34,000 feet altitude and the fighter at 33,000 feet. The ground station for all tests was a 50 watt BC-640 VHF transmitter and RC-81 antenna located at Barksdale AFB. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. AN/ARC-3 VHF receivers were used in the simulated fighters. Frequency was 142.38 megacycles. On KC-97 flights an ECM operator in the bomber monitored operation of the jamming transmitters and set them on frequency with an AN/APR-4 receiver and AN/ALA-2 panoramic adapter for spot jamming runs. An observer in the fighter monitored reception on the AN/ARC-3 receiver and scored the jamming. For sweep jamming tests in B-47 aircraft the jamming transmitters were pre-set on the ground for unattended operation in the aircraft bomb bay. Operation by the co-pilot during the flight consisted only of turning the sets on at the beginning of runs and turning them off at the end of runs. A fourth man in the fighter B-47 monitored reception on the AN/ARC-3 receiver and scored jamming. For spot jamming tests with B-47 aircraft, the jamming transmitters were operated by ECM operators in the Phase V ECM capsule. The Phase V capsule is a manned capsule carried in the bomb bay of a B-47 aircraft. The capsule is designed to carry two ECM operators, various configurations of ECM equipment, and is equipped with heating, pressurization, and liquid oxygen systems. Reception on the AN/ARC-3 receiver in the fighter was monitored and jamming was scored according to the following system:

Condition 0 - no jamming.

Condition 1 - all transmissions can be received with only a little background annoyance.

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Condition 2 - can understand practically all messages but an occasional word is blocked out.

Condition 3 - can understand words and phrases but not complete continuity (a good operator can copy a repeated message).

Condition 4 - can tell a transmission is being made but cannot receive the message.

Condition 5 - cannot tell that a transmission is being made. (CONFID)

(3) The flight test of 6 April used KC-97 aircraft and four spot jamming runs were made, two with narrow noise modulation and two with wide noise modulation. The ECM operator used an AN/APR-4 receiver with CV-253/AIR tuning unit and AN/ALA-2 panoramic adapter to set the jamming transmitters on frequency. Results of this test are shown in the following table: (SECRET)

6 April 1956	KC-97 Aircraft	18,000-19,000 ft	
RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA, MILES	SEPARATION FTR TO BMR, MILES
1	One AN/ALT-7 transmitter - spot jamming - narrow noise modulation. Power output 150 watts.		
	0	30	22
	0	40	25
	1	50	25
	0	60	23
	0	70	23
	0	82	23
	0	97	18
	0	117	15
	0	141	19
2	One AN/ALT-7 transmitter - spot jamming - wide noise modulation. Power output 150 watts.		
	0	140	25
	2	125	25
	2	110	27

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	2	97	28
	2	79	27
	2	66	23
	1	41	18
	1	30	10
3	Same equipment as for Run 1 - power output 140 watts		
	1	33	25
	1	50	25
	1	66	26
	1	81	26
	1	105	26
	1	122	26
	1	138	26
4	Same equipment as for Run 2 - power output 145 watts		
	1	141	25
	1	106	25
	1	96	23
	1	79	23
	1	53	24
	0	30	20

(4) The flight test of 10 April used two B-47 aircraft. One acted as the fighter and the other, acting as the bomber, had three transmitters installed in the bomb bay for unattended operation. All three transmitters were equipped with the 1% QRC-18(t) sweep units and it was intended that four runs be made with three sweep jammers operating on each run. On the first run, however, only one transmitter would come on. On the second run all three operated. On the third run, only one transmitter would come on during the first half of the run; on the second half, another transmitter came on without sweep. This second transmitter stopped sweeping on the ground station frequency so good spot jamming was obtained. On the fourth run one transmitter came on with sweeping operation and one with spot jamming on the ground station frequency. This unexpected good spot jamming from an unattended transmitter can be attributed to the fact that the transmitter center frequencies (the frequency of the transmitter when the sweep unit is stopped)

were set on the ground with a frequency meter before takeoff. At the monitoring receiver on the ground, the difference in frequency between the spot jamming transmitter and the VHF voice transmitter during the third and fourth runs was too small to be measured. Results of this test are collected in the following table: (SECRET)

10 April 1956	B-47 Aircraft	33,000-34,000 ft	
RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA, MILES	SEPARATION FTR TO BOMBER, MILES
1	One 1% QRC-18(t) transmitter. Narrow noise modulation.	800-1000 hits/second.	
	1	24	24
	1	40	22
	1	60	24
	1	82	24
	1	100	26
	1	140	28
	1	170	28
	5	214	31
	5	230	33
	5	250	aircraft in turn
2	5	242	20
	5	218	18
	4	210	19
	3	200	20
	2	190	22
	2	132	25
	2	100	24
	2	90	24
	2	70	23
	2	50	24
	2	30	20
3	One 1% QRC-18(t) transmitter. Narrow noise modulation.	800-1000 hits/second.	
	1	25	25
	1-2	35	20
	1	50	20
	1	96	16
	2	118	18
	1	124	19
	1	152	21
	At this point a second transmitter came on with spot jamming (narrow noise modulation).		
	5	172	20
	5	180	20

	3	185	20
	4	194	22
	5	200	24
	3	210	24
	2	220	24
	1	232	24
	1	240	24
4	One 1% QRC-18(t) transmitter. 800-1000 hits/second and one spot jammer. Narrow noise modulation.		
	5	240	20
	4	212	21
	3	190	24
	3	174	25
	3	156	24
	3	118	25
	3	90	27
	3	72	25
	2	50	25
	2	25	25

When the transmitters were examined after the flight, it was found the capacitor plates of the QRC-18(t) sweep unit in one transmitter had melted, evidently from sustained arcing. In a second transmitter the QRC-18(t) drive motor had failed. The third transmitter operated normally. (SECRET)

(5) The flight test of 13 April used KC-97 aircraft for four spot jamming runs, as described for the flight test of 6 April, except that after setting the jamming transmitter on frequency, the ECM operator rocked the transmitter tuning dial back and forth across the communications frequency. The operator was instructed to rock the dial as rapidly as possible over a frequency width not more than one half megacycle, thereby giving a manual sweep jamming. Results of this test are shown in the following table: (SECRET)

13 April 1956 KC-97 Aircraft 16,000-19,000 ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA, MILES	SEPARATION FTR TO BOMBER, MILES
1	One AN/ALT-7 transmitter. Spot jamming. Narrow noise modulation. Power output 134 watts.		

	0	24	25
	0	37	24
	1	72	25
	1	95	20
	1	122	25
	1	142	28
2	One AN/ALT-7 transmitter. Spot jamming. Narrow noise modulation. Power output 132 watts. Operator rocked tuning dial.		
	1	141	25
	1	129	27
	1	110	30
	1	87	28
	1	70	25
	2	60	25
	1	52	25
	1	37	25
3	Same conditions as Run 1. Power output 130 watts.		
	0	32	23
	2	44	21
	2	53	25
	2	80	22
	2	97	25
	2	104	25
	2	118	25
	2	130	25
	2	142	25
4	Same conditions as Run 2. Power output 140 watts.		
	2	145	23
	2	137	25
	4	130	25
	3	125	25
	3	120	25
	4	115	26
	4	110	27
	3	95	25
	3	90	25
	2	82	25
	3	78	25
	4	71	24
	4	66	25
	3	49	26
	4	46	26
	3	37	25
	2	32	25

The observer in the fighter aircraft reported jamming was at times quite effective during the last run as the jamming transmitter was tuned back and forth across the communications channel. Why the same results were not obtained during the second run, where jamming operation was the same as during the fourth run, is not known. At the ground receiving station the jammer signal appeared to be sweeping across the communications frequency during both runs. The ECM operator reported the dial rocking procedure was very tiring and he doubted it could be continued for long periods (each run of this flight was approximately one hour and two ECM operators alternated on the rocking runs). (SECRET)

(6) The flight of 16 April was flown in B-47 aircraft. The bomber for this test was a Phase V capsule aircraft carrying an ECM operator, and it was intended that four spot jamming runs would be made at 34,000 feet altitude. However, the capsule lost heat and pressurization so the test was flown with the bomber at 20,000 feet and the fighter at 19,000 feet. The capsule was equipped with an AN/APR-14 receiver but the operator could hear no signals on this so he attempted to set on frequency by asking the observer in the other aircraft for frequent conditions of jamming. The observer in the fighter aircraft reported an almost continual jamming condition four or condition five. Since this sounded like unusually good jamming, the ECM operator turned his transmitter off several times and asked for jamming conditions. For six different intervals, during which the jamming transmitter was turned off, the fighter observer reported jamming conditions of four to five. For this reason results of this mission are considered invalid. It is possible that the interference reported as jamming may have been noise in the VHF radio receiver or atmospheric noise. The receiver was checked after the flight and appeared to be operating normally. (CONFID)

(7) The flight of 26 April used two B-47 aircraft and was intended to be a repeat of the 10 April flight. No useful information was obtained from this flight because the AN/ARC-3 receiver in the fighter aircraft stopped receiving any signals shortly after the first run had begun. Also, the sweep units in two of the jamming transmitters failed on the first run. A post-flight inspection of the receiver revealed the trouble to be an antenna connection which had come loose in flight. Inspection of the transmitter sweep units revealed the sweep unit drive motors had failed. (CONFID)

(8) Additional flight tests of both sweep and spot jamming in B-47 aircraft are scheduled to be flown during May. A message is under preparation to Second Air Force, SAC, and ARDC outlining the difficulties encountered with the four 1% sweep motors which failed at altitude. No UR will be submitted since this is a piece of QRC equipment. (CONFID)

8. Test Project Number 40, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Estimated date of completion: September 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) A sweep limit measuring device was constructed using seven S-band cavities.

Preliminary tests were made on this device and it was taken to WADC for evaluation in February. No information has been received from WADC to date on results of the evaluation. (CONFID)

(3) Work is continuing on design and construction of a third model of the cavity test equipment. This model employs three S-band cavities having precision micrometer tuning drives. The three cavities are to be used to set the upper frequency limit, lower frequency limit and center frequency of swept jamming transmitters. Provisions for monitoring transmitter modulation will also be incorporated in the test set. Two types of crystal holders, loop, and coaxial coupler units were designed and built for the cavities. The coupler units fit into the cavities and sample the resonant energy for display on an indicator. Meters will be used as indicators. Provisions will also be made to monitor the rectified RF energy from the cavities, with either headphones or a meter, as an indication of the degree of modulation of the jamming transmitter. (CONFID)

(4) Further tests were conducted on the possibility of using a moving hot spot on a lamp filament as a frequency measuring method. Five types of commercially available lamps were tried:

Specimen 1 - Westinghouse 750 watt, 120 volt projection lamp.

Specimen 2 - General Electric #49, two volt, 60 ma lamp.

Specimen 3 - General Electric 100 watt, 12 volt lamp.

Specimen 4 - #1477 pilot lamp bulb.

Specimen 5 - General Electric 100 watt, 120 volt lamp.

These specimens have various filament sizes and construction. The physical placement inside the evacuated bulb and bead support and connecting wire construction of each is quite different. Several methods of exciting the lamp filaments were used. One method was by straight induction into the lamp filament. This was accomplished by simply placing the lamp in the radio frequency field of the AN/ALT-6 transmitter and varying the frequency from 2400 to 3600 megacycles. Coupling to the RF field was varied by changing position of the lamp. A second method was to connect a small quarter wave pickup probe to one lead of the lamp. Length of the pickup probe was varied to bring the filament hot spot position to the center of the lamp filament. Other methods of exciting the lamp were by means of a two-wire transmission line which could be varied in length, and by a low impedance loop connected to the lamp. (CONFID)

(5) Test observations of the listed specimen lamps: (CONFID)

(a) Specimen 1 - This lamp has eight coils of filament in series but placed side-by-side. When excited with RF, instead of a hot spot, a blue corona point appeared on the edge of one coil. Varying frequency of the transmitter merely varied intensity of the corona glow. (CONFID)

(b) Specimen 2 - This is a small lamp having a very low powered V-shaped filament. When excited, this lamp lights at certain frequencies of the swept band which varies from lamp to lamp. Even when one half the V-shaped filament is burned out, the other half still responds. This indicates the lamp lights because the filament and structure resonate with exciting frequency. The resonant frequency can be changed by changing length of a small externally connected lead. (CONFID)

(c) Specimen 3 and 4 - No response to RF excitation. (CONFID)

(d) Specimen 5 - This lamp gave the best response. When excited, a hot spot in the form of one turn of the coiled filament lighted up and moved from one position to another as frequency of excitation was changed. Movement of the hot spot, however, was not proportional to sweep speed of exciting frequency. The hot spot will stay lit for a considerable frequency excursion before dying out and appearing in another position. It is interesting to record that when specimen 5 was placed in an intense RF field near the transmitter antenna and the transmitter swept in frequency, the internal gas of the lamp would ionize and give different colors for different frequencies in the band. Several colors were observed. (CONFID)

9. Test Project Number 41, "X-Band Interference, Code Name SPOTLIGHT." (CONFID)

a. Date initiated: 29 March 1956.

b. Estimated date of completion: No estimate available at this time.

c. Hours flown: None.

d. Summary:

(1) The main purpose of this project is to determine the extent of X-band jamming interference with other airborne electronic systems and what measures can be taken to reduce the effects of such interference. (CONFID)

(2) The secondary purpose of the test project is to determine effectiveness of X-band sweep jamming against radar equipped AI aircraft to include determination of the optimum sweep jamming rates and bandwidths. (CONFID)

(3) The test program is being written at this time. (UNCL)

(4) The starting date of the actual testing is dependent upon receipt of X-band magnetron kits for AN/ALT-6A transmitters and modification of five B-47 aircraft. (UNCL)

10. Test Project Number 42, "Attenuation of UHF Air-to-Air Transmissions". (CONFID)

a. Date initiated: 15 March 1956.

b. Estimated date of completion: Not presently known.

c. Hours flown: None.

d. Summary:

(1) Purpose of this project is to determine optimum method of attenuating transmitted signals in UHF frequency band and optimum attenuated UHF communications ranges for all tactical operations, i.e., enroute cells, refueling rendezvous, refueling formations, etc. (CONFID)

(2) The test directive for this project is similar to Auxiliary Project 4 which investigated restriction of transmission range of VHF and UHF transmitters. The possibility of reducing transmission or communications range of the AN/ARC-27 and AN/ARC-3 was investigated, and an interim report submitted on technique used and results obtained. The investigation of this problem revealed that for restriction of communication range to a maximum of approximately 25 miles, the transmitter power output must be reduced to the order of one milliwatt or less. Reduction of power was easily accomplished by means of a simple attenuator which is described in the interim report on Auxiliary Project 4; however, the transmitter power required, and consequently the attenuation required, varied widely with different aircraft, condition of co-axial cables, receiver sensitivity, operating frequency, and climatic conditions. A transmitter with reduced power output could be heard up to approximately 100 nautical miles by another aircraft. Because of the widely varying results obtained, it was concluded that,

although the technique of reducing transmitter power was possible, it was not practical. Reduction of power made desired communication very unreliable and gave little or no assurance that the transmitter signals would not be intercepted by passive detection systems. (CONFID)

(3) The normal aircraft VHF or UHF installation uses a stub antenna or an insulated portion of the aircraft for receiving and transmitting antenna. These antennas are designed to operate over a wide band and provide operation in all directions for reliable communications. Such an antenna provides no gain and intercepts only a small portion of the transmitted energy. On the other hand, antennas used for passive detection are highly directional (so that azimuth of intercepted signals may be determined) and have tremendous gain compared to the aircraft communications antennas. The antenna gain provided by directional antennas gives the passive detector receiver a reception range many times that of the aircraft receiver. This was noted during the tests on Auxiliary Project 4. When the transmitting aircraft was far beyond the range at which inter-plane communication was possible, the AN/URD-2 D/F receiver in the Barksdale AFB Control Tower was still able to make satisfactory D/F cuts on the transmitting aircraft. The situation is analogous to the fringe area TV viewer who watches a snowy and marginal picture received on his "rabit ears", or built in antenna, while his neighbor, with a multi-element beam antenna, enjoys perfect reception. (CONFID)

(4) Paragraph 4a of the test directive for this project states that attenuating procedures have been successfully employed with VHF air-to-air signals. If this statement is made in the sense of successful restricted range communication by attenuation of transmitter output, then it disagrees with results found on Auxiliary Project 4. Experience of the 376th Bomb Wing on this test indicated attenuation would be very unreliable and transmitter power output is probably a minor factor in air-to-air communications range. (CONFID)

(5) This is apparently a radio wave propogation problem more than the restricting of equipment designed to operate over longer ranges on frequencies where the propogation characteristics are not necessarily restricted. The Rome Air Development Center designed several Q-band radar transmitters and receivers for similar uses. (CONFID)

(6) Personnel at RCA were contacted for suggestions regarding reduction of power in the UHF transmitter. Their recommendation was that this be accomplished through limitation of output similar to that method performed by the 376th Bomb Wing. They did not believe this would guarantee range reduction of significant benefit. (CONFID)

(7) A test program is being prepared to again investigate means of reducing UHF transmission range with particular emphasis on reduction of communications interference between refueling areas. It is planned to evaluate means of refueling with reduced air-to-air communication. (CONFID)

11. Test Project Number 43, "Pre-flight and Post-flight Procedures for use by B/RB-47 Wings of this Command". (CONFID)

a. Date initiated: 16 April 1956

b. Estimated date of completion: July 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this test project is to prepare optimum pre and post-flight procedures for ECM equipments used by B/RB-47 wings. Procedures will cover AN/ALT-6, AN/ALT-8, and AN/ALT-7 transmitters, AN/APS-54 receiver, and AN/ALE-1 chaff dispenser as used in B/RB-47 aircraft Phases III, IV and IVA with or without the pod. (CONFID)

(2) The test directive for this test project was received on 6 April. In accordance with SAC Regulation 55-28, a test program was prepared and forwarded to Headquarters SAC, Attn: DOPLT, for approval. Prior to submission of

the test program, a conference was held with the staff of the Director of Materiel, personnel of the Armament and Electronics Squadron and Directorate of Countermeasures Test and Tactics. The test directive and a draft of the test program were read and discussed. There were no major objections to the contents of the test program and all present concurred in it. A project officer from the Armament and Electronics Squadron was selected to be responsible for coordination between Armament and Electronics and Countermeasures Test and Tactics. (UNCL)

(3) Assigned project personnel from Armament and Electronics and Countermeasures Test and Tactics had a conference to discuss details of the test program. Responsibilities were delegated and a work schedule established. Research through regulations covering inspection procedures has been completed. Technical data from TO's ECP listings and manufacturers' handbooks has been assembled for use in the test program. Technical Representatives assigned the A&E Squadron and other qualified A&E personnel are proceeding with preparation of detailed inspection procedures for the equipment listed by the test directive. All this material will be assembled and incorporated into the optimum procedures. (UNCL)

(4) From the preliminary work on this test project it has been determined that new definitions and new maintenance concept are needed in the preparation and maintenance of unattended ECM equipment for airborne ECM operations. The terms "pre-flight" and "post-flight" in the accepted meanings do not cover all maintenance necessary to prepare the aircraft for ECM operations and maintain the aircraft in a combat-ready status. The test program will therefore define all maintenance phases and establish a general maintenance concept for ECM systems, tailored to existing airframe maintenance practices. (UNCL)

12. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Estimated date of completion: Continuous.

c. Hours flown: 709:55.

d. Summary:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Mission 32 was set up at the special request of Headquarters SAC to measure the effectiveness of a Phase III B-47 aircraft against GCI and gunlaying radars, and to determine the relative danger to a single Phase III aircraft penetrating a GCI and gunlaying radar area under the following conditions: (SECRET)

(a) When no jamming or chaff are employed. (SECRET)

(b) When chaff only is used. (SECRET)

(c) When jamming only is used (two AN/ALT-8 transmitters with sweep speed of 1200 mc/second over a 200 mc sweep width from 2700 to 2900 mc). (SECRET)

(d) When both chaff and jamming, as in (c) above, are used. (SECRET)

(3) For the first flight (32A) of Mission 32 it was planned to run four Phase III aircraft, each under one of the conditions of paragraph (2), against the Houston GCI and RBS sites on 4 and 5 April. Each aircraft was to make a 200 nautical mile inbound run to the sites and then a 200 nautical mile outbound run. The first aircraft made the run on 4 April with no jamming or chaff. Both radar sites experienced little or no difficulty in tracking this aircraft. The second aircraft, using chaff only, made the run on 4 April, but because of a malfunction in chaff dropping, the run was invalid and will not be reported. On 5 April both the aircraft which was to use jamming only and the one which was to use jamming and chaff ground aborted prior to takeoff. (SECRET)

(4) The second flight (32B) of Mission 32 was scheduled for 18 and 19 April against the Bartlesville-Kansas City area. The two aircraft scheduled to fly on 18 April both aborted, one on the ground and the other in the air. The two aircraft scheduled for 19 April were 40 minutes late in starting their runs due to the unexpected appearance of an aircraft on the radar range to fly WADC Project Windmill. The GCI radar tracked aircraft number three (using jamming only) with only minor difficulty. The flight plan for aircraft number four (jamming and chaff) was already in ADC hands when the aircraft began the run, so tracking was comparatively easy. The RBS site did not get a call from aircraft number three until he was only approximately ten miles out from the site. B-2 track (full automatic) was held for 80,000 yards on the outbound run. Aircraft number four made a complete run with jamming and chaff dispensing as planned. B-2 track was held on aircraft four for the entire run, except for approximately ten miles when tracking was aided by means of the coast button. Additional flights on Mission 32 are planned to be run during May for making up lost flights and to check results of those flown. (SECRET)

(5) Mission 33 was set up at the special request of Headquarters SAC to determine effectiveness of an ECM support aircraft against an RBS/GCI radar area when each of the following equipment configurations are used: (SECRET)

(a) Six jammers with sweep speed of 20 mc/second from 2700 to 3100 mc. (SECRET)

(b) Six jammers with jamming rate of six hits/second over a sweep width from 2700 to 3100 mc. (SECRET)

(c) Six jammers, four at 20 mc/second and two at six hits/second over a sweep width from 2700 to 3100 mc. (SECRET)

(6) On 11 April three B-47E support aircraft, each using one of the equipment configurations of paragraph (5), made individual flights against radars in the Oklahoma City-Bartlesville area. The first two aircraft

did very well against the RBS radar. The RBS site was forced to resort to A-1 mode (aided range tracking) in order to follow the target aircraft. The third aircraft failed to call in to the RBS site so no attempt was made to track. The GCI radar site failed to track any of the three aircraft until they were considerably past the radar site. (SECRET)

(7) On 25 April Mission 30 was flown in the Kirksville, Mo., area. Three support B-47 aircraft accompanied two bomb carriers into and out of the target area. The AN/FPS-10 radar at Kirksville received this attack as a complete surprise. No fighters were scrambled, although they were in the plan. Two target cities were hit by the bomb carriers. No track was established by the radar on any of the aircraft involved. A complete report of the details of this mission and results obtained is being prepared. (SECRET)

(8) Intensive efforts are being made within the 376th Bomb Wing to reduce mission malfunctions caused by personnel error. More intensive briefings, plus a careful survey of mission flimsies to insure their completeness are expected to lessen this problem. Mission crews are required to study and understand fully the contents of the test flimsies prior to takeoff, as well as understand completely the operation and location of all equipment control boxes and switches involved. (UNCL)

FOR THE COMMANDER:

William H. Murphy

WILLIAM H. MURPHY
Major, USAF
Adjutant

6 Incls
1. Chart, Proj 35 (SECRET)
2. Chart, Proj 35 (SECRET)
3. Graph, Proj 37 (SECRET)
4. Graph, Proj 37 (SECRET)
5. Graph, Proj 37 (SECRET)
6. Graph, Proj 37 (SECRET)

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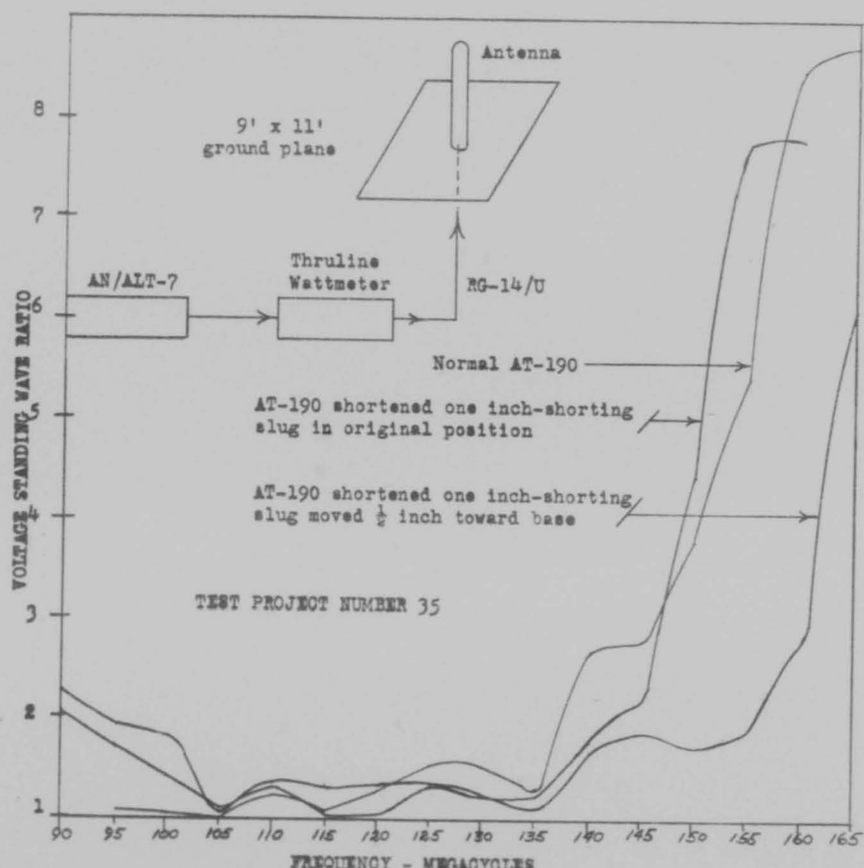

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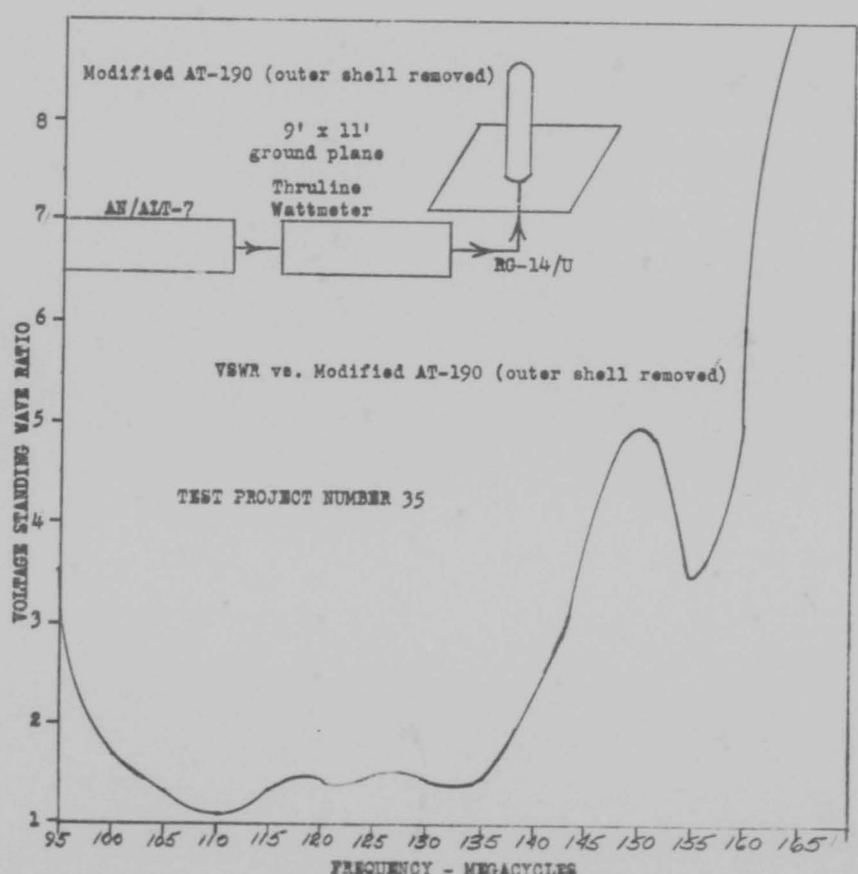

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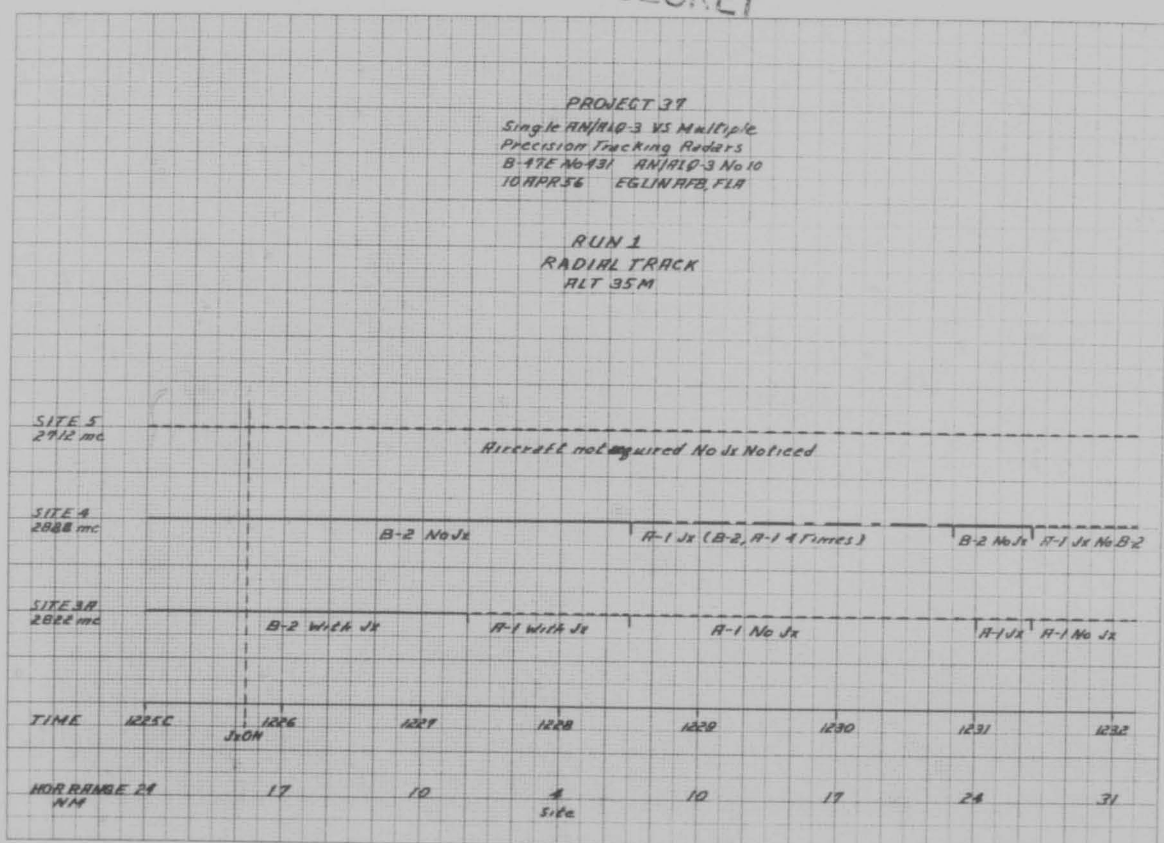

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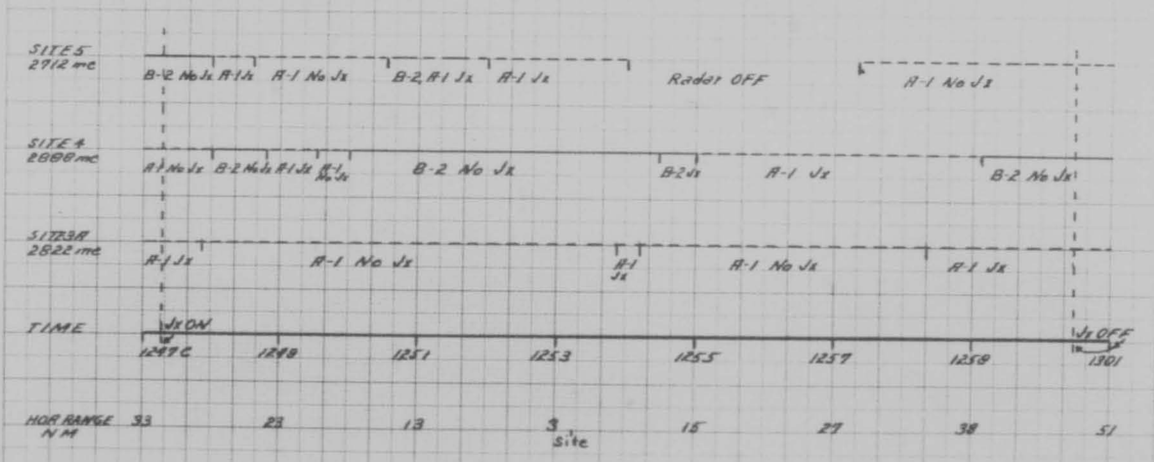
Incl 3

SECRET

PROJECT 37
Single AN/ALQ-3 VS Multiple
Precision Tracking Radars
B-47E No 431 AN/ALQ-3 No 10
10 APR 56 EGLIN AFB FLA

RUN 2
RADIAL TRACK
ALT 35M



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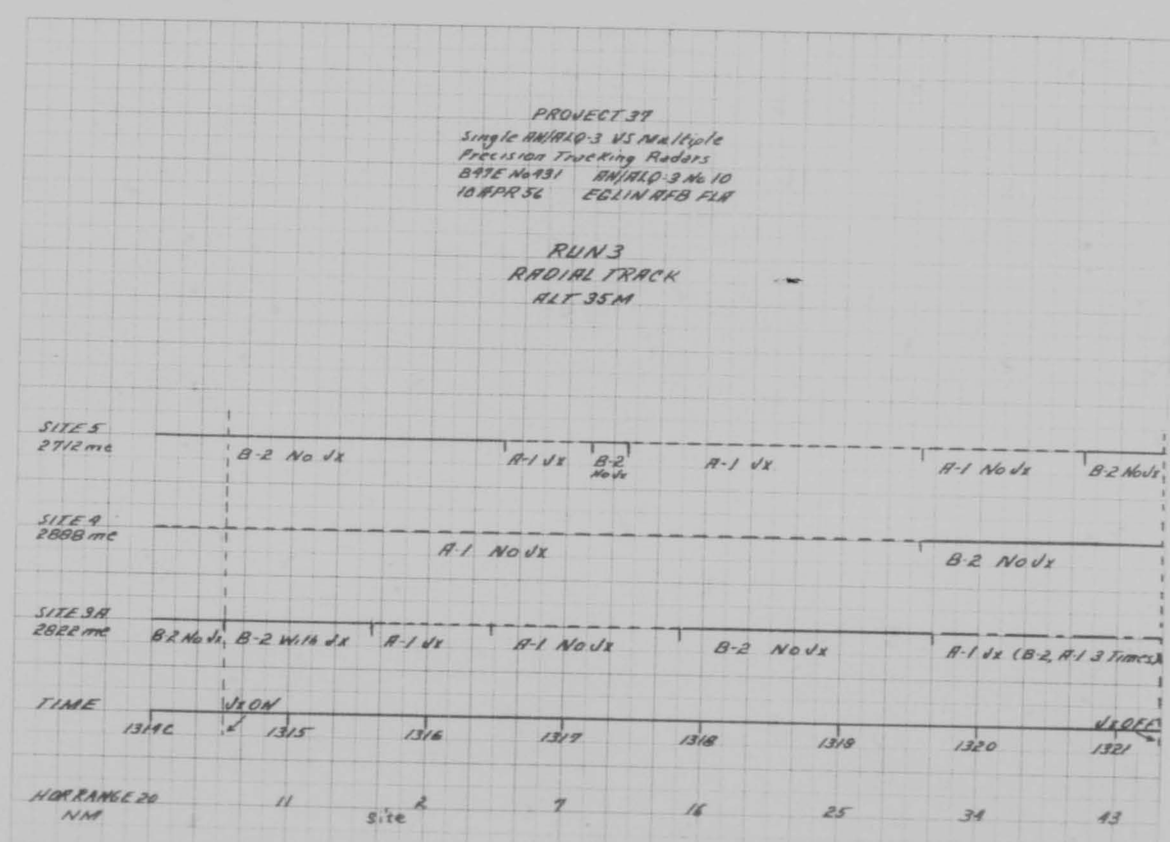
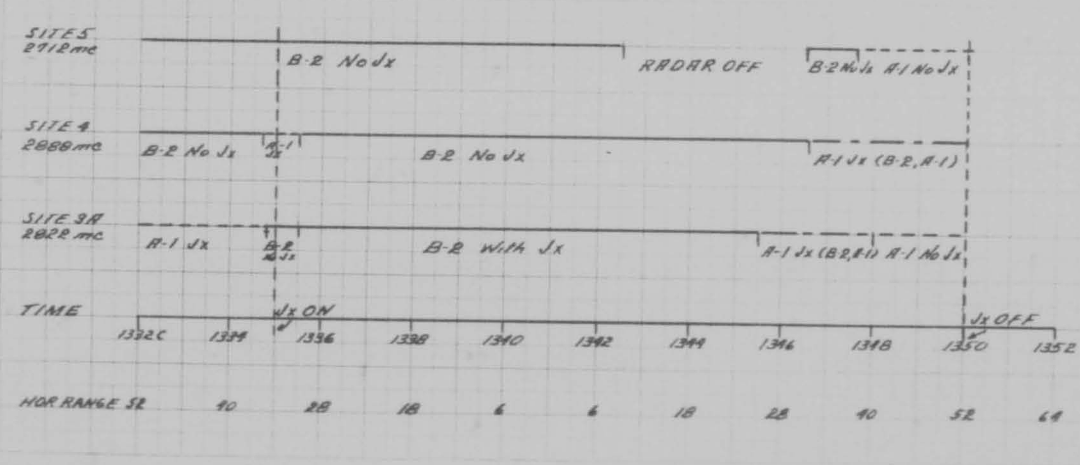


SECRET

Incl 5

PROJECT 37
Single AN/ALQ-3 VS Multiple
Precision Tracking Radars
B-47E No 431 AN/ALQ3 No 10
10 APR 56 EGLIN AFB FLA

RUN 4
RADIAL TRACK
ALT 35 M



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Classification: SECRET
Auth: COMDR 376BOMWG M
Initials: Rl. Hall
Date: 7 June 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

7 June 1956

SUBJECT: Test Progress Report (RCS: SAC-U30)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 31 May 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 34, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Estimated date of completion: March 1957.

c. Hours flown: 8:00.

d. Summary:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when

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received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) Preliminary tests showed the difference in frequency between the receiver and transmitter after the jammer had locked-on a signal was too great for effective jamming. It was felt this could be improved by frequency modulating the fixed oscillator and thereby vary the transmitter output in a portion of the enemy receiver bandwidth. To test this, a 30 megacycle oscillator, modulated by a reactance tube, was constructed to replace the normal crystal controlled oscillator. When this circuit was tried in the jammer, transmitter carrier was frequency modulated 170 kilocycles at a 400 cycle rate. Loss of transmitter efficiency, effectiveness, and frequency drift caused the abandonment of this method. (CONFID)

(3) Work is continuing on a mechanical automatic frequency control system to overcome the frequency error. A servo-motor and saturable transformer were obtained and a servo DC amplifier and discriminator built. This system is undergoing tests in the breadboard stage. If the mechanical difficulties of such a system can be overcome, it will be incorporated in the jammer. The motor control circuitry of the jammer was modified to incorporate a delay in the transmitter; this is necessary to prevent the transmitter from being keyed on before the AFC circuit centers the receiver on the incoming signal. (CONFID)

3. Test Project Number 35, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Estimated date of completion: April 1957.

c. Hours flown: None.

d. Summary:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a fly-back time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus no reason to continue jamming it. If there were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multi-vibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension cables have been made for all units so they may be removed from the receiver rack for testing and aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. (SECRET)

(4) First checks of the receiver lock-on sensitivity showed the minimum discernible signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 DB at the high frequency range and 110 DB at low frequency range. Gate and pause circuits have been adjusted so that pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the lock-on circuitry has been reduced by turning down the threshold control; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is used. All receiver functions have been checked; all memory, lock-on, and receiver gate circuits are operating. A transmitter gate has been built and is operating. Necessary cables and connectors have been added to the receiver and transmitter and the two units interconnected. The system has been tested over the entire band and will lock in the range from 96 to 158 megacycles. Further tests show that the accuracy of lock-on is not yet satisfactory; at some frequencies the error of lock-on is as great as 400 kilocycles for the combined receiver and transmitter system. The error in lock-on appears to be due to three separate problems:

first, inaccuracy of lock-on of the receiver oscillator; second, drift caused by the AFC circuit leakage; and, finally, error in the lock-on of the transmitter. Inaccuracy of receiver lock-on seems to be caused by delay in the control circuits and instability of the receiver local oscillator. A phase correction capacitor has been added to the receiver control output tube to improve initial lock-on of the receiver. Work is being done on the receiver local oscillator to improve stability; several modifications have been made on the AFC circuit but not too much improvement has been noted. It is believed that if the receiver can be made to stop closer to the correct frequency, the AFC will automatically become more effective. (SECRET)

(5) The IP-130/UPM-17 spectrum analyzer is being used to examine the output from the receiver oscillator and transmitter. This piece of test equipment, which was received during May, appears to be very useful for this type work. The spectrum of the receiver oscillator and transmitter were found to be very broad, approxmately 200 to 400 kilocycles for the oscillator and 500 kilocycles or more for the transmitter. The spectrums of these two circuits may have to be reduced before accurate lock-on can be obtained. (SECRET)

4. Test Project Number 36, "S-Band RF Systems" (SECRET)

a. Date initiated: 1 November 1954.

b. Estimated date of completion: Continuous.

c. Hours flown: 91:35.

d. Summary:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) In compliance with Second Air Force classified message DM3A4-12651, 29 Dec 55, directing that all AN/ALT-6 ECM equipments be turned in for recycling, it was necessary to return the T-402/ALT-6 transmitter, which had been modified to allow the magnetron oscillator tube and tuning mechanism to be operated remotely from the transmitter case, to its normal configuration, thereby terminating further tests and evaluation of the

AN/ALT-6 remoted magnetron installation. The modified equipment was returned to its normal state for shipment. An interim report on this portion of the test project is being prepared, including modification data, installation data, test missions flown, malfunctions encountered, modifications to eliminate malfunctions, and conclusions arrived at from test data. (SECRET)

(3) As previously reported, since data obtained from flight tests of the remote magnetron appeared promising, though not conclusive, a B-47E aircraft Blue Cradle installation was made wherein six AN/ALT-6 transmitters each feed RF output into waveguide approximately 28" long, including a 90 degree H-plane bend, and radiate through apertures in the bomb bay doors. Several missions have been flown and results reported in previous SAC U-30 reports. Due to other commitment of aircraft, only one scheduled mission was flown during May. This was a local mission to determine relative antenna pattern by means of an AN/APR-9 receiver on the ground. Data obtained on this flight was not sufficient to establish a pattern and additional flight testing will be required. Other aircraft commitments have necessitated cancellation of all Test Project 36 missions for the month of June. In view of this and the Second Air Force message referred to in paragraph 4d(2), further tests and evaluation of AN/ALT-6 equipment have been cancelled and terminated. An interim report is being prepared to include all data obtained from missions flown using the Blue Cradle waveguide installation. (SECRET)

(4) It is planned to fly similar missions using AN/ALT-6A transmitters with a waveguide system for further evaluation of this type of transmission line installation. Tests and measurements are presently being made to improve the waveguide transmission system for obtaining higher efficiency and better radiation pattern from the antenna before flying additional tests against ground radar sites. (CONFID)

(5) During May a spot check was made of 12 QRC-27(T) RF cables and connectors which had been in use in B-47 aircraft. Each cable was tested using an AN/ALT-6A transmitting 270 to 350 watts of power through a Hewlitt-Packard S-810A slotted line section, through the six foot QRC-27(T) cable under test, terminating in a Cubic Calorimeter Wattmeter for power measurement. Power readings obtained were compared with power readings obtained with the same set-up but with the tested cable removed. This comparison revealed an approximate loss of 30% of the generated power in the six foot length of QRC-27(T) cable and connectors. (CONFID)

(6) Tests were completed as part of this test project in compliance with 1st Indorsement by Headquarters SAC to letter by Headquarters Fifteenth Air Force, DM4MEE, Subject: "Antennas for

AN/ALT-8 ECM Jammer in Phase IVA Aircraft", dated 6 Mar 56. The following information and recommendations were submitted by the 376th Bomb Wing as 3d Indorsement to basic letter. (UNCL)

(a) "Voltage standing wave ratio curves were plotted for the AT-518, AT-519, AT-528, AT-589 and AT-590 antennas. These measurements were made using a three foot length of RG-117/U coaxial cable to connect a T-477/ALT-8 transmitter to a coaxial-to-waveguide adapter (UG-1106/ALT-6) and model S-810A slotted line section, then through a UG-1106/ALT-6 co-axial-to-waveguide adapter into a 155" RG-117/U coaxial cable to an antenna mounted on an outside ground plane. The VSWR measurements obtained in this manner indicate not only the VSWR of the antenna, but of the multiple discontinuities introduced by the 155" coaxial cable and connectors as used in the battery compartment of the Phase IVA aircraft. (SECRET)

(b) "The AT-518 and AT-589 helix antennas do not cut off sharply at 3600 megacycles but remain below the three-to-one VSWR permitted with the AN/ALT-8 over both the QK-459 and QK-460 magnetron oscillator ranges (2300 to 4105 megacycles). The VSWR of the AT-519 and AT-590 helix antennas approaches the maximum allowable three-to-one VSWR of the AN/ALT-8 at 3250 megacycles and below. The VSWR curves plotted on the AT-528 horn antenna were below 1.8 to 1 between 3100 and 4050 megacycles. (SECRET)

(c) "Recommend the following:

1. Of the antennas tested, the horn antenna should be used with the AN/ALT-8 transmitter if at all possible. (CONFID)

2. Reactance curves should be obtained for the AT-518 and AT-589 antennas before their use is considered. Careful comparison of the RF system Smith charts and QK-460 magnetron Reike diagrams must be made before an accurate determination can be made as to the seriousness and location of "frequency holes" (regions of unstable operation) caused by these systems. The 376th Bomb Wing does not have facilities for making the necessary measurements. (CONFID)

3. The AT-519 and AT-589 should not be used with the QK-459 and QK-460 magnetron oscillators. (CONFID)

4. Inclosures 1, 2 and 3 are VSWR versus frequency graphs for the various antennas tested." (UNCL)

5. Test Project Number 37, "AN/ALQ-3 Suitability Test" (SECRET)

a. Date initiated: 2 May 1955.

b. Estimated date of completion: October 1956.

c. Hours flown: 83:00.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Six complete AN/ALQ-3 systems have been delivered to the 376th Bomb Wing for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing; to date, 28 systems have arrived: (CONFID)

(a) Systems 1 and 2 have been modified by W L Maxson field engineer using new sub-units obtained from the factory and should now meet operational specifications. (CONFID)

(b) Systems 6, 7, 8, 9, 10 and 23 are being used for test. (CONFID)

(c) Twenty systems are still in crates in the 376th A&E Supply Room. (CONFID)

(2) Two B-47E Blue Cradles have been modified for installation of the AN/ALQ-3. This modification consists of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes have been necessary, only the additions described. (UNCL)

(3) The following changes have been made in the project test program by Headquarters SAC: Tests of the AN/ALQ-3 against EW and GCI radars are waived, limiting testing of the AN/ALQ-3 to tracking type radars only. No modifications of the AN/ALQ-3 will be accomplished to permit operation against EW/GCI radars. (CONFID)

(4) Two flight tests were conducted during May with the AN/ALQ-3 installed in a B-47E aircraft and flown against a single precision tracking radar at Eglin AFB, Fla. Purpose of these tests was to determine protection afforded a single AN/ALQ-3-equipped aircraft from a single precision tracking radar of the MSQ type. Voice tape recordings and Esterline-Angus tapes were obtained from the radar site and will be used to evaluate the missions. This data has not been completely reduced, therefore results of the May tests will be reported in the June SAC U-30 report. (CONFID)

(5) The following three flight tests were conducted during April but the results were not reported in the April SAC U-30 report due to lack of time. (UNCL)

(a) 24 April, single AN/ALQ-3-equipped B-47 aircraft operating against MSQ type radars at sites 4 and 5, Santa Rosa Island, Eglin AFB, Fla. Aircraft altitude 35,000 feet and true airspeed 430 knots. Aircraft tracks are shown on Inclosure 4. (SECRET)

(b) 26 and 27 April, single AN/ALQ-3-equipped B-47 aircraft operating against MSQ type radars at sites 4, 5 and 32, Eglin AFB. Aircraft altitude 35,000 feet and true airspeed 430 knots. Aircraft tracks are shown on Inclosure 4. (SECRET)

(6) Tracking records for each run of each mission are shown in Inclosures 5 through 29. Mode of radar operation is shown on the track records as A-1, A-2 or B-2. These modes are as follows: A-1, full manual operation of radar, used while searching or attempting to acquire a target (track record is shown as a dashed line during A-1 operation indicating no tracking of the aircraft); B-2, full automatic operation in range, elevation and azimuth (track record is shown as a solid line during B-2 operation indicating radar tracking of the aircraft); A-2, aided range operation, automatic tracking in azimuth and elevation with range rate set in manually (track record is shown as a solid line during A-2 operation indicating radar tracking of the aircraft). Periods during which the AN/ALQ-3 effectively jammed the tracking radar are shown as dash-dot lines. Effective jamming was assumed for any period during which the jammer prevented the radar from obtaining more than a 15 second smooth track, assuming the aircraft would not be vulnerable to radar controlled firing if the tracks were for less than 15 seconds for each acquisition. (SECRET)

(7) For the mission of 24 April, when one AN/ALQ-3 was used against two MSQ radars, the AN/ALQ-3 receiver sensitivity was set on X100 (20 db attenuation) in an attempt to prevent one radar from monopolizing the AN/ALQ-3 receiver by keeping the radar beam in the vicinity of the aircraft, but not necessarily on the aircraft. Reducing the receiver sensitivity accomplished this; however, it was found that the sensitivity was reduced to the extent that the AN/ALQ-3 receiver would not pick up the radar signal for certain aspects of the target aircraft with respect to the tracking radars. This was apparent on radial runs where the aircraft was tracked in B-2 mode, both inbound and outbound. Jamming, when it occurred, was when the aircraft was at close range inbound or overhead. The 30 nautical mile tangential runs also show that the AN/ALQ-3 receiver sensitivity was set too low, particularly on track 7, when the AN/ALQ-3 antenna

was pointing away from the ground radars. A summary of AN/ALQ-3 operation against two MSQ radars appears below in chart form. Each separate track of the aircraft is listed by the length of time the track was held. The aircraft horizontal range during the track is listed under H RNG HIGH V (high vulnerability) or H RNG LOW V (low vulnerability). It is assumed that tracking within 15 nautical miles or 30,000 yards would cause the aircraft to be highly vulnerable to radar-controlled anti-aircraft fire; therefore, tracking ranges from zero to 15 nautical miles would have to be extended when considering radar-controlled missile firing, depending on the type missile and guidance system. Total time the aircraft was tracked with high and low vulnerabilities is shown as a fraction of the total possible tracking time. For example, if one radar tracked for six minutes and the other for four minutes on a run which lasted for 20 minutes, this would be expressed as 10/40 (since the total possible combined tracking time of the two radars would be 40 minutes for a 20 minute run). The fractions are broken down into HIGH V or LOW V time, depending on the range involved. The total time jamming was effective is shown as a fraction of the total possible tracking time. No listing is made of the time used by the radars searching for the target aircraft, some of which could be credited to jamming, whenever it was jamming, which caused the radar to break-lock. These instances can be seen on the track records showing the entire track for each run. (SECRET)

SUMMARY
AN/ALQ-3 VS TWO MSQ RADARS
(AN/ALQ-3 RECEIVER SENSITIVITY ON X100)

TYPE COURSE	TRACK TIME (Min)	H RNG HIGH V (NM)	H RNG LOW V (NM)	EFFECTIVE JAM TIME (MIN)	H RNG (NM)
		RUN 1			
Radial	2½	0-14	-	2	5-18
Radial	3	-	43-55	1½	15-23
Radial	3½	-	40-55		
Totals Run 1: HV 2½/34, LV 6½/34, Eff. Jamming 3½/34					
		RUN 2			
Radial	5		45-15	2	15-5
Radial	3½	-	15-32	2	27-16
Radial	3	-	45-27		
Radial	9½	15-0-15	15-41		
Totals Run 2: HV 4½/30, LV 11½/30, Eff. Jamming 4/30					

RUN 3

Tan(10NM)	1 -	35-28	12	37-10-34
Tan(10NM)	2 -	26-17	$\frac{1}{2}$	36-34
Tan(10NM)	2 -	48-38		

Totals Run 3: HV 0/22, LV 5/22, Eff. Jamming $12\frac{1}{2}$/22

RUN 5

Tan(20NM)	1 -	20-24	$2\frac{1}{4}$	21-27
Tan(20NM)	$\frac{1}{2}$ -	26-29	$1\frac{1}{2}$	26-35
Tan(20NM)	1 -	35-42		

Totals Run 5: HV 0/16, LV $2\frac{1}{2}$/16, Eff. Jamming 4/16

RUN 6

Tan(20NM)	$6\frac{1}{2}$ -	39-21	$1\frac{1}{2}$	21-27
Tan(20NM)	3 -	27-42	8	28-20=36

Totals Run 6: HV 0/28, LV $9\frac{1}{2}$/28, Eff. Jamming $9\frac{1}{2}$/28

RUN 7

Tan(30NM)	8 -	56-30=49	0	
Tan(30NM)	8 -	56-30-49		

Totals Run 7: HV 0/18, LV 16/18, Eff. Jamming 0/18

RUN 8

Tan(30NM)	4 -	34-31-35	5	47-31
Tan(30NM)	5 -	32-31-40		

Totals Run 8: HV 0/26, LV 9/26, Eff. Jamming 5/26

(8) For the mission of 26 April, on which one AN/ALQ-3 was used against three MSQ radars, the AN/ALQ-3 receiver sensitivity was set on X10 (10 db attenuation). It was noticed on this test that the increased receiver sensitivity provided better aircraft coverage and still prevented one radar from monopolizing the AN/ALQ-3 jamming. During the mission the radars at sites 4 and 32 were operated on frequencies within five megacycles of each other. The radars were separated sufficiently to insure one did not interfere with the other; however, the result was that when the AN/ALQ-3 jammed one radar, the other also received jamming. The close proximity of the two radar frequencies was not learned until after the mission. The summary of this mission is shown below: (SECRET)

SECRET

SUMMARY
AN/ALQ-3 VS THREE MSQ RADARS
(AN/ALQ-3 RECEIVER SENSITIVITY ON X10)

TYPE COURSE	TRACK TIME (MIN)	H RNG HIGH V (NM)	H RNG LOW V (NM)	EFFECTIVE JAM TIME (MIN)	H RNG (NM)
RUN 1					
Radial	3	-	16-35	1	27-33
Radial	½	8-11	-	2½	8-26
Radial	1		21-26	1½	30-22
Radial	2		33-44		
Radial	1½	19-11			
Radial	3		26-45		
Radial	1½		38-30		
Radial	2	11-18			
Radial	2½		22-35		
Totals	Run 1: HV 4/39, LV 13/39, Eff. Jamming 5/39				
RUN 2					
Radial	¾		25-27	5	21-10-20
Radial	4		43-18	6	35-73
Radial	½	9-4		3½	7-30
Radial	1½	3-7		2½	43-27
Radial	1½		27-21	2	5-0-7
Radial	2		20-35	6½	11-53
Totals	Run 2: HV 2/45, LV 7½/45, Eff. Jamming 33¼/45				
RUN 3					
Tan(10NM)	½		40-35	10	40-2-40
Tan(10NM)	¾		19-22	1½	39-28
Tan(10NM)	¾		34-36	2	15-34
Tan(10NM)	3	18-10-15		2	35-55
Tan(10NM)	¼		52-53	5	35-10-12½
Totals	Run 3: HV 3/33, LV 1¼/33, Eff. Jamming 20½/33				
RUN 4					
Tan(10NM)	2		26-12	9	27-0-45
Tan(10NM)	1		21-25	2½	57-72
Tan(10NM)	1	3-9		3	9-30
Tan(10NM)	1		45-50	2	40-26
Tan(10NM)				5	12-3-20
Tan(10NM)				3	28-47
Totals	Run 4: HV 1/39, LV 4/39, Eff. Jamming 24½/39				

SECRET

RUN 5

Tan(20NM)	1½	25-21	½	48-51
Tan(20NM)	½	51-53	7	21-20-53
Tan(20NM)			5½	21-53

Totals Run 5: HV 0/27, LV 2/27, Eff. Jamming 13/27

RUN 6

Tan(20NM)	½	30-28	1	37-32
Tan(20NM)	3	20-28	3	28-19
Tan(20NM)	½	30-34	3½	34-52
Tan(20NM)			5	43-20
Tan(20NM)			5½	19-38
Tan(20NM)			1½	21-12
Tan(20NM)			2	11-10-14
Tan(20NM)			5	18-48

Totals Run 6: HV 0/39, LV 4/39, Eff. Jamming 26½/39

RUN 7

Tan(30NM)	4	31-34	10	53-20-40
Tan(30NM)			9	40-30-60

Totals Run 7: HV 0/30, LV 4/30, Eff. Jamming 19/30

RUN 8

Tan(30NM)	2½	38-55	4½	40-30-40
Tan(30NM)	3	40-30-31	2½	52-72
Tan(30NM)	1	50-57	3	31-50
Tan(20NM)	1/3	25	1½	56-63
Tan(20NM)	1/3	25	9½	35-20-72
Tan(20NM)	½	30		
Tan(20NM)	1/3	48		

Totals Run 8: HV 0/30, LV 8/30, Eff. Jamming 21/30

(9) For the mission of 27 April, on which one AN/ALQ-3 was used against three MSQ radars, receiver sensitivity was set on X10 as for the previous mission. Radar frequencies were separated so that when the AN/ALQ-3 was jamming one, the others would not be affected. During the repeat of Runs 1 and 2, radar smoothing was allowed, which accounts for the longer tracking ratio during these runs. (SECRET)

SUMMARY
AN/ALQ-3 VS THREE MSQ RADARS
(AN/ALQ-3 RECEIVER SENSITIVITY ON X10)

TYPE COURSE	TRACK TIME (MIN)	H RNG HIGH V (NM)	H RNG LOW V (NM)	EFFECTIVE JAM TIME (MIN)	H RNG (NM)
		RUN 1			
Radial	2/3	5		3	24-0-2
Radial	2½		35-20	1½	20-10
Radial	1	9-1		6	31-10-19
Radial	2½		45-30		
Radial	1/3		25		
Radial	2/3		21		
Radial	1½		19-30		
Totals	Run 1: HV 1½/30, LV 7½/30, Eff. Jamming 10½-30				
		RUN 2			
Radial	1	3-0-5		5	38-3
Radial	2		39-47	5	5-39
Radial	3		38-15	7½	5-50
Radial	1	15-9		2	11-20
Radial	½	3-0-2			
Radial	7		19-59		
Totals	Run 2: HV 1½/39, LV 13/39, Eff. Jamming 19½/39				
		RUN 3			
Radial	3		36-14	9	27-1-34
Radial	3	13-9-15		9	14-10-50
Radial	5		15-48		
Radial	3		45-27		
Totals	Run 3: HV 3/39, LV 11/39, Eff. Jamming 18/39				
		RUN 4			
Tan(10NM)	1	12-9		5	41-12
Tan(10NM)	1	9-11		5	11-45
Tan(10NM)	2½		29-15		
Tan(10NM)	1	10-15			
Tan(10NM)	5		15-45		
Tan(10NM)	5		26-54		
Totals	Run 4: HV 3/39, LV 12½/39, Eff. Jamming 10/39				
		RUN 5			
Tan(20NM)	1		19-21	3	35-19
Tan(20NM)	½		35-30	3½	21-41
Tan(20NM)	2½		35-42	5	31-19-25

RUN 6

Tan(20NM)	1		28-33	9½	45-19-28
Tan(20NM)	2½		34-23	2	35-49
Tan(20NM)	3		21-19-23	6	23-49
Tan(20NM)	1		15-20	6	29-14
Tan(20NM)				3	42-60

Totals Run 6: HV 0/42, LV 7½/42, Eff. Jamming

RUN 7

Tan(20NM)	1-3/4		33-30		
Tan(20NM)	½		38-40		

Totals Run 7: HV 0/21, LV 2¼/21, Eff. Jamming 0/21

RUN 8

Tan(30NM)	5		53-30	3½	53-35
Tan(30NM)	2		30-34	3½	34-53
Tan(30NM)	3		23-37	4	36-23
Tan(30NM)				3½	36-55

Totals Run 8: HV 0/33, LV 10/33, Eff. Jamming 14½/33

REPEAT OF RUN 1 (with smoothing)

Radial	4		43-15	5	7-1-28
Radial	1	15-7		5	29-1-6
Radial	2		27-44	4¾	55-28
Radial	1½		28-18	6½	18-11-32

Totals Repeat Run 1: HV 1/36, LV 7½/24, Eff. Jamming 20¼/36

REPEAT OF RUN 2 (with smoothing)

Radial	3½		23-44	3½	44-20
Radial	3½		44-15		
Radial	1½	15-9			
Radial	5	7-3-15			
Radial	4½		15-44		
Radial	3½		34-15		
Radial	3	15-11-15			
Radial	7		15-57		

Totals Repeat Run 2: HV 9½/39, LV 22/39, Eff. Jamming 3½/39

(10) Four flight tests are planned for June. Two tests will involve compatibility of AN/ALQ-3 with AN/ALT-6A sweep jammers. Two missions will be flown using two AN/ALQ-3-equipped B-47 aircraft against three MSQ type radars at Eglin AFB, Fla. (SECRET)

(11) Radar operator technique during AN/ALQ-3 jamming missions has been closely observed during each test. It is fairly common

for an experienced operator to manually swing the antenna off the target aircraft, when jamming appears, in an attempt to cause the AN/ALQ-3 receiver to break-lock and pick up another radar signal. The operator then swings the antenna back to its previous position, searches in range and re-acquires the target. It is felt that if a bundle of chaff is dispensed from the aircraft at the moment the AN/ALQ-3 receiver breaks lock and jamming ceases, the radar operator will undoubtedly lock-on the chaff when attempting to re-acquire the target. This will give the aircraft additional time to escape reacquisition by the ground radar. This technique will be tested during a mission in July. (SECRET)

6. Test Project Number 39, "Flight Test of QRC-18(t) (SECRET)

a. Date initiated: 15 August 1955.

b. Estimated date of completion: June 1956.

c. Hours flown: 91:50.

d. Summary:

(1) Purpose of this project is to test tactical suitability of the QRC-18(t). Essentially, the QRC-18(t) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

(2) Two flight tests were flown during May using B-47 aircraft. Two aircraft were used on each test, one simulated the bombing aircraft carrying the jamming transmitters, and the other, an attacking fighter. Aircraft maintained a 25-mile separation while flying nose-to-tail over a course extending approximately 250 miles from the ground station. The bomber flew at 34,000 feet altitude and the fighter at 33,000 feet. The ground station for the tests was a BC-640 VHF transmitter and RC-81 antenna located at Barksdale AFB, La. Transmissions to the fighter aircraft were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. AN/ARC-3 VHF receivers were used inthe simulated fighters. Frequency was 142.38 megacycles. On the first test the jammers were pre-set on the ground for unattended operation in the aircraft bomb bay. On the second test, spot jamming runs were made by ECM operators in the B-47 Phase V manned capsule. An observer in the fighter aircraft monitored the AN/ARC-3 receiver and scored jamming according to the following system:

Condition 0 - no jamming.

Condition 1 - all transmissions can be received with only a little background annoyance.

Condition 2 - can understand practically all messages but an occasional word is blocked out.

Condition 3 - can understand words and phrases but not complete continuity (a good operator can copy a repeated message).

Condition 4 - can tell a transmission is being made but cannot receive the message.

Condition 5 - cannot tell a transmission is being made. (CONFID)

(3) On the flight test of 1 April it was intended that three transmitters would be used on runs where two normal 1% QRC-18(t) sweep units were used and runs where a single transmitter having a unit modified to sweep 1.2 megacycles was used. However, the two transmitters with the normal sweep units failed to operate at high altitude and four runs were made with a single transmitter sweeping over a bandwidth of 1.2 megacycles. The modified sweep unit used on these runs was made in the 376th Bomb Wing by opening up one of the normal QRC-18(t) sweep units and removing all but two of the sweep capacitor plates. Results obtained on this test are shown in the following chart. (SECRET)

1 May 1956 B-47 Aircraft 33,000 & 34,000 Feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA - MILES	SEPARATION FTR TO BOMBER -MILES
1	One AN/ALT-7 transmitter - narrow noise modulation - sweep jamming with special sweep unit designed to sweep over 1.2 megacycle width.		
	3	30	18
	5	54	18
	2	80	20
	4	88	20
	5	100	20
	4	122	19
	5	130	19
	5	150	18
	5	175	19
	5	200	19
	5	225	19
	5	250	19

2 Same equipment as for Run 1

5	250	12
5	200	14
5	150	16
5	100	20
4	88	24
3	70	24
2	46	24
1	42	24

3 Same equipment as for Run 1

0	24	12
1	36	15
3	50	24
4	62	24
5	76	25
5	100	26
5	150	25
5	200	25
5	250	26

4 Same equipment as for Run 1

5	250	25
5	200	27
4	176	26
1	152	24
1	118	26
2	110	26
5	100	26
1	80	25
5	62	25
1	55	25

Jamming results on this test were somewhat better than on previous tests and this was probably due to the narrow sweep used (the narrowest normal QRC-18 sweep units cover five to ten megacycles). However, effective jamming was received only at distances of approximately 100 miles or beyond, and on the last run jamming conditions varied widely, even at far distances. This might possibly be due to drift of transmitter frequency during the last run. The two transmitters which failed to operate during the flight were checked after the mission and found to operate normally. The sweep units were carefully inspected and small amounts of moisture could be seen condensed on the inner surface of the glass envelope. The sweep units are not evacuated but are sealed with dry air when manufactured. The condensation observed indicates that either the seal is imperfect or that moisture or other vapor may be released from motor windings or other parts during operation. (SECRET)

(4) On the flight of 14 May a Phase V B-47 with ECM capsule was used as the bomber aircraft. The ECM capsule is carried in the bomb bay of the B-47 aircraft and designed to carry two ECM operators, with various configurations of ECM equipment, and is equipped with heating, pressurization, and liquid oxygen systems. On this flight test four spot jamming runs were made using an AN/ALT-7 transmitter with narrow noise modulation. An AN/APR-14 receiver was used to set the transmitter on frequency. Results are shown in the following table:

14 May 1956 B-47 Aircraft 34,000 & 33,000 Feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA - MILES	SEPARATION FTR TO BOMBER - MILES
1	One AN/ALT-7 transmitter - narrow noise modulation spot jamming. AN/APR-14 receiver inoperative.		
	1	40	29
	1	72	25
	1	100	23
	1	130	22
	1	170	20
	2	180	19
	2	200	18
	2	224	20
	5	235	22
	5	240	23
2	Same as for Run 1 - receiver not working.		
	3	230	26
	1	215	26
	1	180	24
	1	170	20
	1	110	22
	1	90	25
	1	50	29
	1	30	30
3	Same as for Run 1 - receiver operating normally.		
	1	30	35
	2	40	30
	3	55	28
	5	65	26
	5	85	23

5	100	23
5	125	21
5	147	23
5	180	25
5	200	27
5	230	28

4 Same as for Run 1 - receiver operating normally

5	240	15
5	228	15
5	213	14
5	195	19
5	180	24
0	147	27
5	135	27
5	102	28
0	94	30
5	87	30
5	60	30
5	45	30
5	31	30

On the first two runs the AN/APR-14 receiver did not receive signals. This was found to be caused by improper switching of antennas in the aircraft. On the last two runs the antenna switch was set to connect the antenna to the receiver and excellent results were obtained. The observer in the fighter aircraft reported that Runs 3 and 4 were the best jamming he had heard. Jamming was continually effective, with no trace of voice signal. On the last run the two conditions zero shown coincided with times when the jamming operator turned off his transmitter to look-through for the voice signal. (SECRET)

(5) Engineers from the Hallicrafter Company visited Barksdale AFB on 21 May and brought with them several modified QRC-18(t) sweep units and two modified speed control units. The modified units are designed to sweep over widths, which vary according to unit, of from one megacycle to a few hundred kilocycles. The speed controls are designed to cause the sweep units to sweep at a random or erratic rate. Flights for testing of these units are scheduled for the first week in June. All flight testing of normal QRC-18(t) units is complete and the final report on this portion of the test project is being prepared. (SECRET)

7. Test Project Number 40, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Estimated date of completion: September 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) Three models of a cavity device for measuring sweep limits have been designed. Model I is being used by the 376th Bomb Wing Armament and Electronics maintenance personnel for an evaluation under operational conditions. This first model uses six pre-set cavities and neon-lamp indicators. Model II was taken to Wright-Patterson AFB in February for investigation and evaluation by WADC personnel and has not been returned. This second model uses six pre-set cavities and filament type lamps as resonance indicators. It also contains a broad-band detector whereby the jamming transmitter noise modulation may be monitored with a pair of headphones. Model III is under construction. This third model will use three precision micrometer-tuned cavities in the frequency range from 2400 to 3400 megacycles and will have micro-ammeter resonance indicators. The micro-ammeters will be actuated by the rectified outputs from small crystal diode detectors coupled to the cavities. In the first two models, the power required to actuate the neon or filament lamps was great enough to cause the cavity Q to be reduced at resonance. This made the resonance peak several megacycles wide. The micro-ammeter indicators require only a fraction of the power required by the lamps so higher Q can be maintained, and a much sharper resonance indication obtained. Also, it is much easier to read a meter indication of the resonance peak than to judge the point from the brilliance of a lamp or neon bulb. One disadvantage might be that it will require light to read the meter in dark places or at night, whereas the lamps provide illumination. (CONFID)

(3) The project engineer has some electroluminescent flat type tubes which light up upon application of pulsating direct current. These tubes are flat plates containing a semi-conducting electroluminescent material. The tubes will light on very small currents, in the order of micro-amperes, so these will be investigated as possible low power resonance indicators. The third cavity device will also incorporate a detection system so the output of the jamming transmitter can be monitored with headphones or a speaker for an indication of modulation. Methods to incorporate a circuit in the third model to measure relative transmitter power output are being investigated. (CONFID)

(4) A TS-118A/AP radio frequency wattmeter has been received and this is being investigated for possible use in measuring power output of AN/ALT-6 and AN/ALT-8 transmitters. The TS-118A/AP is a thermocouple type wattmeter designed to measure RF power up to 500 watts in the range from 20 to 1400 megacycles. There is the possibility that the frequency range may be extended to cover 2400 to 3600 megacycles by the design and use of auxiliary equipment. If such extended range coverage can be realized with reasonable accuracy, the wattmeter, which is currently available as a standard item of Air Force stock, would be suitable for interim use as a power measuring device for AN/ALT-6 and AN/ALT-8 transmitters. The auxiliary equipment required would be one extra thermocouple, to cover the frequency range desired, designed to couple into RG-117/U type RF cable. (CONFID)

8. Test Project Number 41, "X-Band Interference, Code Name SPOTLIGHT." (CONFID)

a. Date initiated: 29 March 1956.

b. Estimated date of completion: No estimate available at this time.

c. Hours flown: None.

d. Summary:

(1) The main purpose of this project is to determine extent of X-band jamming interference with other airborne electronic systems and what measures can be taken to reduce the effects of such interference. (CONFID)

(2) The secondary purpose of the project is to determine effectiveness of X-band sweep jamming against radar equipped AI aircraft to include determination of the optimum sweep jamming rates and bandwidths. (CONFID)

(3) A test program for this project has been written and forwarded to Headquarters SAC. (UNCL)

(4) The starting date of the actual testing is dependent upon receipt of X-band magnetron kits for AN/ALT-6A transmitters and modification of five B-47 aircraft. (UNCL)

9. Test Project Number 42, "Attenuation of UHF Air-to-Air Transmissions". (CONFID)

a. Date initiated: 15 March 1956.

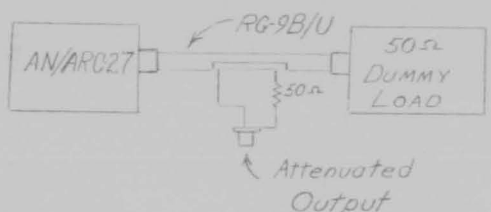
b. Estimated date of completion: Not presently known.

c. Hours flown: None.

d. Summary:

(1) Purpose of this project is to determine optimum method of attenuating transmitted signals in UHF frequency band and optimum attenuated UHF communications ranges for all tactical operations, i.e., enroute cells, refueling rendezvous, refueling formations, etc. (CONFID)

(2) An RF attenuator for use with the AN/ARC-27 transceiver has been constructed and tested for use on this test project. The device is shown diagramatically below:



The device consists of a short length of RG-9B/U RF cable which connects the output of the transmitter to a 50 ohm dummy load where most of the transmitter power is dissipated. A small portion of the RF power flowing in the RG-9B/U cable is coupled out by means of a small loop and brought out to a UG-58/U connector. This attenuated output will be connected to the antenna for transmission. A change-over relay, not shown, will connect the receiver directly to the antenna for reception without attenuation. (CONFID)

(3) The attenuator was tested with an AN/ARC-27 transciever. On a frequency of 236.6 megacycles, with a normal transmitter output power of four watts, the attenuated output was measured as 0.2 milliwatts, or an attenuation of 43 decibels. To make this measurement the output from the AN/ARC-27 was fed to the attenuator and dummy load through a Bird Model 43 Thruline Wattmeter. Attenuated transmitter output was fed into an AN/ARR-8 receiver and height of the signal noted on the receiver panoramic scope. The attenuated output from the transmitter was then disconnected from the receiver and the output from a TS-497B/URR signal generator fed into the AN/ARR-8. The signal generator output was then adjusted until the signal height on the receiver was the same as that observed from the transmitter signal. At this setting the output of the signal generator in microvolts was read from the calibrated dial. This was 100,000

microvolts. Power was then computed by means of the formula $P=E^2/R$, where E is the signal generator output voltage and R is The load resistance, 50 ohms. Thus:

$$P = \frac{0.1^2}{50} = 0.0002 \text{ watts or } 0.2 \text{ milliwatts}$$

(UNCL)

(4) As an additional test it is planned to investigate the feasibility of using small transceivers such as the survival transceiver AN/URC-4 or AN/URC-11 for communication from tanker to bomber at close ranges. Two of each transceiver are on hand but operate on the distress frequency. Crystals have been ordered for these sets to allow their use on refueling frequencies. (CONFID)

(5) A Revere tape recorder will be installed in a KC-97 aircraft to record all VHF-UHF communications incident to a routine refueling operation. This will be done to study communications technique and amount of interference between aircraft or groups of aircraft on normal refueling missions. (UNCL)

(6) A complete test program for this test project has been prepared and forwarded to Headquarters SAC. (UNCL)

10. Test Project Number 43, "Pre-flight and Post-flight Procedures for use by B/RB-47 Wings of this Command". (CONFID)

a. Date initiated: 16 April 1956.

b. Estimated date of completion: July 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this test project is to prepare optimum pre and post-flight procedures for ECM equipments used by B/RB-47 wings. Procedures will cover AN/ALT-6, AN/ALT-8, and AN/ALT-7 transmitters, AN/APS-54 receiver, and AN/ALE-1 chaff dispenser as used in B/RB-47 aircraft Phases III, IV and IVA with or without the pod. (CONFID)

(2) Procedures have been drafted for AN/ALT-6, AN/ALT-6A, AN/ALT-8 and AN/ALT-8A systems. Representatives of the 301st Bomb Wing Armament and Electronics Maintenance Squadron were interviewed on the development of the general ECM maintenance concept to assure that procedures developed by the 376th Bomb Wing will be applicable to the bomb wings having standard allotments of ECM equipment. Representatives of the 301st Bomb Wing were in substantial agreement with procedures already drafted. (CONFID)

(3) An improvement in reporting procedures for analysis of ECM malfunctions originates with the post-flight; recommendations to achieve improved analysis are being prepared and will include revision and amplification of SAC Form 254. (UNCL)

e. Conclusions and Recommendations:

(1) AN/ALE-1 chaff dispensing difficulties will be corrected by the modifications of TO's 1B-47-775 and 1B-47-686. Satisfactory operation of this system can be obtained in the interim period if the dispensers are not operated at high speeds with older types of chaff, if the compartment is cleared of obstructions to the chaff tape, and if strict adherence to correct loading and tape splicing procedures is observed. (CONFID)

(2) ECM operators should be briefed on the operation of the indicator lamp on the C-1282/ALE-1 control unit. This indicator has three different modes of operation in: a. continuous speed positions; b. positions A, B, C, D; and c. positions E and F. It is important to note that dispenser malfunctions cannot be detected from the action of the lamp in positions E and F. (CONFID)

(3) The maintenance of pressure in the power supplies of the AN/ALT-6 and AN/ALT-8 systems at high altitude is still under study. Scheduled preventive maintenance can substantially reduce failure due to loss of pressure at altitude. This preventive maintenance should include: (CONFID)

(a) Proper installation of O rings in connectors and face plates. If the O rings are made of silicone rubber (red in color), Dow-Corning D4 compound should never be used to aid the seal. This compound may, however, be used on neoprene rubber (black in color) and will help to seal connectors. (CONFID)

(b) Connectors and face plates must be correctly torqued. (CONFID)

(c) Pressure relief valves must be inspected and tested to see they reseal at approximately 17 PSI. (CONFID)

(d) Power supplies must be pressurized as close to the time of takeoff as practical. The power supplies should not be pressurized above 5 PSI at sea level in an attempt to compensate for loss of pressure. (CONFID)

(e) Pressure leaks through the connectors of the AN/ALT-8 systems appear to be reduced by potting of the back or inside of the connectors. (UNCL)

11. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Estimated date of completion: Continuous.

c. Hours flown: 731:50.

d. Summary:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Make-up flights to complete Mission 32 were planned to be flown on 1 May using two Phase III B-47 aircraft, one with chaff only and one with jamming only. Observers were sent to Houston RBS and to the GCI radar site at Ellington AFB, Texas. One aircraft had a mechanical abort and the other was held on the ground because of extremely bad weather. (CONFID)

(3) Mission 34 was flown against the Kansas City RBS site (MPS-9 radar) on 11 May for a comparison between the standard support aircraft sweep speeds and a combination using a much faster slow-sweep speed. The normal fast sweep speed was reduced by a factor of five in an attempt to increase the dwell time while still maintaining sub-multiple circumference synchronization. The reduced fast sweep speed was successful in causing considerable servo jitter, but the speeded up slow sweep was ineffective. (SECRET)

(4) Mission 35 was flown on 17 May against the Kirksville, Missouri, AN/FPS-10 radar and the St Louis RBS to test a new sweep speed configuration. Normal slow sweep speed was reduced by five megacycles per second to increase dwell time, and normal fast sweep speed was reduced by a factor of five as was tested on Mission 34. It was hoped this configuration would increase the amount of interference to RBS radars and simultaneously decrease the effect of normal high speed sweep which causes a fixed azimuth strobe on the AN/FPS-10 radar. Results against the RBS radar were excellent until the aircraft penetrated to 50,000 yards, at which time the radar was able to establish a B-2 track (fully automatic). Physical check through the antenna telescope showed the cross-hairs to be following smoothly 25 mils below and to the rear of the aircraft. A close inspection of the Esterline Angus range, altitude, and azimuth recordings for this four-minute period failed to substantiate the radar operator's claim to be on-target during the B-2 period. Servo jitter from the fast sweeping jammers did not cause the radar any perceptible difficulty. Variance in the data gathered makes evaluation of this

mission difficult and establishes a need to fly this test again before valid conclusions can be drawn. (SECRET)

FOR THE COMMANDER:

William H Murphy
WILLIAM H. MURPHY
Major, USAF
Adjutant

29 Incls
1. Chart, Proj 36 (SECRET)
2. Chart, Proj 36 (SECRET)
3. Chart, Proj 36 (SECRET)
4. Acft Tracks, Proj 37 (UNCL)
5 thru 29. Tracking Records, Proj 37 (SECRET)

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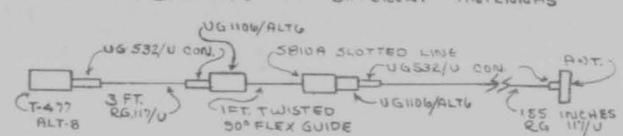
ALL EQUIPMENT & HOOKUPS ARE THE SAME IN ALL MEASUREMENTS
WITH THE EXCEPTION OF DIFFERENT ANTENNAS



— HOT READING } AT 518
---- COLD READING } SER # 940

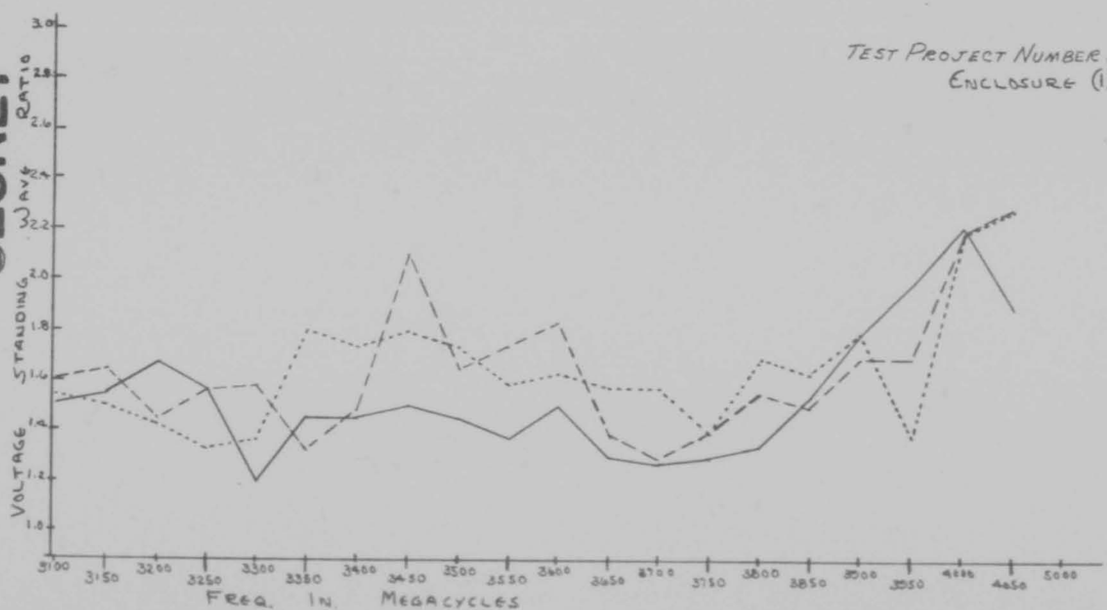
– – – HOT READING } AT 518
SER # 948

USED IN CONJUNCTION WITH S810A, HP 415A FOR (VSWR)
FREQ. SETTINGS WERE MADE USING APR-9

Incl 1

SECRET

TEST PROJECT NUMBER 36
ENCLOSURE (1)



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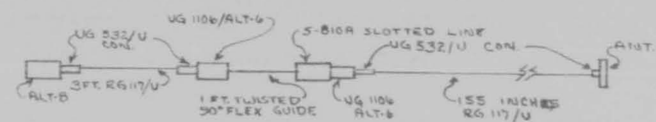
ALL EQUIPMENT & HOOK-UPS ARE THE SAME IN ALL MEASUREMENTS
WITH THE EXCEPTION OF DIFFERENT ANTENNAS

--- HOT READING } AT 519
— COLD READING } SER # 79

····· HOT READING } AT 590
SER # 119

Incl 2

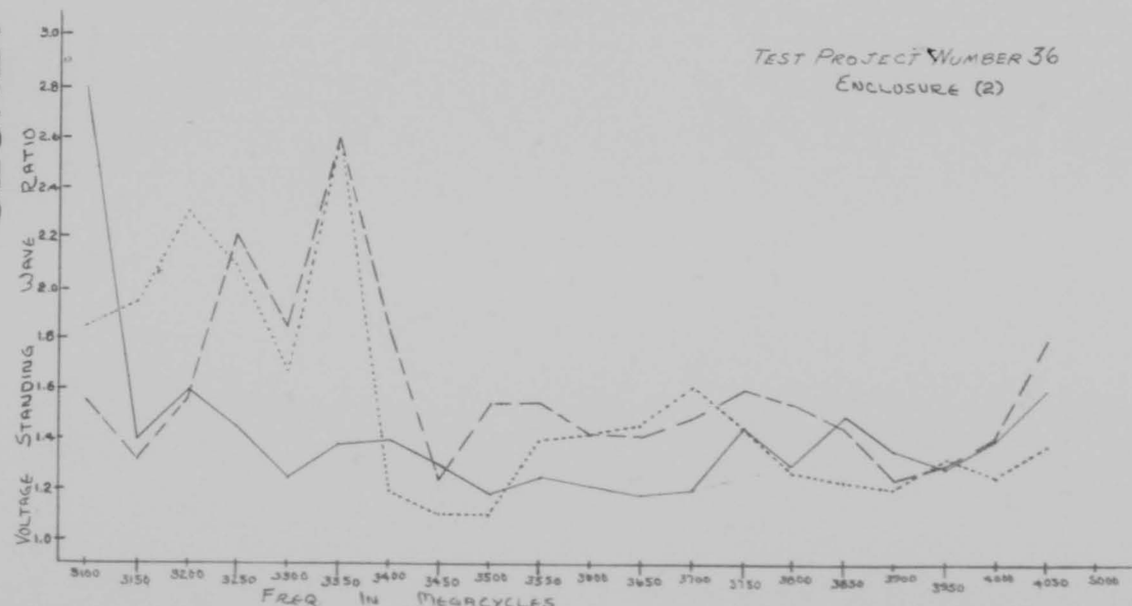


USED IN CONJUNCTION WITH S-810A, HP 415A FOR (VSWR)
FREQ. SETTINGS WERE MADE USING APR-9

SECRET

TEST PROJECT NUMBER 36
ENCLOSURE (2)

SECRET



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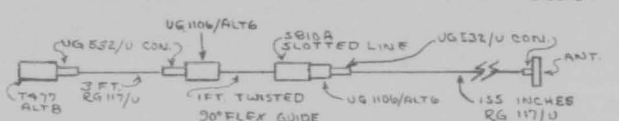


—·—· HOT READING } AT 589 SER # 165

------ HOT READING } AT 589 SER # 137

—— HOT READING } AT 528 (HORN) SER # 65

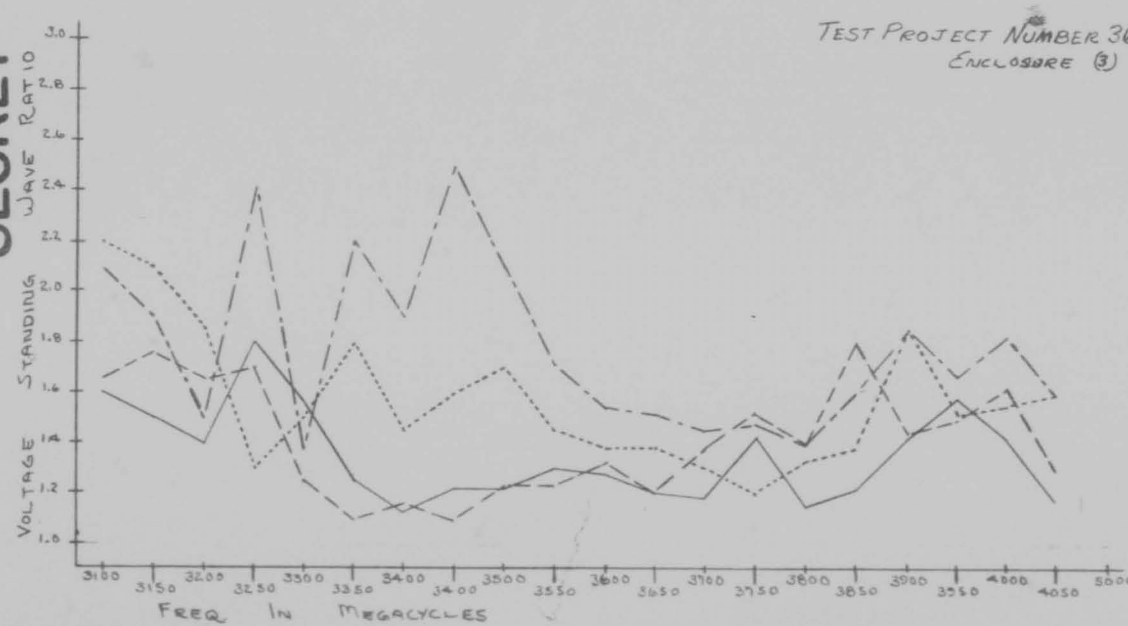
– – – – HOT READING } AT 528 (HORN) SER # 8

USED IN CONJUNCTION WITH SB10A, HP 415A FOR (VSWR)
FREQ. SETTINGS WERE MADE USING APR-9

TEST PROJECT NUMBER 36
ENCLOSURE (3)

Incl 3

SECRET



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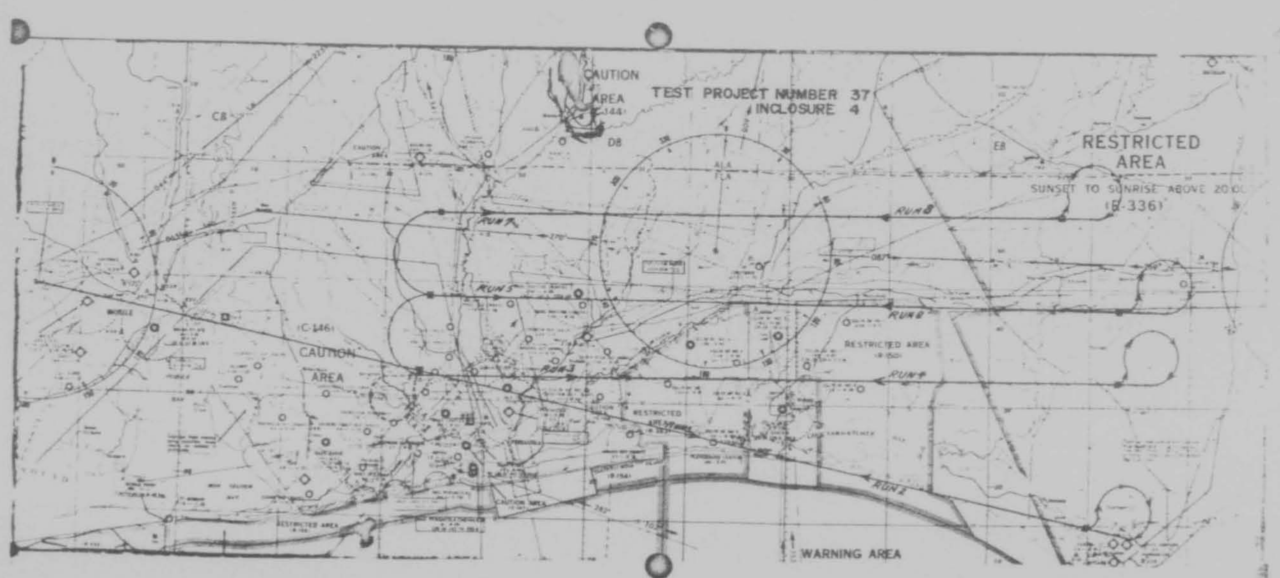

Incl #4

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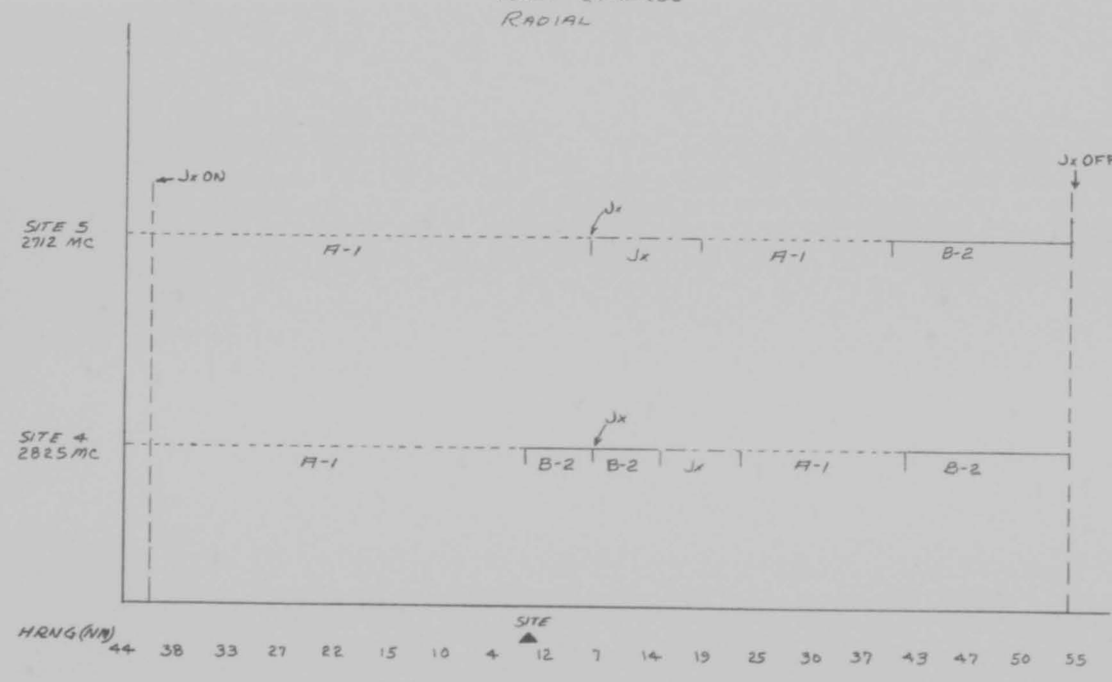
Incl 5

PROJECT 37
RUN 1 24 APR 56
RADIAL



ENCLOSURE 5

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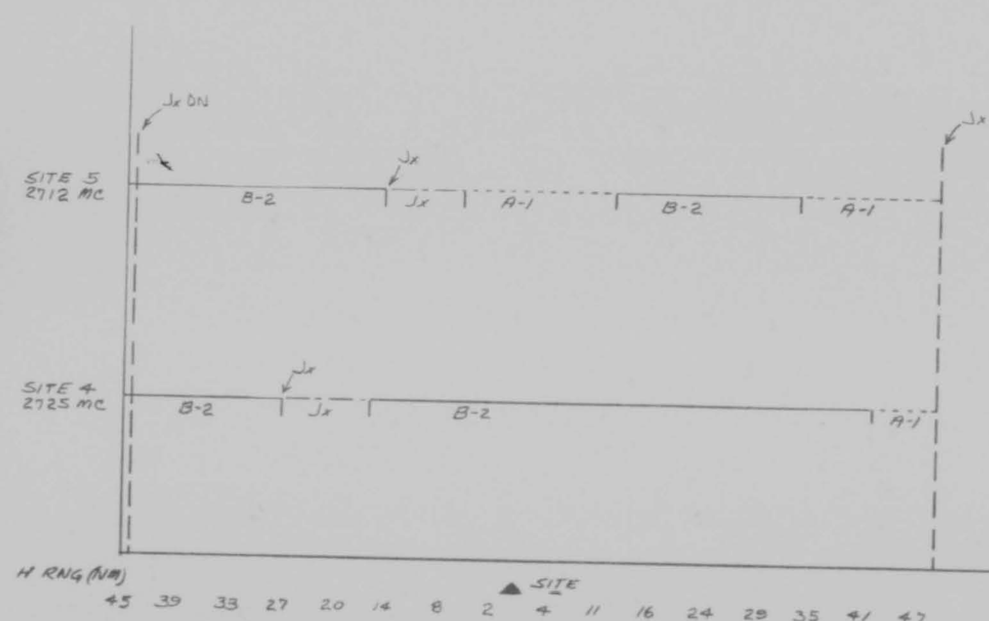
PROJECT 37
RUN 2 24 APR 56
RADIAL

Incl 6



ENCLOSURE 6

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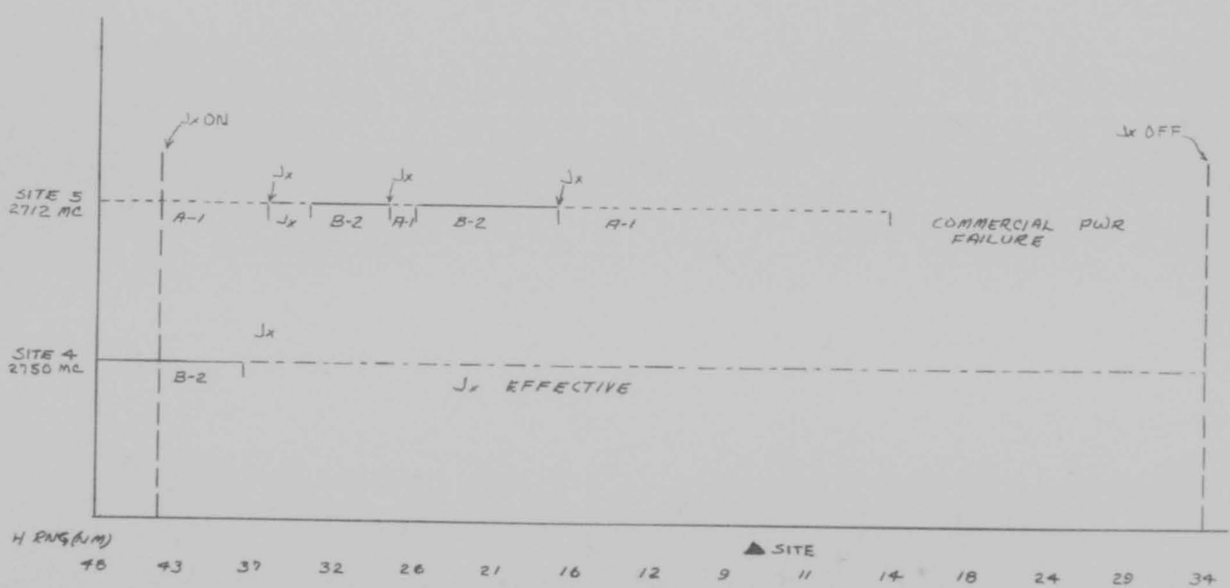
PROJECT 37
RUN 4 24 APR 56
TANGENTIAL

SECRET

Incl 7



ENCLOSURE 7

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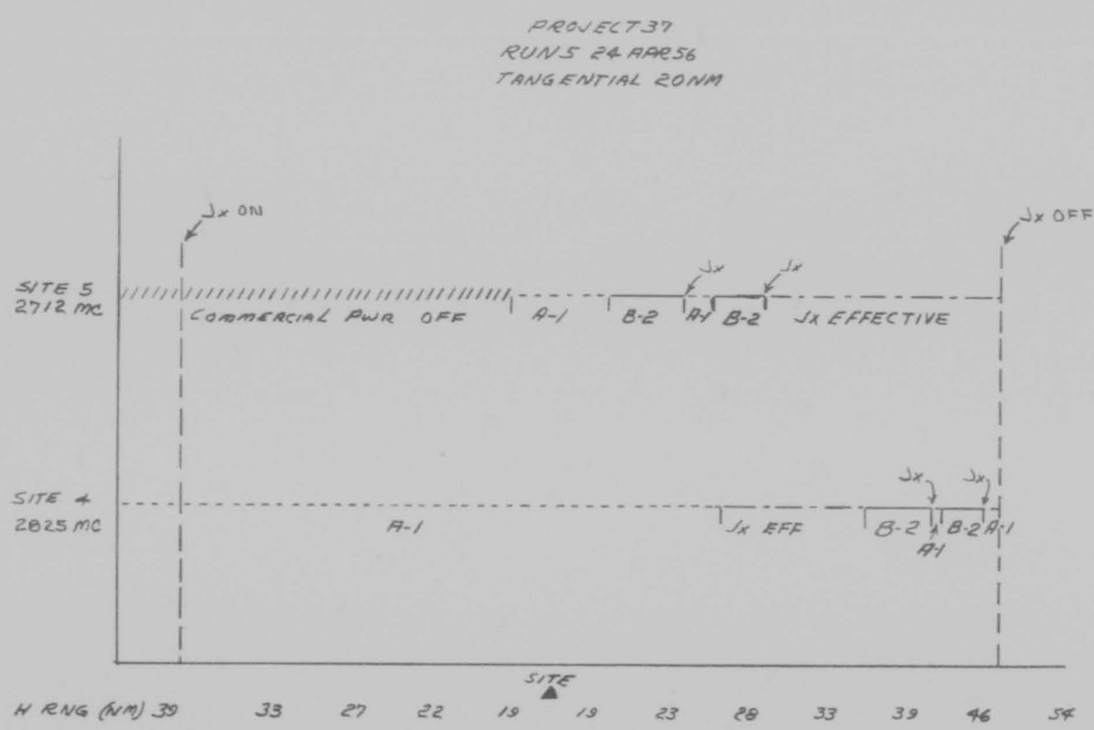

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Incl 9

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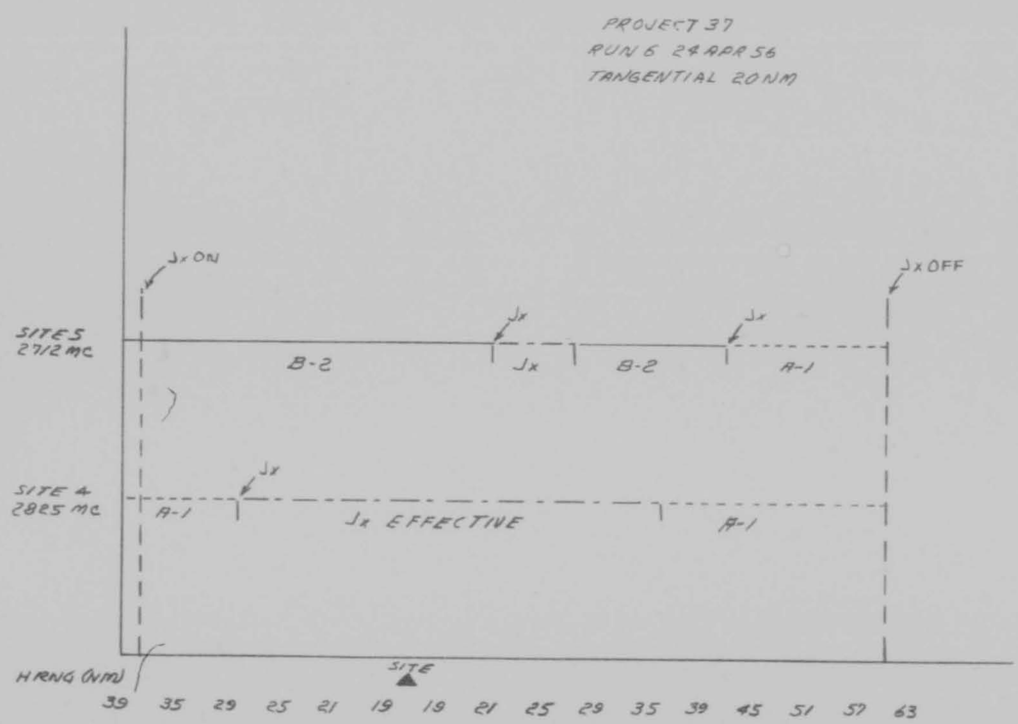

ENCLOSURE 9

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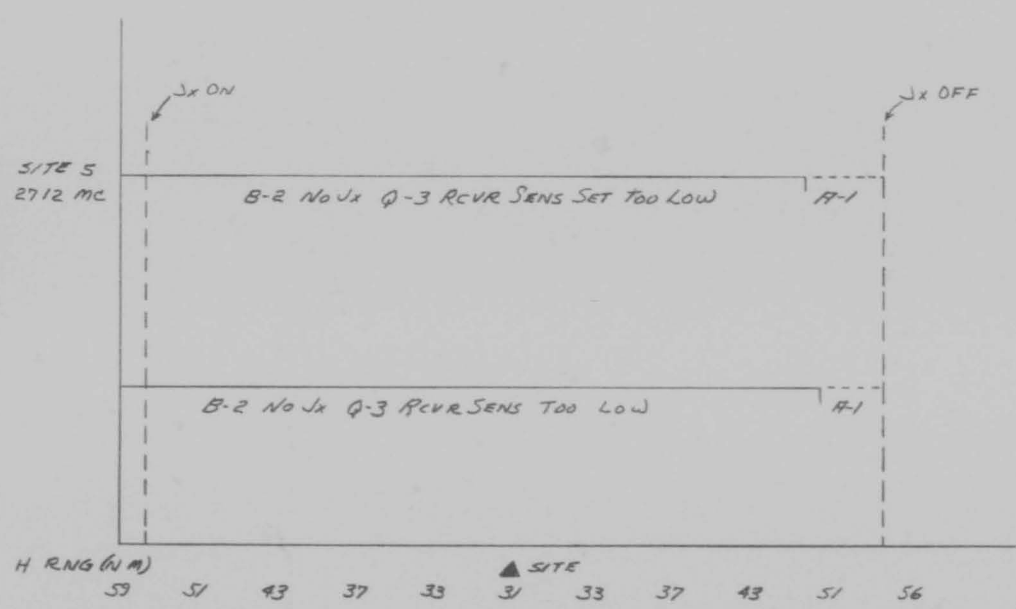
PROJECT 37
RUN 7 24 APR 56
TANGENTIAL 30NM



ENCLOSURE 10

Incl 10

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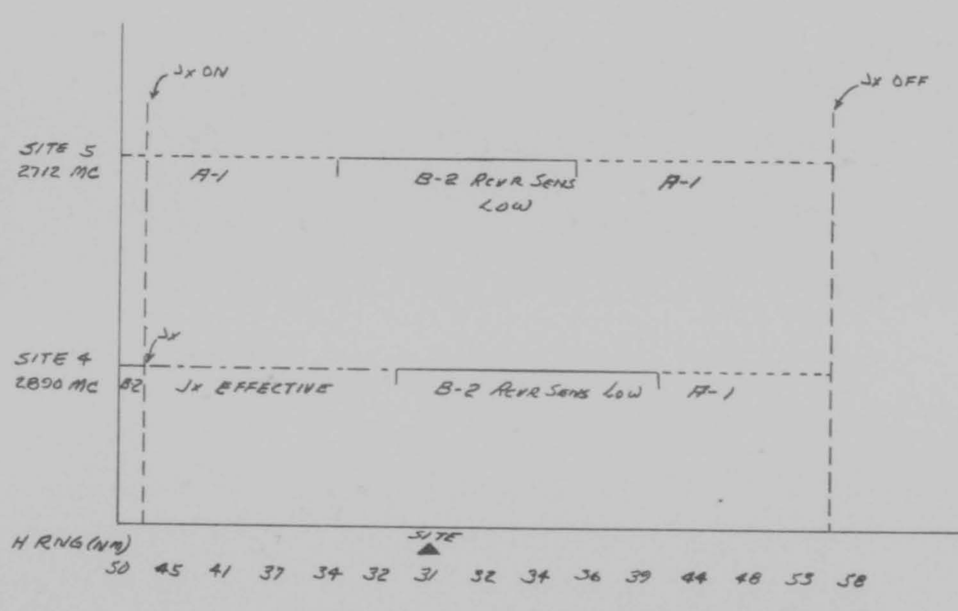
Incl 11

PROJECT 37
RUN 8 24 APR 56
TANGENTIAL 30NM

SECRET



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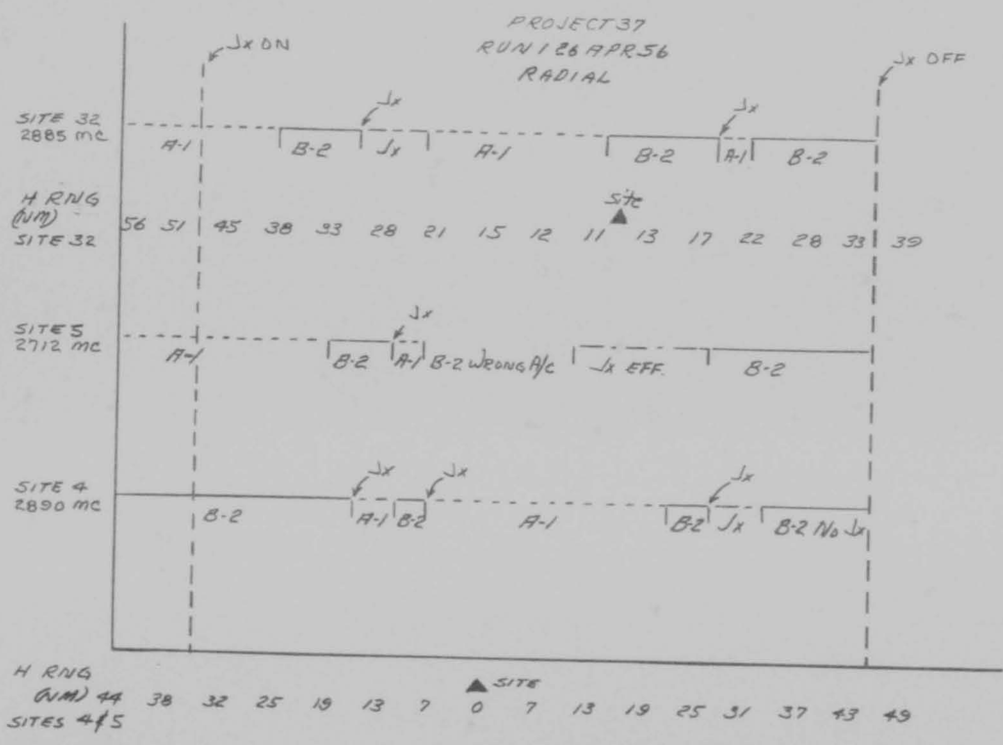

ENCLOSURE 12

INCL 12

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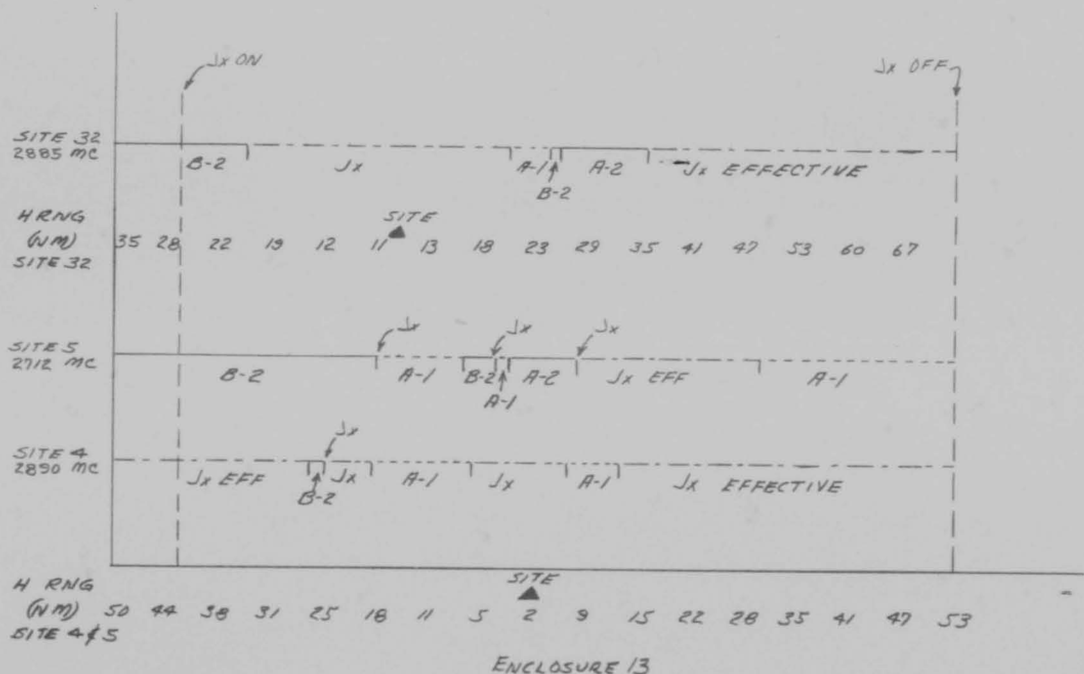
SECRET

Incl 13

PROJECT 37
RUN 2 26 APR 56
RADIAL



ENCLOSURE 13

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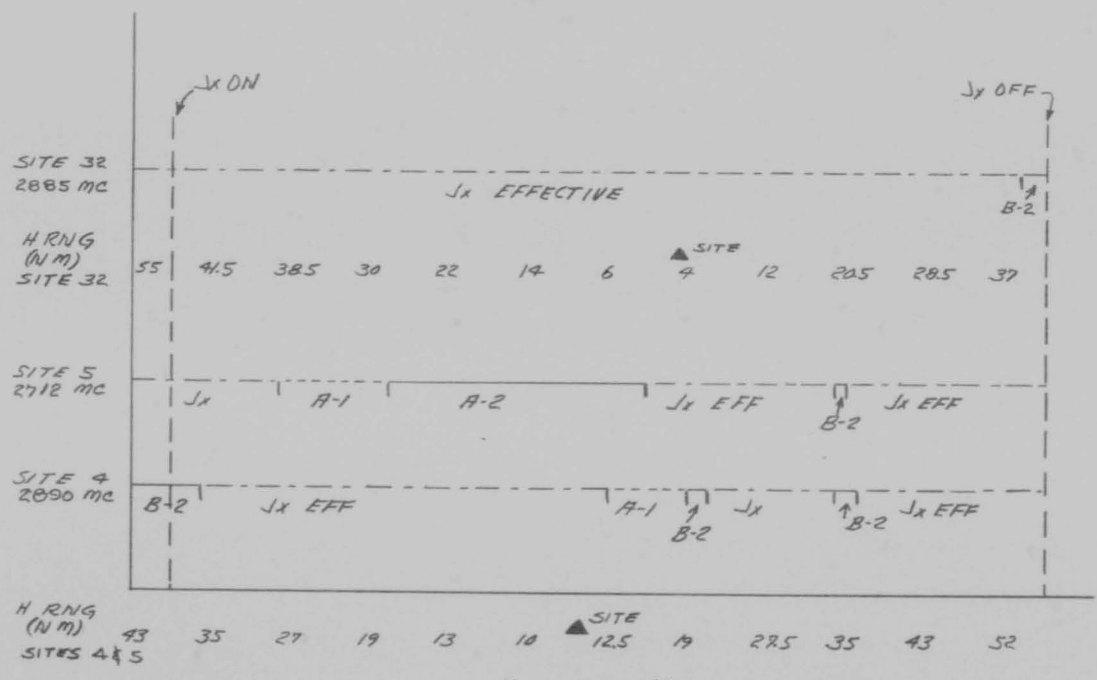
PROJECT 37
RUN 3 26 APR 56



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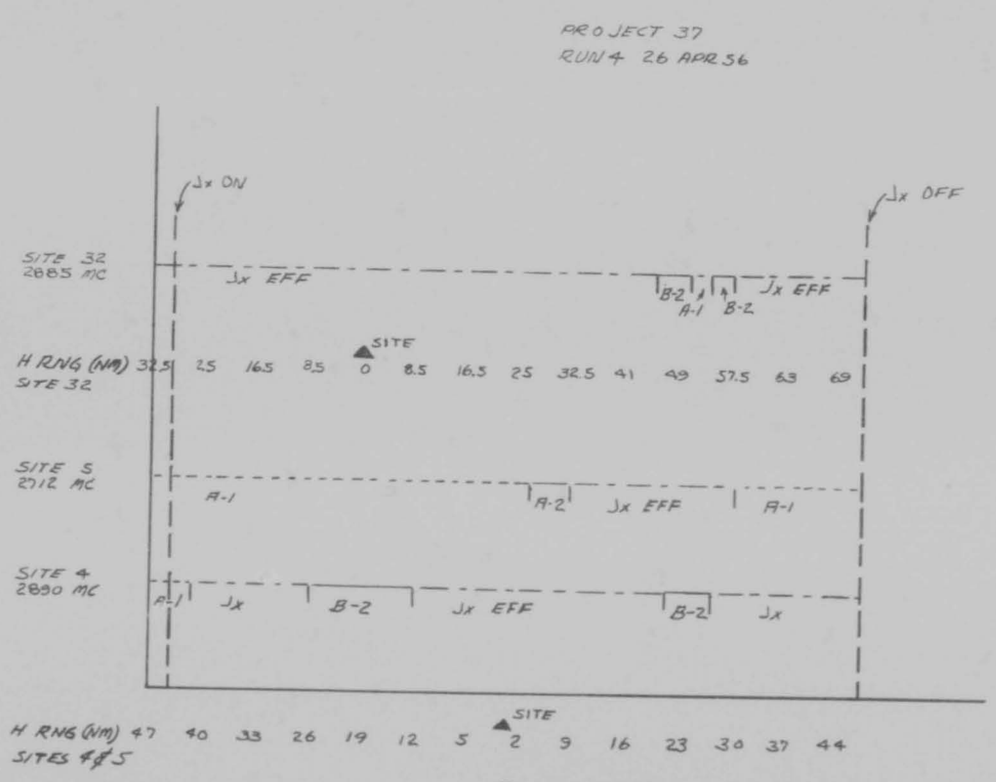

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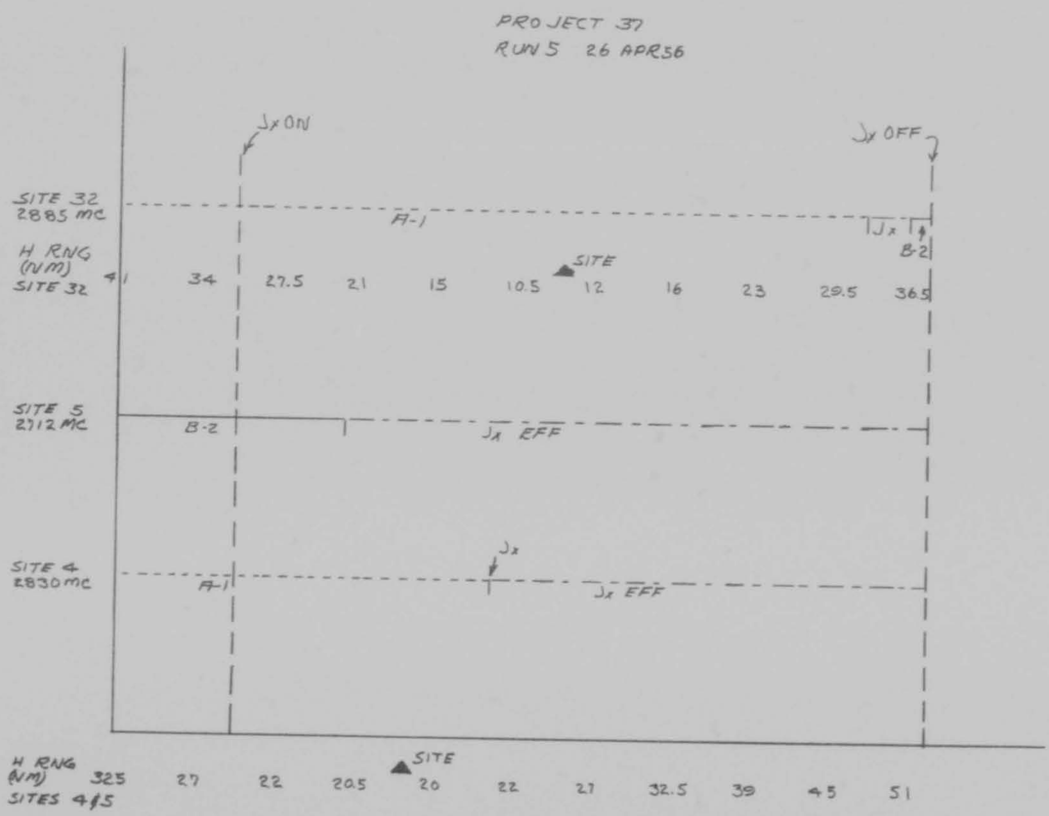

ENCLOSURE 16

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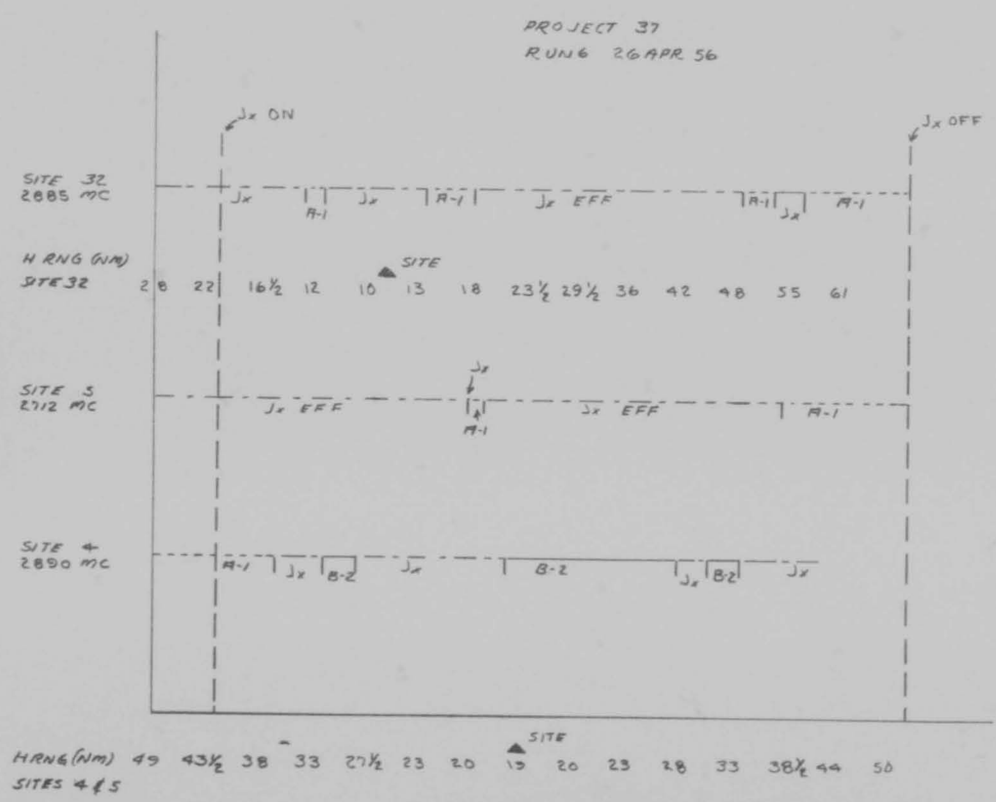

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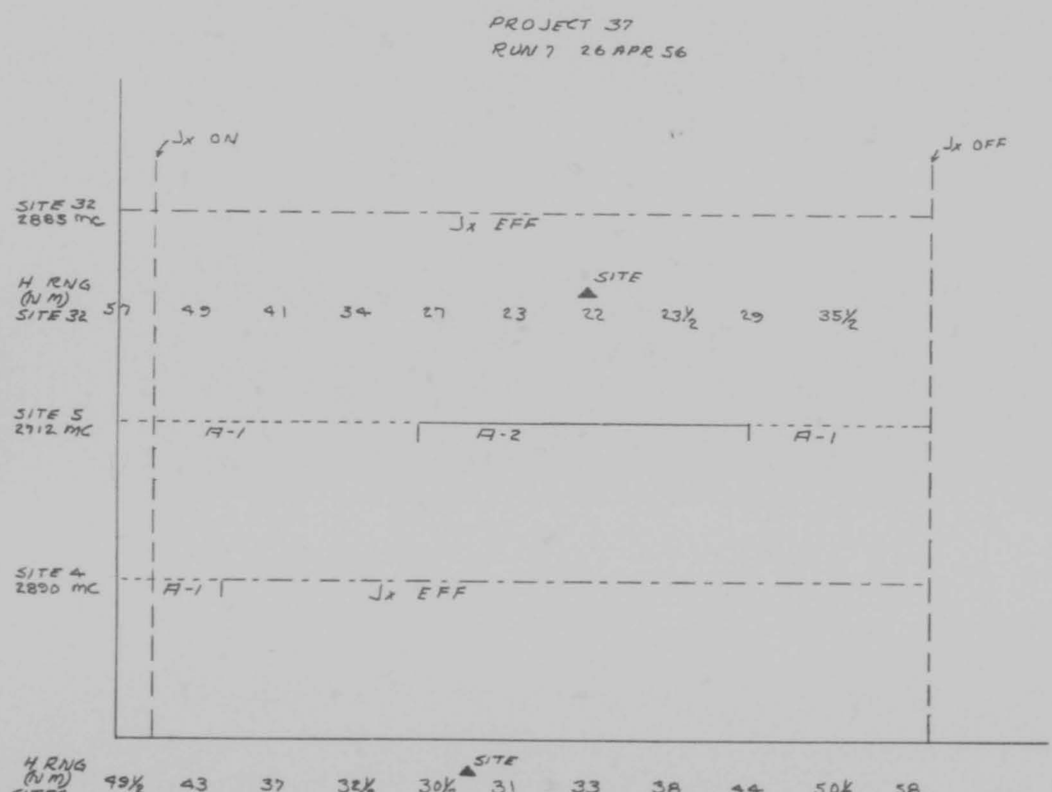

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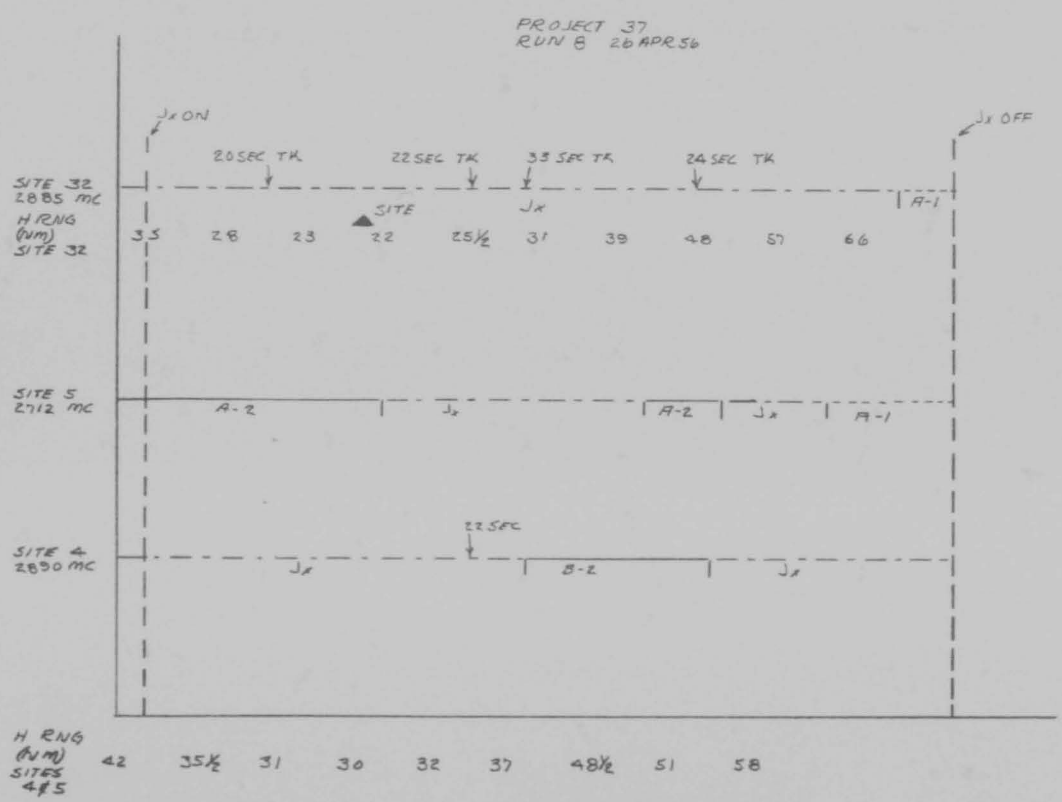

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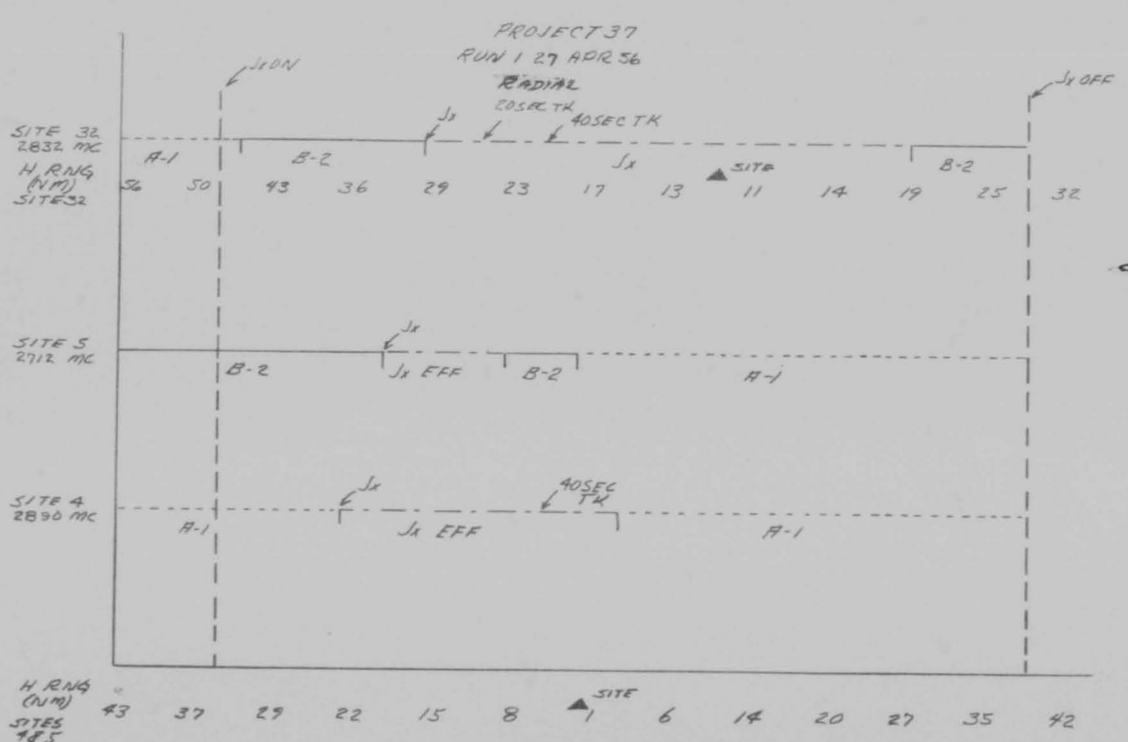

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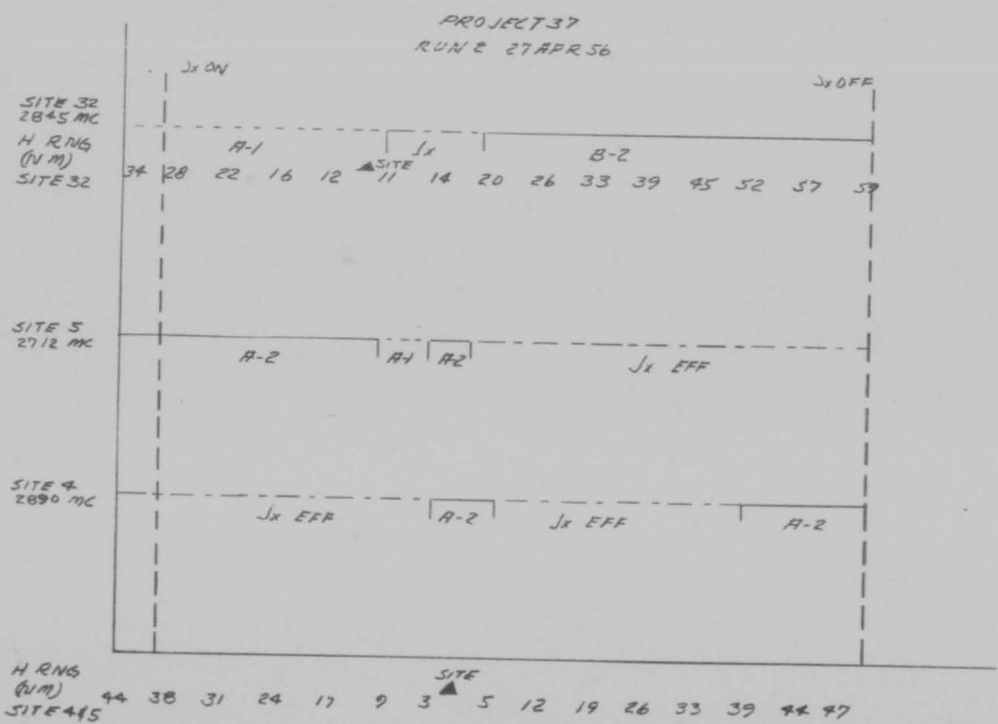

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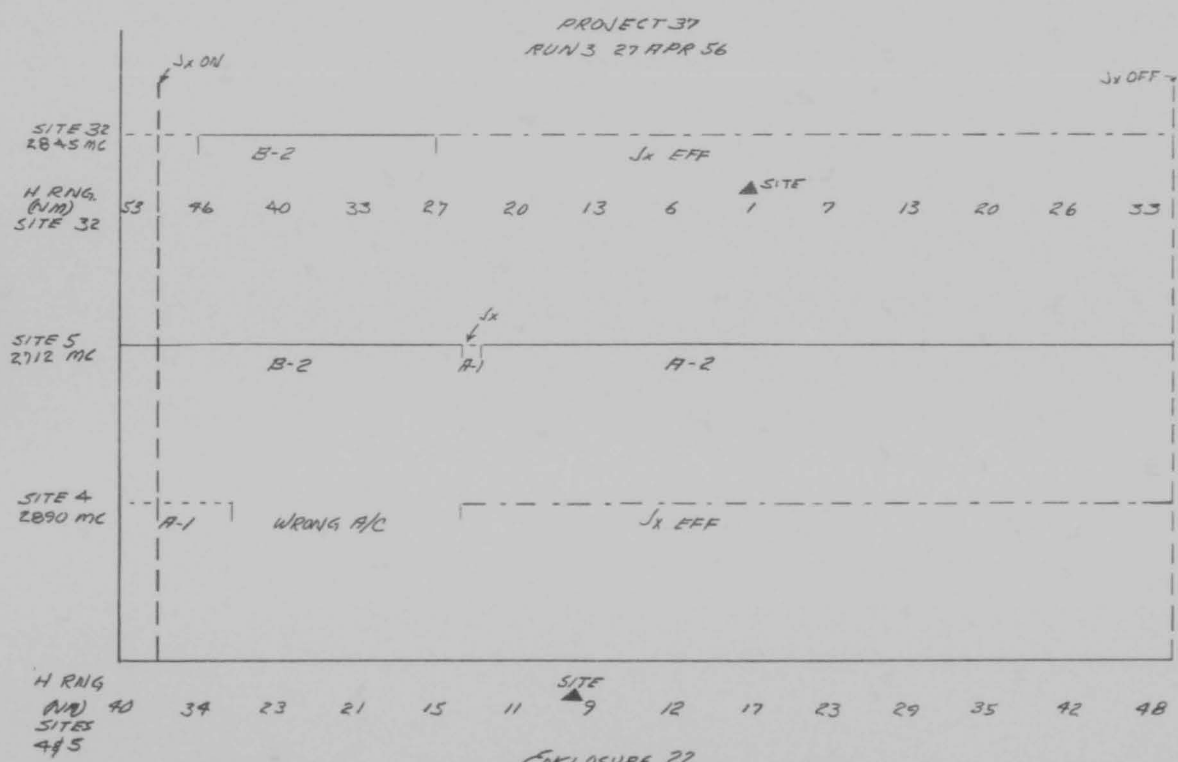

ENCLOSURE 22

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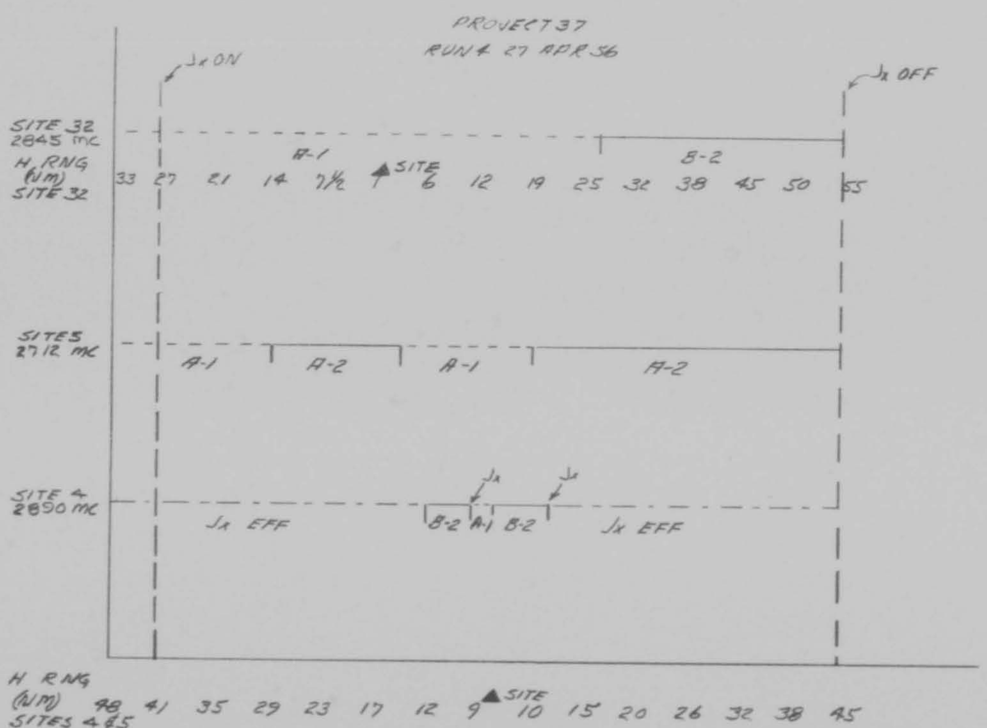

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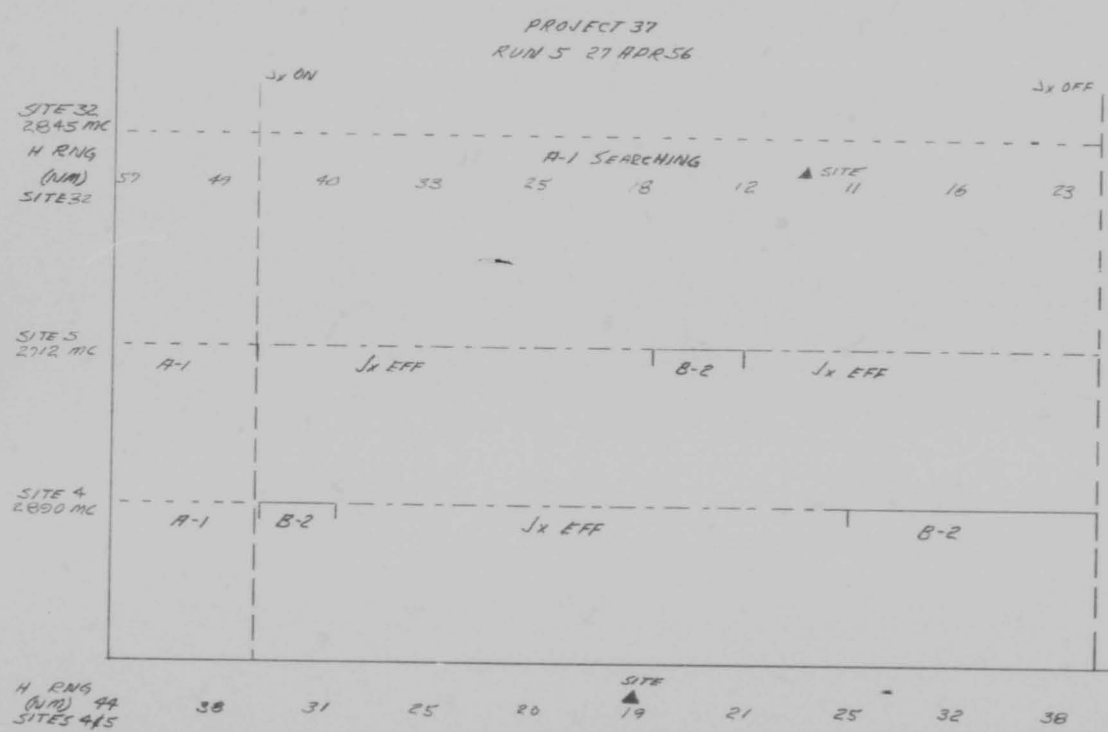

ENCLOSURE 24

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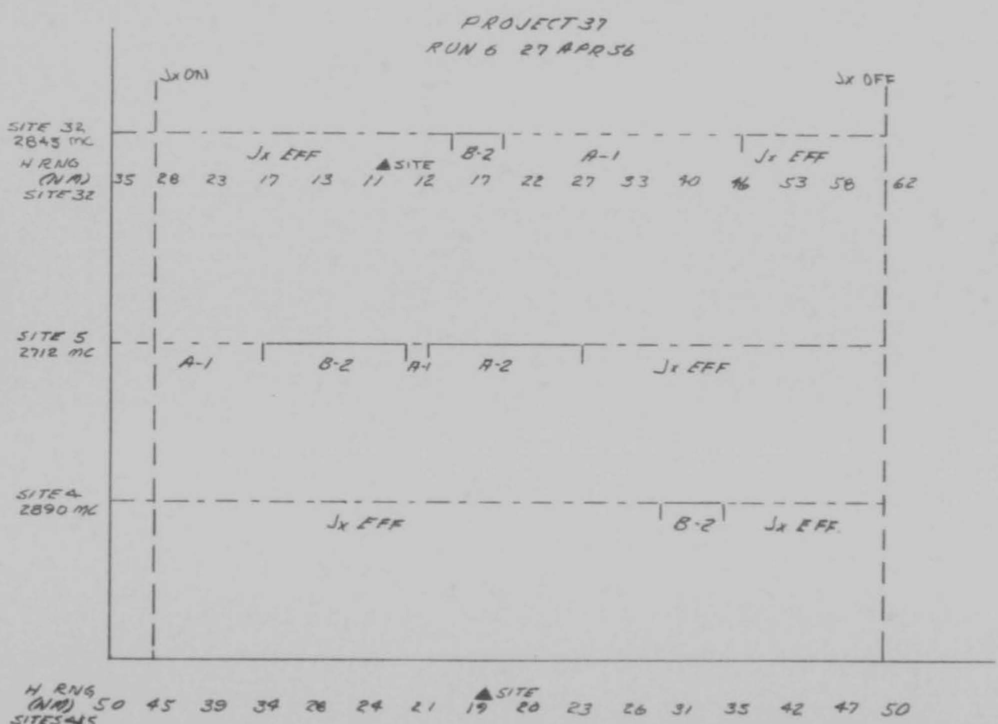

ENCLOSURE 25

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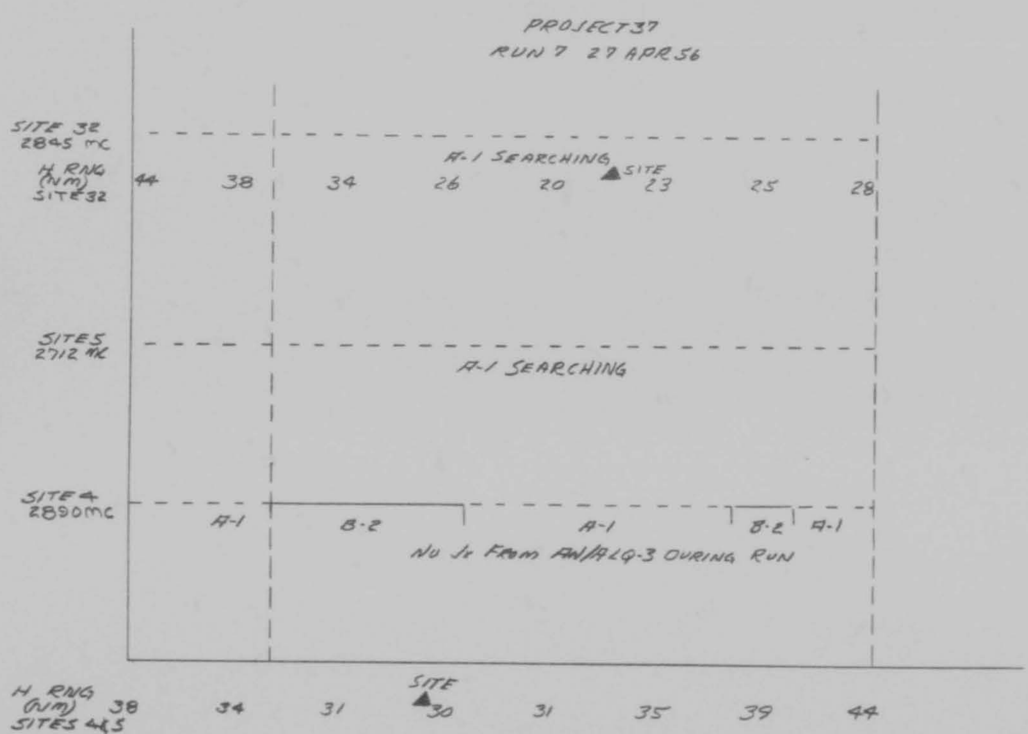

ENCLOSURE 26

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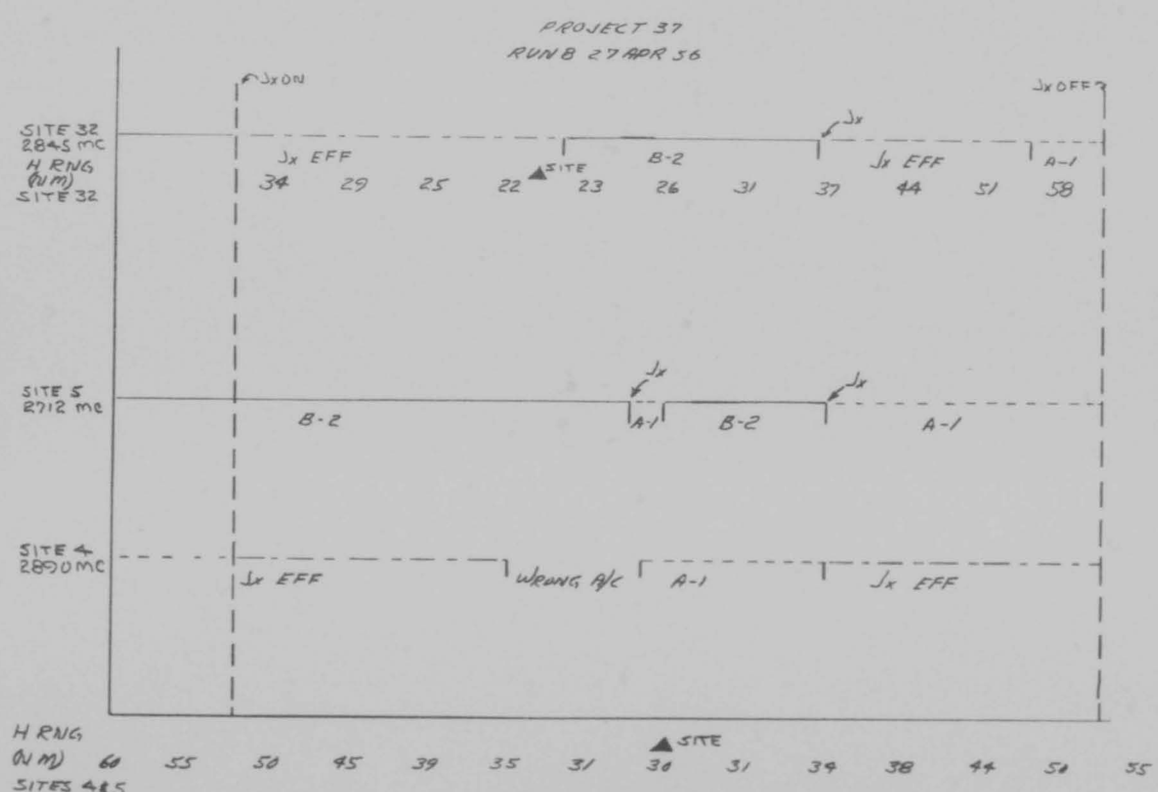

ENCLOSURE 27

INCL 27

SECRET

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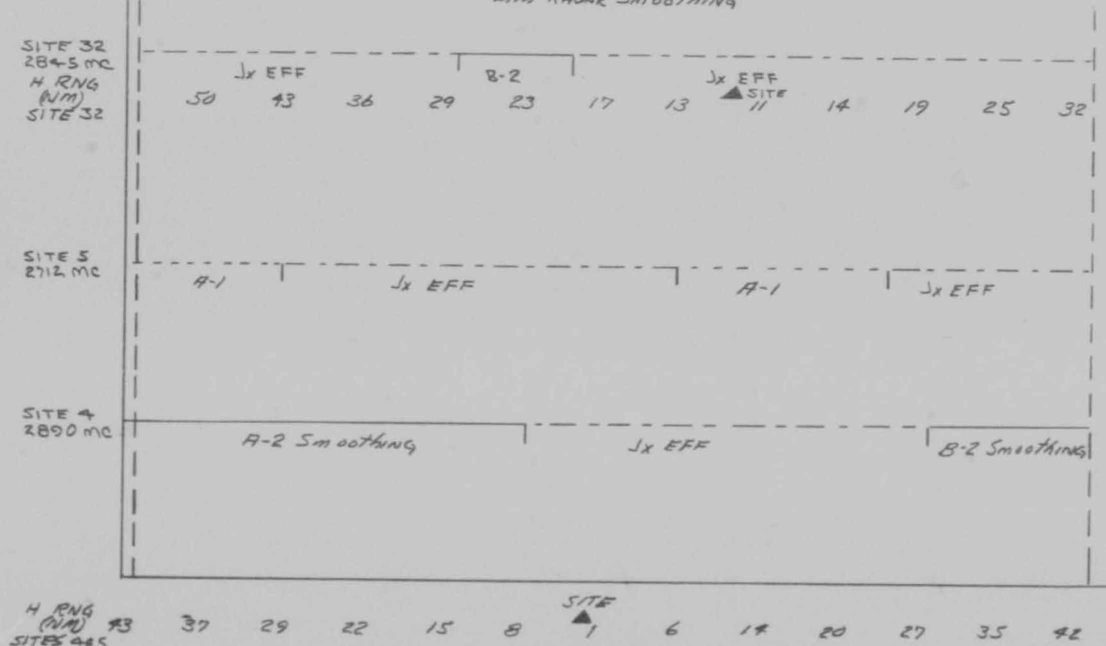
Incl 28

PROJECT 37
RUN 1 27 APR 56
With Radar Smoothing



Enclosure 28

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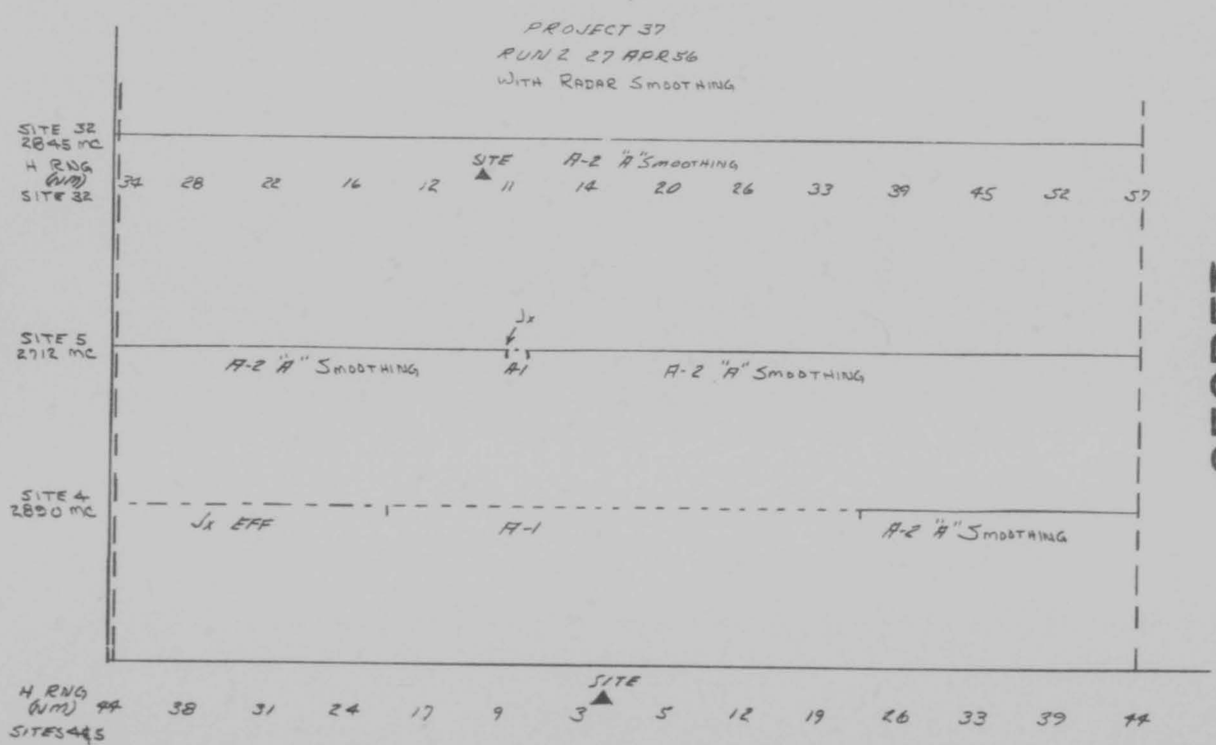

ENCLOSURE 29

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Incl 29

SECRET

Classification: SECRET
Auth: COMDR 376BOMWG M
Initials: Murphy
Date: 12 Jul 56

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

12 July 1956

SUBJECT: Test Progress Report (RCS: SAC U-30)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 30 June 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 34, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Estimated date of completion: March 1957.

c. Hours flown: 8:00.

d. Summary:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and the receiver re-cycles for normal search. The transmitter is modulated from two sources: a noise generator, and a supersonic oscillator. The supersonic tone thus produced is used

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for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) The lock-on error existing between the receiver and transmitter of the original Project 34 model necessitated a different approach to the method of tuning, signal searching, and locking on enemy signals. In order to keep lock-on error to a minimum and assure that the receiver and transmitter of the jammer would be in the bandwidth of an enemy signal, a mechanical automatic frequency control system is being incorporated into the equipment. This essentially consists of a servo-motor with gear train, DC control amplifier, frequency discriminator as an error detector, and one additional stage of IF amplification. (CONFID)

(3) The servo-motor was mated to a gear train by extensive machining, which resulted in a speed reduction of 200:1. This means that with a normal motor speed of 4000 RPM, it could be expected the VHF spectrum would sweep from 100 to 156 megacycles in three seconds. However, the final speed of the search sweep can be varied by varying input to the DC amplifier. The DC control amplifier is now developed to a point where a one volt signal, positive or negative, will drive the motor to maximum speed in either direction. The direction for servo-motor rotation is dependent on polarity of the incoming signal. (CONFID)

(4) In order to satisfactorily operate an automatic frequency control system, it is necessary to incorporate a means of error detection, the signal of which is fed back to the correction circuits. This is best accomplished by a discriminator circuit in the IF stages of the receiver. When a received signal is above the IF frequency, a positive voltage is produced; when the signal is below the IF frequency, a negative voltage is produced. It is these positive and negative voltages that are applied to the DC amplifier for correction of the receiver tuning. However, to obtain a voltage of sufficient peak-to-peak amplitude at the discriminator, it was necessary to inject approximately 300 microvolts of RF signal into the front end of the receiver. In other words, sensitivity of the receiver decreased from ten to 300 microvolts. Sensitivity of the receiver was increased to the original figure by adding another IF stage of amplification. This increased gain of the entire IF strip to 80 db, causing a tendency toward instability and oscillation. Therefore, it was decided that the present IF strip was

inadequate in design to fully realize the advantages of an AFC system and another sub-chassis which would incorporate the full IF amplifier, discriminator, and motor control, should be constructed. Work is now continuing along this line. (CONFID)

3. Test Project Number 35, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Estimated date of completion: April 1957.

c. Hours flown: None.

d. Summary:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the transmitter and receiver. A transmitter has been built with a power output of 50 to 100 watts in the frequency range of 100 to 156 megacycles. The transmitter incorporates circuits which sweep it through the VHF frequency band and cause it to stop on any frequency to which an associated receiver is tuned. Information from the receiver required for this lock-on is the discriminator output. If frequency of the receiver is changed, the transmitter will also shift to follow the receiver. Operation of the transmitter has been tested using a manually tuned ARR-5 receiver. (SECRET)

(2) An electronically tuned receiver has been built. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period can be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds, with a fly-back time of 100 milliseconds, allowing five complete scans per second. Look-through will not be employed because there would be no assurance that the signal being jammed was the desired victim signal, thus no reason to continue jamming it. If there were only one signal in the swept band, it would be jammed for three second periods at intervals of 200 milliseconds. (SECRET)

(3) The search-and-lock-on receiver has been built in six sections: master sweep circuits, master control circuits, RF circuits, master multi-vibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis, all mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry which will be required for identification capability or any other modifications which may become necessary. Extension

cables have been made for all units so they may be removed from the receiver rack for testing and aligned to tune the VHF band from 100 to 156 megacycles. Sweep circuits have been adjusted to tune the receiver through the same range at five sweeps per second. (SECRET)

(4) First checks of the receiver lock-on sensitivity showed the minimum discernible signal to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 DB at the high frequency range and 110 DB at low frequency range. Gate and pause circuits have been adjusted so that pause and lock-on periods of as much as three seconds are obtained on test and actual signals. Longer periods may not be required if the transmitter can be controlled to lock-on in sufficiently short time. Sensitivity of the lock-on circuitry has been reduced by turning down the threshold control; therefore, it has not been necessary to move into a screen room to eliminate interference from local VHF signals. For testing under these conditions, a high amplitude signal from a TS-497B/URR signal generator is used. All receiver functions have been checked; all memory, lock-on, and receiver gate circuits are operating. A transmitter gate has been built and is operating. Necessary cables and connectors have been added to the receiver and transmitter and the two units interconnected. The system has been tested over the entire band and will lock in the range from 96 to 158 megacycles. Further tests show that the accuracy of lock-on is not yet satisfactory; at some frequencies the error of lock-on is as great as 400 kilocycles for the combined receiver and transmitter system. The error in lock-on appears to be due to three separate problems: first, inaccuracy of lock-on of the receiver local oscillator; second, drift after lock-on due to improper functioning of the memory circuits and AFC circuits; and, finally, error of undetermined causes in the transmitter lock-on. During the last month work has been concentrated on correcting receiver lock-on errors. By using the AN/UPM-17 spectrum analyzer it was found that the receiver local oscillator was frequency modulated from 200 to 400 kilocycles. This caused the lock-on frequency to vary by this much in consecutive pauses on a given frequency. Improving the lead dress in the DC sweep amplifiers narrowed the oscillator spectrum to 100 kilocycles or less. The receiver consistently locks-on too high in frequency by as much as one megacycle. This was determined to be due in part to power supply surges when the receiver gate de-sensitized the receiver during lock time. Substituting regulated power supplies reduced this error but did not entirely eliminate it. Addition of a cathode by-pass condenser on the sweep driver tube corrected the lock-on at the low end of the band but

over-corrected at the high end. Work is continuing on this problem. Drift after lock-on could be due to decay of correction voltage from the AFC circuit after lock-on. Other causes of drift could be either drift down the band from loss of charge on the memory capacitor or drift up the band from insufficient cut-off bias on the pause circuitry tubes. If possible, the circuit will be modified to work without AFC. These circuits are by nature unstable and difficult to adjust. Pause circuit modifications consisting of the addition of a DC restorer have eliminated positive drift. Work is now being done in replacing pause circuit components, such as carbon resistors and tube sockets, with higher quality items in an attempt to reduce memory error due to circuit leakage. A leakage resistance of 600 megohms can cause 500 kilocycles drift. Alternately, these circuits may require potting to reduce effects of dirt or moisture. (SECRET)

(5) The AT-190/AP antenna, which has been modified to cover the frequency range of 100 to 156 megacycles for this project, will be filled with Eccofoam FP foaming plastic and test flown on B-47 aircraft to determine if it will be mechanically suitable for aircraft use. Chemicals for making the foaming polystyrene plastic have been ordered. (CONFID)

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SECRET

4. Test Project Number 36, "S-Band RF Systems" (SECRET)

a. Date initiated: 1 November 1954.

b. Estimated date of completion: Continuous.

c. Hours flown: 94:05.

d. Summary:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) Laboratory tests and measurments have continued in an effort to improve efficiency of the transmission lines and radiation patterns of S-band antennas. Other commitments for B-47 aircraft precluded the flying of missions on this project in these aircraft during June. One flight test was made with a C-47 aircraft wherein output from an AN/ALT-6A transmitter was fed through waveguide and a matching section directly to a stub antenna. The flight test was aborted before completion because of insufficient AC power in the aircraft but enough information was obtained to warrant further investigation and testing. For this test two installations using AN/ALT-6A transmitters were made in the aircraft. One transmitter fed a QRC-27(t) antenna through a waveguide-to-coaxial adapter and four and a half feet of RG-117/U RF cable. The other transmitter fed a QRC-27(t) antenna through a waveguide-to-coaxial transformer and a four and a half foot length of waveguide. Runs were made at 10,000 feet altitude using each of the installations, against the AN/FPS-10 radar at Kirksville, Mo. The observer at the radar site reported that considerably better jamming was obtained when the waveguide installation was used. (CONFID)

(3) In line with the recent test directive and test program for this project, a reorganization of personnel assigned the project and assignment of additional personnel is now being made with a schedule designed to establish test responsibilities, requirements and reporting procedures. Strict adherence to this schedule should result in more efficient and satisfactory accomplishments of requirements as listed in the test directive. (UNCL)

SECRET

5. Test Project Number 37, "AN/ALQ-3 Suitability Tests". (SECRET)

a. Date initiated: 2 May 1955.

b. Estimated date of completion: October 1956.

c. Hours flown: 114:50.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Six complete AN/ALQ-3 systems have been delivered to the 376th Bomb Wing for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing; to date, 28 systems have arrived. (CONFID)

(a) Systems 1 and 2 have been modified by W L Maxson field engineer using new sub units obtained from the factory and should now meet operational specifications. (CONFID)

(b) Systems 6, 7, 8, 9, 10 and 23 are being used for test. (CONFID)

(c) Twenty systems are still in crates in the 376th A&E Supply Room. (CONFID)

(2) Two B-47E Blue Cradles have been modified for installation of the AN/ALQ-3. This modification consists of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes have been necessary, only the additions described. (UNCL)

(3) The following changes have been made in the project test program by Headquarters SAC: Tests of the AN/ALQ-3 against EW and GCI radars are waived, limiting testing of the AN/ALQ-3 to tracking type radars only. No modifications of the AN/ALQ-3 will be accomplished to permit operation against EW/GCI radars. (CONFID)

(4) Four flight tests were scheduled during June with the AN/ALQ-3 installed in a B-47 aircraft. These missions were as follows:

(a) 5 June - One B-47E equipped with one AN/ALQ-3 and two AN/ALT-6A in a Blue Cradle and two AN/ALT-8 transmitters in ATO compartments. Purpose of the mission was to determine compatibility of AN/ALQ-3 and sweep jammers in the same aircraft. Mission was cancelled because of aircraft maintenance abort. (SECRET)

(b) 12 June - Two B-47E aircraft, one equipped with an AN/ALQ-3, two AN/ALT-6A's and two AN/ALT-8's; other aircraft equipped with six AN/ALT-6 transmitters. Purpose of mission was to determine compatibility of AN/ALQ-3 with standard Blue Cradle-equipped aircraft and with sweep jammers in the same aircraft. The AN/ALT-6A transmitters in the AN/ALQ-3-equipped aircraft were set to sweep 2700 to 2900 megacycles at 4800 megacycles per second, and the AN/ALT-8 transmitters were set to sweep the same frequency range at 1200 megacycles per second. The Blue Cradle-equipped aircraft had four AN/ALT-6A transmitters set to sweep at 20 megacycles per second and two at 240 megacycles per second over the frequency range from 2700 to 3100 megacycles. The two aircraft made several formation runs against the RBS radar at Kansas City with the Blue Cradle aircraft at distances of ten, 15, and 20 NM behind and ten, 15, and 20 NM abreast of the AN/ALQ-3 (lead) aircraft. Altitude separation of 500 feet was maintained between aircraft with the AN/ALQ-3-equipped aircraft at the lower altitude. During each run the ground radar locked-on the lead aircraft, which caused the AN/ALQ-3 receiver to lock-on the ground radar signal (indicated to the observer in the lead aircraft by the white target lamp on the AN/ALQ-3 control box). After receiving the white lamp signal, the observer in the lead aircraft directed the sweep jammers in the second aircraft be turned on. In this manner if the AN/ALQ-3 receiver picked up enough noise jamming to cause the receiver to break-lock, it was immediately indicated to the observer by the loss of the white target lamp signal on the AN/ALQ-3 control box. Results of this test indicated that the AN/ALQ-3 will operate properly with, and is not affected by, sweep jammers located in another aircraft for the spacings tested. During another phase of this mission, after the observer had received the white target lamp indication of lock-on, he turned on the sweep jamming transmitters located in the same aircraft with the AN/ALQ-3. First results indicated that whenever either AN/ALT-6A transmitter was turned on, the AN/ALQ-3 would break-lock, but either or both of the AN/ALT-8 transmitters would not affect the AN/ALQ-3. A later test indicated just the opposite, the AN/ALT-8 transmitters would cause the AN/ALQ-3 receiver to break-lock. The difference in results may possibly have been due to differences in receiver sensitivity, in AN/ALT-8 power output, or in the radar signal-to-jammer signal ratio at the input of the AN/ALQ-3 receiver. Further tests will be conducted to determine the exact degree of compatibility between the AN/ALQ-3 and swept jammers in the same aircraft. (SECRET)

(c) 25 and 28 June - Two B-47E aircraft, both equipped with a single AN/ALQ-3, flew a penetration type mission against a radar complex at Eglin AFB, Fla. The AN/FPS-3 radar at Site 30 was used as an acquisition radar to feed position information to three MSQ type precision tracking radars at sites 4, 5 and 20 at Eglin AFB. Each aircraft made a bomb run on targets so selected that the precision tracking radars would simulate strategically placed fire control equipments. Three bomb runs were made on 25 and 28 June. On each day one aircraft had an AN/ALQ-3 malfunction, the cause of which has not yet been determined. During one run on each date chaff was dispensed from the aircraft at the rate of one bundle each time the AN/ALQ-3 caused a ground radar to break-lock. The result appeared to be very desirable from the standpoint of radar operator confusion and greatly increased the time between target loss and radar lock-on. Esterline-Angus recordings of target altitude, range and azimuth, and voice recordings were made at each of the ground radar sites during the missions. This data has not yet been fully reduced so detailed reporting of these missions will be made in the next monthly report. (SECRET)

(5) Two flight tests conducted during May were not covered in the report for May since the data had not been reduced. These were flown with a single AN/ALQ-3-equipped B-47 aircraft against a single MSQ type precision tracking radar at Eglin AFB. For both tests aircraft altitude was 35,000 feet and true airspeed was 430 knots. Aircraft tracks are shown on Inclosure 4. (SECRET)

(6) Tracking records for each run of each mission are shown in Inclosures 5 through 21. Mode of radar operation is shown on the track records as A-1, A-2 or B-2. These modes are as follows: A-1, full manual operation of radar, used while searching or attempting to acquire a target (track record is shown as a dashed line during A-1 operation indicating no tracking of the aircraft); B-2, full automatic operation in range, elevation and azimuth (track record is shown as a solid line during B-2 operation indicating radar tracking of the aircraft); A-2, aided range operation, automatic tracking in azimuth and elevation with range rate set in manually (track record is shown as a solid line during A-2

operation indicating radar tracking of the aircraft). Periods during which the AN/ALQ-3 effectively jammed the tracking radar are shown as dash-dot lines. Effective jamming was assumed for any period during which the jammer prevented the radar from obtaining more than a 15 second smooth track, assuming the aircraft would not be vulnerable to radar controlled firing if the tracks were for less than 15 seconds for each acquisition. (SECRET)

(7) A summary of AN/ALQ-3 operation against two MSQ radars appears below in chart form. Each separate track of the aircraft is listed by the length of time the track was held. The aircraft horizontal range during the track is listed under H RNG HIGH V (High Vulnerability) or H RNG LOW V (Low Vulnerability). It is assumed that tracking within 15 nautical miles or 30,000 yards would cause the aircraft to be highly vulnerable to radar-controlled anti-aircraft fire; therefore, tracking ranges from zero to 15 nautical miles would have to be extended when considering radar-controlled missile firing, depending on the type missile and guidance system. Total time the aircraft was tracked with high and low vulnerabilities is shown as a fraction of the total possible tracking time. For example, if one radar tracked for six minutes and the other for four minutes on a run which lasted 20 minutes, this would be expressed as 10/40 (since the total possible combined tracking time of the two radars would be 40 minutes for a 20 minute run). The fractions are broken down into HIGH V or LOW V time, depending on the range involved. The total time jamming was effective is shown as a fraction of the total possible tracking time. No listing is made of the time used by the radars searching for the target aircraft, some of which could be credited to jamming, whenever it was jamming, which caused the radar to break-lock. These instances can be seen on the track records showing the entire track for each run. (SECRET)

SUMMARY
AN/ALQ-3 VS SINGLE MSQ RADAR
(AN/ALQ-3 RECEIVER SENSITIVITY ON X1)
14 May 56

TYPE COURSE	TRACK TIME (Min)	H RNG HIGH V (NM)	H RNG LOW V (NM)	EFFECTIVE JAM TIME (Min)	H RNG (NM)
		RUN 1			
Radial	40sec	-	39-43	6	43-0
Total Run 1:	HV 0/14, LV 0.66/14, Eff. Jamming 6/14				
Radial	1½	-	15-27	8	43-0-15
Total Run 2:	HV 0/14, LV 1½/14, Eff. Jamming 8/14				

RUN 3

Tan(10NM)	0	-	-	7½	38-9-30

Total Run 3: HV 0/9, LV 0/9, Eff. Jamming 7½/9

RUN 4

Tan(10NM)	30sec	-	26	12	34-9-52

Total Run 4: HV 0/12, LV 1/12, Eff. Jamming 12/12

RUN 5

Tan(20NM)	18sec	-	23	6½	48-19

Total Run 5: HV 0/11, LV 0.3/11, Eff. Jamming 6½/11

RUN 6

Tan(20NM)	0	-	-	10½	65-19-37

Total Run 6: HV 0/10½, LV 0/10½, Eff. Jamming 10½/10½

RUN 7

Tan(30NM)	½	-	41-44	9½	57-30-48

Total Run 7: HV 0/11, LV 0.5/11, Eff. Jamming 9½/11

RUN 8

Tan(30NM)	½	-	36-33	12	53-36, 33-30-60

Total Run 8: HV 0/12, LV 0.5/12, Eff. Jamming 12/12

SUMMARY
AN/ALQ-3 VS SINGLE MSQ RADAR
(AN/ALQ-3 RECEIVER SENSITIVITY ON X1)
17 May 56

TYPE COURSE	TRACK TIME (Min)	H RNG HIGH V (NM)	H RNG LOW V (NM)	EFFECTIVE JAM TIME (Min)	H RNG (NM)
RUN 1					
Radial	0	-	-	11½	48-0-55

Total Run 1: HV 0/11½, LV 0/11½, Eff. Jamming 11½/11½

RUN 2					
Radial	½	-	33-29	8	45-33, 7-46

Total Run 2: HV 0/11, LV 0.5/11, Eff. Jamming 8/11

RUN 3					
Tan(10NM)	14sec	1	-	10	41-0-56

Total Run 3: HV 0.25/11, LV 0/11, Eff. Jamming 10/11

RUN 4					
Tan(10NM)	0	-	-	7	16-10-40

Total Run 4: HV 0/10, LV 0/10, Eff. Jamming 7/10

RUN 5

Tan(20NM)	2	-	18-17-23	2	32-18

Total Run 5: HV 0/11, LV 2.5/11, Eff. Jamming 6/11

RUN 6

Tan(20NM)	1	-	35-28		
	20sec	-	48	2	47-60

Totals Run 6: HV 0/12, LV 1.2/12, Eff. Jamming 2/12

RUN 7

Tan(30NM)	1	-	29-28	8½	45-29, 28-55

Total Run 7: HV 0/10, LV 1/10, Eff. Jamming 8½/10

RUN 8

Tan(30NM)	1½	-	41-34	1	33-30
	6½	-	28-27-53		

Totals Run 8: HV 0/11, LV 8/11, Eff. Jamming 1/11

(8) It is concluded from this data that a single AN/ALQ-3-equipped B-47 aircraft is well protected from a single precision tracking radar of the MSQ type, with close tangential passes (10-15 NM) affording more protection than radial or tangential passes at greater ranges. (SECRET)

(9) One flight test is planned for July in an attempt to determine range of compatibility of the AN/ALQ-3 and sweep jammers in the ATO compartments of the same aircraft. (SECRET)

6. Test Project Number 39, "Flight Test of QRC-18(t)" (SECRET)

   a. Date initiated: 15 August 1955.

   b. Estimated date of completion: June 1956.

   c. Hours flown: 94:00.

   d. Summary:

      (1) Purpose of this project is to test tactical suitability of the QRC-18(t). Essentially, the QRC-18(t) consists of an AN/ALT-7 jamming transmitter modified to improve its effectiveness against VHF communications. The modification consists of different sweep units designed to give sweep widths of 1%, 2%, or 4% of the transmitter's center frequency. The new sweep units are also designed to give sweep rates variable up to 2000 CPS. (SECRET)

      (2) All testing on this project has been completed; final report has been written and is being prepared for printing and distribution. This test project will no longer be reported. (UNCL)

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7. Test Project Number 40, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Estimated date of completion: September 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) The third model of the cavity device for measuring sweep frequency limits is almost complete. Front, back, and internal views of this device are shown in Inclosures 1, 2 and 3. Located on the front panel are three 0 to 50 microampere DC meters and three sensitivity equalizing controls. The three micrometer adjustments for the measuring cavities may be seen at the top of the device. Tuning range of the cavities used in this prototype model is approximately 2300 to 3600 megacycles. The rear view photograph shows the master probe antenna which is coupled to the antenna of the transmitter under test. RF energy picked up by the probe antenna is radiated into the space inside the case to excite the three measuring cavities. The hinged cover has been opened in the internal view to show the cavities, meters and sensitivity controls. Each of the frequency measuring cavities is coupled to the large common cavity of the case. RF energy in the cavities is detected by a crystal, the holders of which may be seen on the lower end of each cavity. Rectified DC from the crystals is taken through the leads, through the sensitivity controls to the indicating meters. Each meter has an RF by-pass capacitor connected across its terminals. (CONFID)

(3) A means for measuring noise modulation is yet to be added. Three broadband noise modulation detector antennas will be added to the common cavity to sample noise at the high, center, and low end of the band. Output from the noise measuring antennas will be fed to a common crystal detector for indication either on a meter or with headphones. The tester is expected to be completed during July, after which operating tests will be made to determine limitations or necessary modifications. (CONFID)

SECRET

(4) Efforts have been made to extend frequency range of the TS-118A/AP wattmeter so that it can measure power output from AN/ALT-6 and AN/ALT-8 transmitters. Normally the wattmeter is used only up to 1400 megacycles, but there is the possibility that this may be extended to cover the range of 2400 to 3600 megacycles. Essentially, the TS-118A/AP consists of a load resistor immersed in cooling oil, a meter and associated thermocouple to measure the power dissipated in the load resistor. Voltage-standing-wave-ratio measurements were made of the wattmeter load and these are shown on Inclosure 21. The wattmeter has a satisfactory VSWR up to about 3200 megacycles, above which frequency the VSWR rises abruptly. With all other conditions the same, but with the coolant oil removed, the VSWR is satisfactory from 2000 to 4000 megacycles; however, the load cannot be operated without the coolant oil because the power dissipation capability is considerably reduced. The sharp rise of VSWR above 3200 megacycles appears to be caused by resonance of some part of the load when immersed in oil. It is hoped the load can be modified to remove this resonance, or at least move it outside the band of interest. (CONFID)

8. Test Project Number 41, "X-Band Interference, Code Name SPOTLIGHT". (CONFID)

a. Date initiated: 29 March 1956.

b. Estimated date of completion: No estimate available due to lack of test aircraft.

c. Hours flown: None.

d. Summary:

(1) Primary purpose of this project is to determine the extent of X-band jamming interference to other airborne electronic systems and what measures can be taken to reduce the effects of such interference. The secondary purpose is to determine effectiveness of X-band sweep jamming against radar-equipped AI aircraft to include determination of optimum sweep jamming rates and bandwidths. (SECRET)

(2) Equipment used in this test is the AN/ALT-6A equipped with the OA-822 extension kit. The OA-822 kit provides frequency coverage from 8750 to 10,500 megacycles. Two sweep speeds are available: a fast sweep with a bandwidth from 30 to 400 megacycles and a sweep rate of 1 to 12 cps, and a slow sweep with a bandwidth from 0 to 1750 megacycles and a sweep rate of .02 to 2.0 cps. A combination of these two sweeps may be employed which will cause the fast sweep to modulate the slow sweep. (SECRET)

(3) The X-band kit (OA-822) was received from WADC on 8 June 1956 and handcarried to the 376th Bomb Wing. The X-band kit is equipped with a ridged waveguide and requires an adapter in order to use it with standard waveguide. WADC sent a waveguide adapter on 22 June to Perrin AFB, Tex., where the first phase of the test program was run. (CONFID)

(4) This first phase was a ground test against the E-4 fire control system with the X-band AN/ALT-6A mounted on a truck located approximately 1500 yards from the E-4 radar and in line with the radar target. The radar target was an oil well derrick located about four miles from the radar. The E-4 fire control system is an airborne intercept radar for use in single place aircraft such as the F-86D. The E-4 system used in the test was mock-up system in the A&E Field Maintenance Shop. Some characteristics of this radar are: frequency 9375 megacycles, bandwidth 2.5 megacycles, PRF 910, PW 0.5 μsec, conical scan rate 75 cps, beam width 7°, and peak power output 250 kw. Local oscillator frequency of this radar is 9405 megacycles, giving an IF

frequency of 30 megacycles. A separate local oscillator is used when the radar is operated in the beacon mode. This beacon local oscillator has a frequency of 9280 megacycles, which is 30 megacycles below the beacon frequency of 9310 megacycles. (CONFID)

(5) Instrumentation employed in the ground test consisted of an AN/APR-9 receiver for setting up the proper center frequency and sweep widths on the AN/ALT-6A transmitter, 16 mm movie camera for taking pictures of the B-scope presentation system of the radar, and another 16 mm movie camera for taking pictures of the radar video displayed on a 5" oscilloscope. A log of jamming effectiveness was kept by the radar operators. (UNCL)

(6) The first part of the test was a spot jamming run with the AN/ALT-6A transmitting on the radar frequency. When the radar was in the search mode, no targets could be seen through the jamming. Jamming appeared continuous at all azimuths of the radar antenna. When the radar was locked on the target and the AN/ALT-6A then energized, the radar immediately broke-lock and the target could not be reacquired. No targets could be seen through the jamming. (SECRET)

(7) For the second part of the test the AN/ALT-6A was operated on a frequency of 9435 megacycles, or 60 megacycles above the radar frequency. When jamming at this radar image frequency, results were identical to those obtained during the first part of the test, during both search-and-lock-on operations. Tests were also run with the radar set operating in the beacon mode with the AN/ALT-6A on a frequency of 9310 megacycles, representing the beacon receiver frequency, and on a frequency of 9250 megacycles, representing the beacon image frequency. At both frequencies intense jamming completely covering the jizzle band of the radar B-scope was observed. No beacon return was available for comparison with the jamming video. Results of these tests indicate consideration must be given to the radar image frequencies, as well as the radar frequencies, when designing a companion receiver for sweep jammers for center frequency lock-on purposes. This is especially true if the companion receivers are to be utilized in reduction of jamming interference to friendly radars. (SECRET)

(8) Test results for the remainder of the test, including both slow and fast sweep modes, have not been evaluated; however, preliminary indications are that when the sweep speed of the AN/ALT-6A is below about 40 mc/sec, the radar will

break-lock and targets cannot be seen through the jamming during either the search or lock-on phases. When the sweep speed is above about 40 mc/sec., the radar will not break-lock and targets can be acquired through the jamming. (SECRET)

(9) A small number of combination fast and slow sweeps were also tested. No appreciable increase in jamming effectiveness was noted when the fast sweep mode of operation was added to the slow sweep mode. (SECRET)

(10) Results obtained from this ground test must be further evaluated before any definite conclusions can be drawn concerning optimum sweep speeds and sweep widths. These optimum sweep widths and speeds were obtained at a very short range and with fixed site positions. Results obtained may not be valid during air operations, however they will form the basis for the airborne tests against AI aircraft. (CONFID)

(11) At the present time no information is available as to the completion date of the proposed installation of antenna and waveguide assemblies in the test aircraft. Boeing Aircraft Co. indicates that the power dividers for these installations will not be available for two months. Until these modifications are completed, no further tests as outlined in the test program can be accomplished. (CONFID)

9. Test Project Number 42, "Attenuation of UHF Air-to-Air Transmissions". (CONFID)

a. Date initiated: 15 March 1956.

b. Estimated date of completion: Not presently known.

c. Hours flown: 6:00.

d. Summary:

(1) Purpose of this project is to determine optimum method of attenuating transmitted signals in UHF frequency band and optimum attenuated UHF communications ranges for all tactical operations, i.e., enroute cells, refueling rendezvous, refueling formations, etc. (CONFID)

(2) During June a visit was made by project officers and engineers to RCA Engineering Department, Camden, N.J., to discuss possible methods of attenuating UHF signals. The RCA engineers knew of no way to restrict or limit the distance a radio wave travels; however, they did make some suggestions on methods to attenuate the output of the UHF transmitter. Use of directional antennas was discussed but this method ruled out due to the nature of communications used in refueling groups and also because directional antennas, with their narrow beam width would give increase in power gain, which would defeat the purpose of attenuating the signal. As for the attenuated signal itself, the psychological effect on the pilot was discussed. It was felt that if a receiver pilot was about out of fuel, he would naturally want to use the maximum power output from his transmitter in order to effect a speedy rendezvous with a tanker plane rather than use reduced power and hope his calls would be heard. (CONFID)

(3) Change-over relays required to complete the UHF attenuators for this test are on order. Crystals and batteries have been ordered to allow use of the AN/URC-4 and AN/URC-11 survival transceivers on refueling frequencies. These transmitters will be used in an experimental set-up for radio communication between tanker and bomber, or between boom operator and receiver pilot. (CONFID)

(4) On a recent night mass refueling mission two KC-97 aircraft were equipped with tape recorders to record all UHF and VHF radio communications incident to a refueling mission. Results indicate too much reliance is placed on radio communications and not enough on rendezvous equipment. Also, it

appears that a large amount of superfluous radio transmissions are made. As installed, the recorders were set up to record VHF and UHF simultaneously. A future test of this type, using recorders, is planned wherein separate recorders will be used for UHF and VHF transmissions to obtain a clearer picture of the radio technique. (CONFID)

(5) Many discussions with KC-97 and B-47 aircraft commanders have been held. All these persons feel that radio transmissions are necessary and would prefer more powerful radio transmitters rather than attenuated signals. All agreed that some radio transmissions which are called for in existing SAC manuals, i.e., tanker notifying bomber amount of fuel off-loaded and tanker leader notifying his base total fuel loaded, could be dispensed with, resulting in less radio transmissions and less interference. Also, most of the people involved feel that the rendezvous equipment is not reliable for distances in the order of 100 miles. Whether this is due to poor maintenance, lack of familiarity with the sets, or is characteristic of the equipment is not known but should be investigated. (CONFID)

10. Test Project Number 43, "Pre-flight and Post-flight Procedures for use by B/RB-47 Wings of this Command". (CONFID)

a. Date initiated: 16 April 1956.

b. Estimated date of completion: July 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this test project is to prepare optimum pre and post-flight procedures for ECM equipments used by B/RB-47 wings. Procedures will cover AN/ALT-6, AN/ALT-8, and AN/ALT-7 transmitters, AN/APS-54 receiver, and AN/ALE-1 chaff dispenser as used in B/RB-47 aircraft Phases III, IV and IVA with or without the pod. (CONFID)

(2) Final report on this test project has been written and is being prepared for printing and distribution. This test project will no longer be reported. Procedures for ECM pre and post-flights have been divided into four maintenance phases. The following paragraphs, taken from the forthcoming final report, describe each phase and its scope: (UNCL)

"ECM MAINTENANCE PHASES.

PHASE I - ECM PRE-MISSION AND PLANNING PHASE

This phase is accomplished by planning maintenance as soon as the ECM mission requirements are known and aircraft are scheduled, and by executing the maintenance approximately two to three days in advance of the mission. This is the main phase of preparation and includes: (UNCL)

a. Installation of carriers - cradles and capsules. (UNCL)

b. Loading of chaff and adjustment of dispensers and intervalometers. (UNCL)

c. Setting-up of the transmitter configuration, with installation or replacement of equipment, racks and accessories. (UNCL)

d. Pre-setting, adjustment, operational checks, and pressurization of ECM transmitters as required for the mission. (UNCL)

e. Operational check and adjustment of receivers as required. (UNCL)

f. Inspection of installation by a supervisor. (UNCL)

"SCOPE OF PHASE I

The extent of maintenance to be performed on the Pre-mission Phase will depend on status of the aircraft at the time of mission scheduling. If the aircraft is normally in an EWP configuration for ECM, maintenance will be limited to changes in equipment and adjustments required for the mission. Such maintenance might include the loading of a different type of chaff, replacement of transmitters, and changes in frequency settings. In other cases this maintenance might include removal of a complete installation, substitution of systems, reloading of chaff, and replacement of antennas. At a later date AN/ALT-6 and AN/ALT-8 systems will have as many as 13 different oscillator units; at that time ECM operations will be scheduled over the entire frequency spectrum. At a minimum, this phase will consist of determining that the aircraft is in the correct configuration and that no maintenance is necessary. Quantity of maintenance in manhours will vary with these factors; carrier aircraft will be the main exception and always require a major Pre-mission Phase. (CONFID)

"PHASE II - ECM PRE-FLIGHT INSPECTION

This phase will be accomplished within 12 hours before aircraft station time and will include: (UNCL)

a. General inspection of maintenance performed in Phase I and limited operational check of equipment as necessary. (UNCL)

b. Final adjustment of equipment, including pressurization of power supplies and placement of switches and circuit breakers. (UNCL)

c. Preparation of and entries in forms as required. (UNCL)

"SCOPE OF PHASE II

It is the aim of planned maintenance to limit the scope and duration of this phase. All major preparatory work must be completed on the Pre-mission Phase. The operational check of equipment should be restricted to a quick check of such factors as frequency settings, modulation, and power output; limitation of this operational check depends largely on the development of suitable flight line test instruments. In cases where the Pre-mission Phase would involve only the re-setting of frequencies, this adjustment could be made on this phase. Scope of this phase depends on the type of mission, experience with the equipment, and test instruments available. (UNCL)

"PHASE III - ECM POST-MISSION REPORTING

This phase will be accomplished immediately on landing of the aircraft and include: (UNCL)

a. Meeting the aircraft, picking up the in-flight report and discussion with co-pilot of any incidents or discrepancies. (UNCL)

b. A brief inspection of the ECM installation, including position of switches and circuit breakers, checking power supply pressures, and recording chaff counter readings. (UNCL)

c. Any necessary entries will be made on the in-flight report and the ECM System Historian or Dispatcher will be briefed on the ECM status of the aircraft and extent of any necessary maintenance. (UNCL)

"SCOPE OF PHASE III

This phase must be accomplished before the crew has left the aircraft. One of its main purposes is to secure all the information on performance of ECM equipment and any flight factors which may affect this performance. A visual inspection of equipment is made, power supply pressures checked, and the co-pilot interviewed. An estimate can be made of the extent of the maintenance to be performed on the Post-mission Inspection. Data which will aid in malfunction analysis can be entered on the in-flight report. (UNCL)

"PHASE IV - ECM POST-MISSION INSPECTION

This phase will be accomplished within the normal maintenance schedule and should start not later than 24 hours after an aircraft has completed an ECM mission. This phase includes: (UNCL)

a. Operational check of installed equipment. (UNCL)

b. Down-loading of carriers and substitution of equipment if required. (UNCL)

c. Correction of all discrepancies and clearing of Form 781. (UNCL)

d. Unloading and reloading of chaff as required. (UNCL)

e. Post-mission entries on the in-flight report if malfunctions have occurred. (UNCL)

f. Inspection of the installation by a supervisor who will certify the aircraft in-commission for ECM operations. (UNCL)

"SCOPE OF PHASE IV

This phase will include all the maintenance necessary to restore aircraft to a desired or standing configuration. If malfunctions have occurred, all discrepancies must be cleared and as much data as possible assembled. In many cases the Post-mission Inspection will serve as the Pre-mission Phase (Phase I) for a subsequent flight and thus greatly reduce maintenance necessary prior to the next flight. (UNCL)

"EXTENT OF THE MAINTENANCE PHASES

The four phases of maintenance cover all conditions which can occur in preparing and maintaining an aircraft in-commission for ECM operations. From the view of maintenance management it may be necessary to differentiate the extensive and less extensive Pre-mission and Post-mission phases as follows: (UNCL)

a. Category A - Major Pre-mission and Post-mission phases which involve configuration changes and extensive maintenance, or an extended Pre-mission phase involving numbers of aircraft to be prepared within a limited schedule. (UNCL)

b. Category B - Limited maintenance phases including Post-mission Inspections which do not require extensive correction of discrepancies or configuration changes. (UNCL)

"The A&E Maintenance Squadron is the only agency competent to judge the extent of maintenance to be performed. This can be done efficiently only if immediate information on the status of all assigned aircraft is available. The ECM Line Maintenance Section must maintain a current ECM Status Board on all aircraft. This board must list equipment installed, coded designation for the frequency setting of transmitters, type and quantity of chaff loads, and status of the installation with date of the last Post-mission Inspection. This is the minimum requirement and the information must be made current at the start of each working day. (UNCL)

"The ECM Maintenance Phases are performed only when ECM equipment is to be used or has been used on a flight. If an aircraft has made several flights with the installed ECM equipment unused, this equipment cannot be considered in-commission without the performance of a regular ECM Phase IV Inspection. Experience of the 376th Bomb Wing indicates that ECM systems should be operated and checked with reasonable frequency. By necessity, airborne operation of ECM equipment is only a small fraction of the aircraft airborne time but the ECM equipment is subjected to vibration, temperature cycling, and corrosion. In general, ECM equipment will benefit from consistent and moderate use and performance will be improved by regular maintenance attention." (UNCL)

11. Test Project Number 46, BUS STOP. (SECRET)

a. Date initiated: 13 September 1955.

b. Estimated date of completion: No estimate presently available.

c. Hours flown: 146:00.

d. Summary:

(1) This report is submitted in accordance with Headquarters SAC letter, DOPLT, dated 18 June 1956, subject: "Assignment of Test Directive Number 46, Project Bus Stop". (UNCL)

(2) The first phase of Project Bus Stop was initiated under the authority of the Commander, Second Air Force, 13 September 1955. Purpose was to determine operational effectiveness of the Phase V ECM capsule within SAC, utilizing the full frequency configuration. This first phase was conducted to test both single and multiple Phase V aircraft operating against EW/GCI multiple beam L and S-band radar. The test consisted of eight single and three multiple aircraft missions; total flight time for the test was approximately 146 hours. Missions were flown at optimum altitude of 33,000 to 37,000 feet against the AN/FPS-10, FPS-3 and AN/MPS-7 radars. The capsule was equipped with the AN/APR-9 receivers and AN/ALT-6, AN/ALT-9 and AN/ALT-8A jamming transmitters. In addition to the capsule equipment, two AN/ALT-8A's were installed in the battery compartment. All equipment installed in the capsule operated with no malfunction on any mission flown; however, a malfunction rate of 90% was experienced for equipments installed in the battery compartments. Equipment failures were traced to loss of pressurization in the supplies. (SECRET)

(3) A complete report, dated 30 April 1956, on Phase One of the test program was forwarded to Headquarters Second Air Force. (UNCL)

(4) Conclusions of this phase are as follows:

(a) Single aircraft S-band sweep jamming mission results were unsatisfactory. (SECRET)

(b) In this case constant skin painting of each aircraft was interrupted only between 65 miles inbound to 30 miles outbound. Furthermore, this radial course case is the most favorable condition for this test item. (SECRET)

(c) In its present configuration this capsule is so limited and deficient in jamming capabilities that its use in combat for ECM support purposes would be unwise. (SECRET)

(5) Recommendations are as follows:

(a) Re-design the RF system as follows:

1. Replace antennas now installed on the capsule with an antenna more suited for tactical requirements. Directional antennas now installed in the capsule were designed to be used primarily against gunlaying radars beaming most of the energy directly below the aircraft. (CONFID)

2. Replace the present RG-117 coaxial cables and connectors with a more satisfactory coaxial cable fitted with better connectors.

3. Re-locate receiver antennas so that mutual interference between transmitters and receivers can be reduced. (CONFID)

(b) Conduct a study to determine possibility of loading additional transmitters in the capsule. (UNCL)

(c) Consider the elimination of ECM operator and the addition of added equipment in the capsule when and if sweep jamming operations are planned. (CONFID)

(6) The above progress report covers only 376th Bomb Wing activities. Progress of the 2d Bomb Wing will be reported next month. (UNCL)

12. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Estimated date of completion: Continuous.

c. Hours flown: 731:50.

d. Summary:

(1) Purpose of this test project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Because of the small number of flying hours allotted for June it was decided to use these to further complete Test Project Number 37. Project personnel used the time during June to catch up on reduction of the large amount of data collected on previous tests and to prepare mission reports. Data from these tests was also used in research and planning for future missions. (UNCL)

FOR THE COMMANDER:

William H. Murphy
WILLIAM H. MURPHY
Major, USAF
Adjutant

21 Incls
1. Photo, Proj 40 (CONFID)
2. Photo, Proj 40 (CONFID)
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4. Map, Proj 37 (UNCL)
5. thru 20. Charts, Proj 37 (SECRET)
21. Chart, Proj 40 (UNCL)

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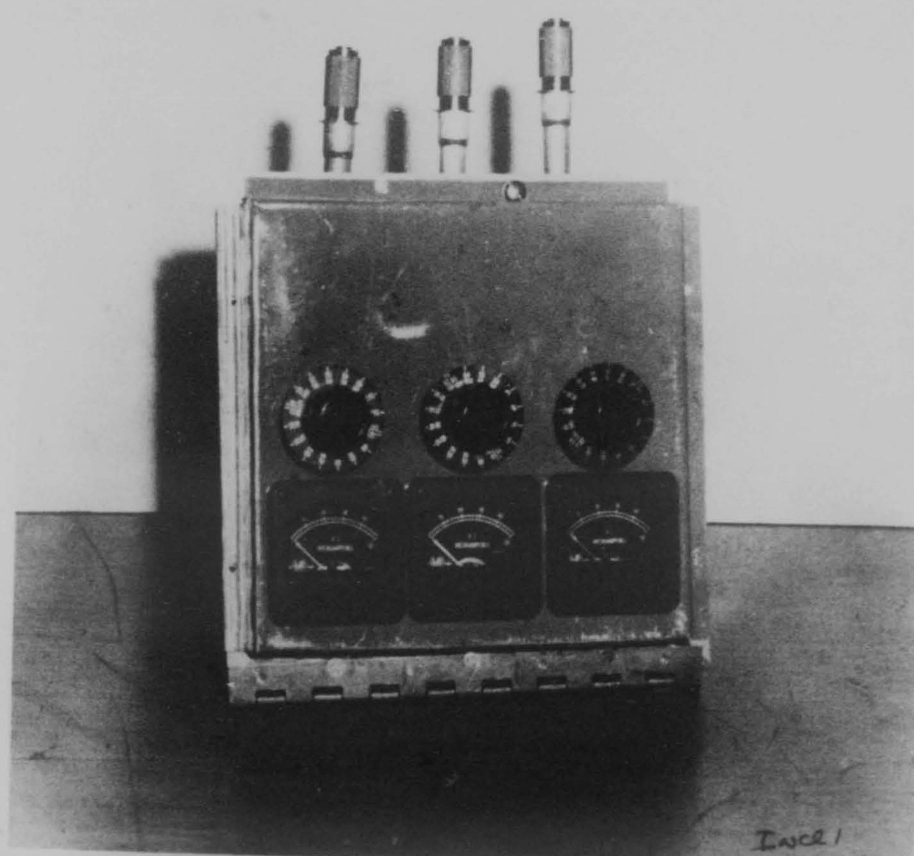

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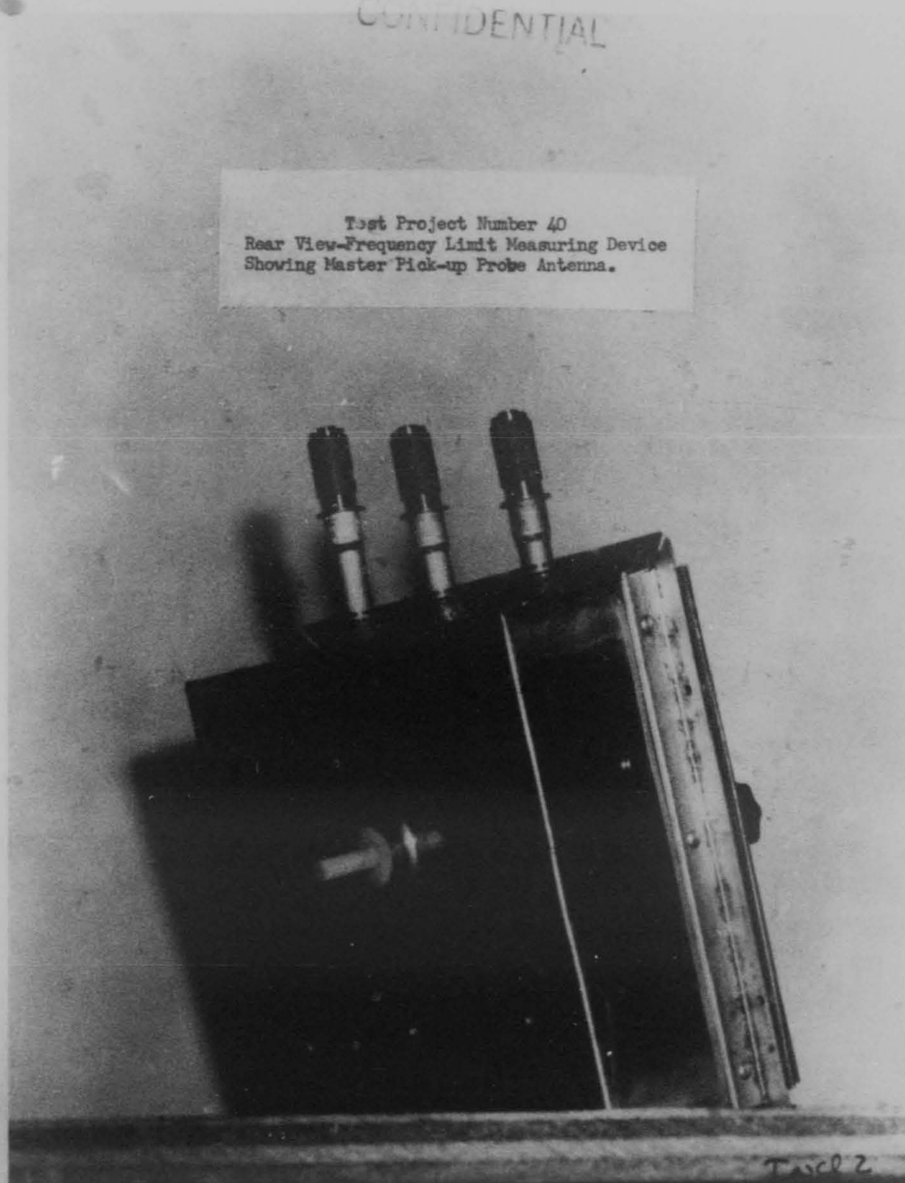

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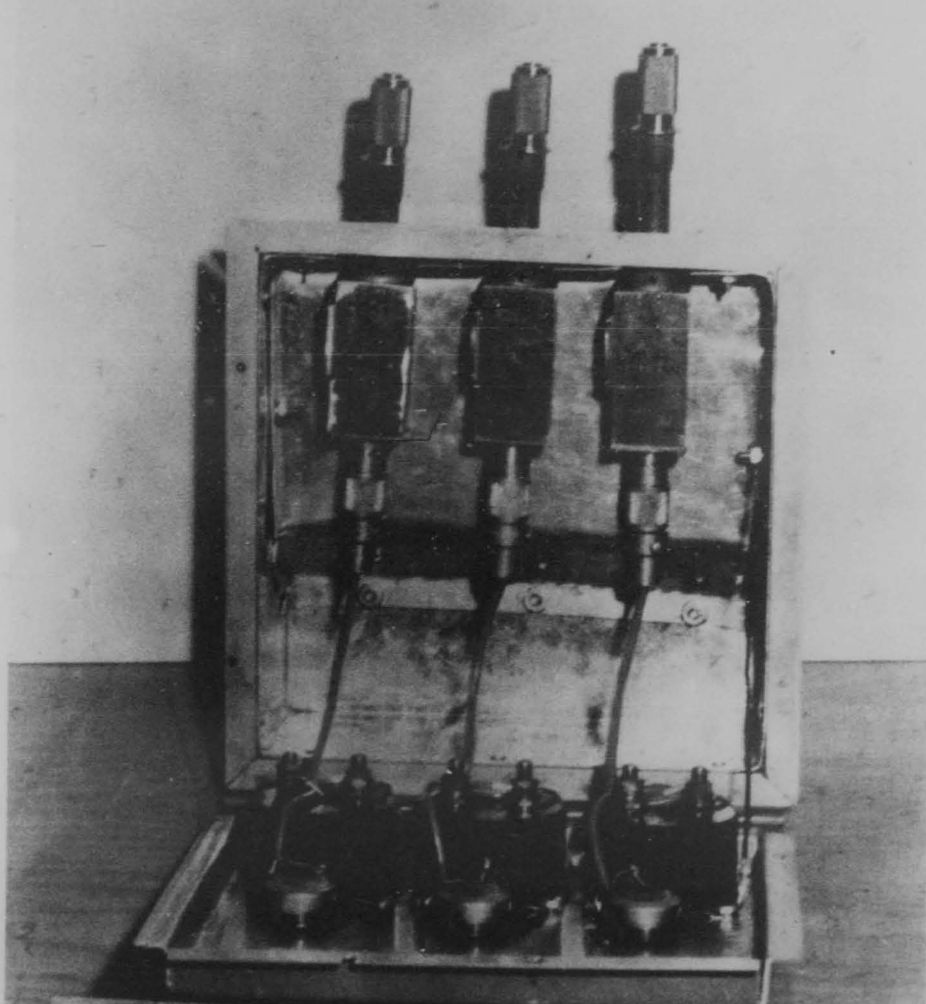

Test Project Number 40, Internal View-Frequency Limit Measuring Device.

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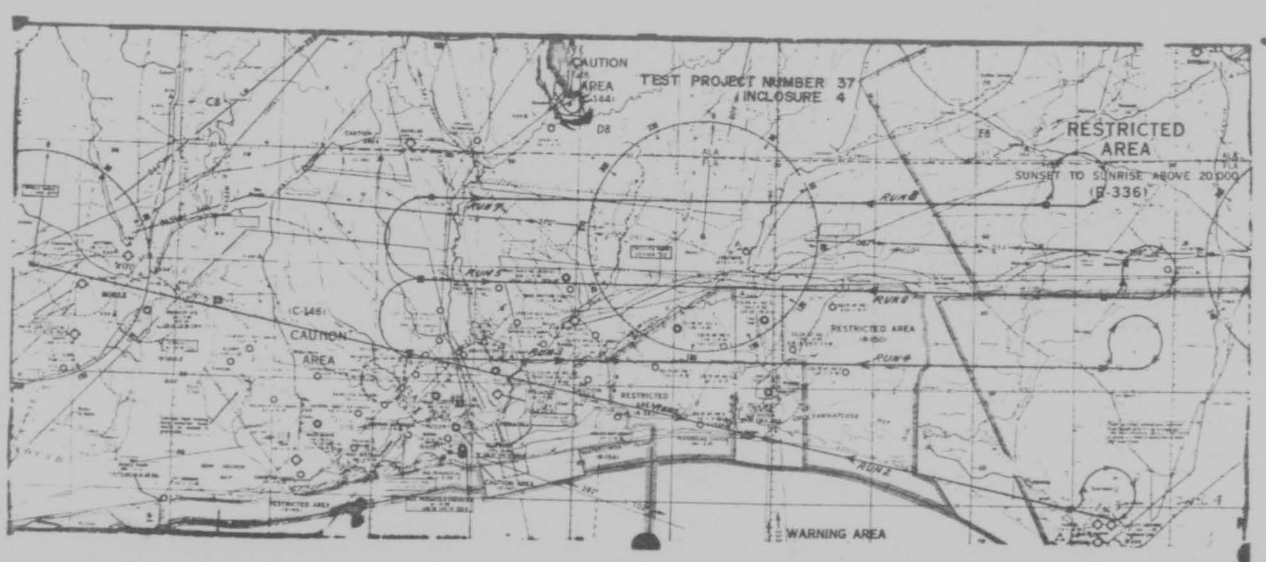

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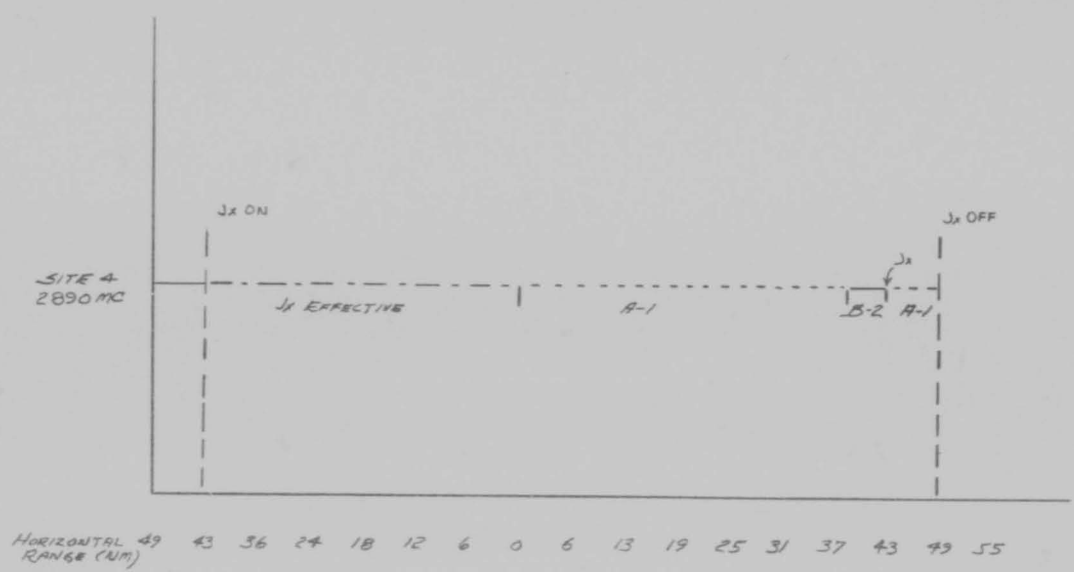

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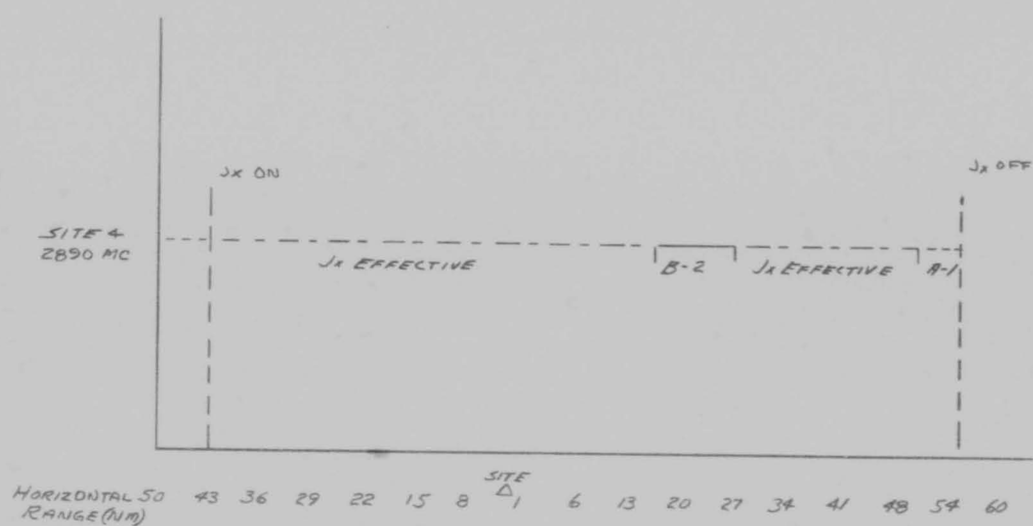

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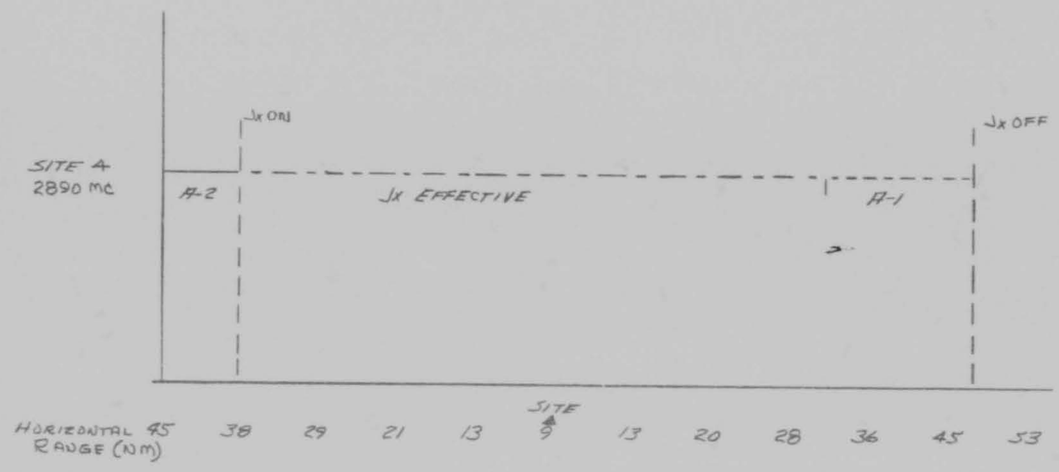

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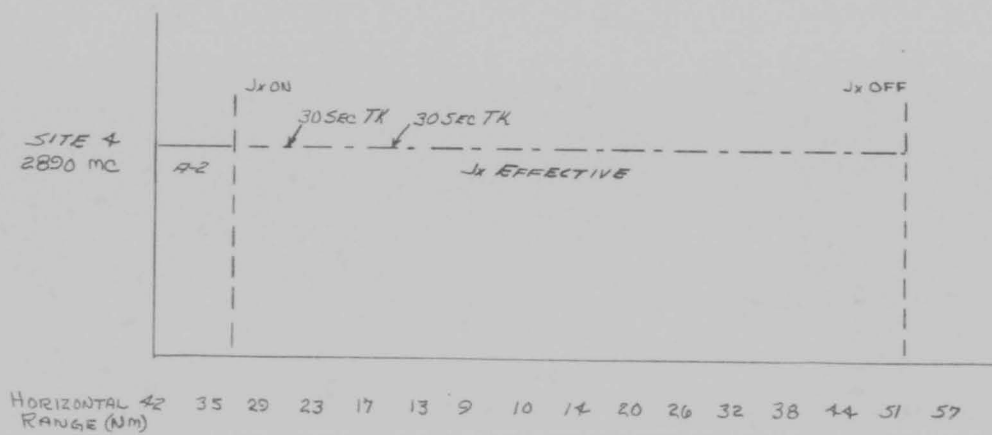

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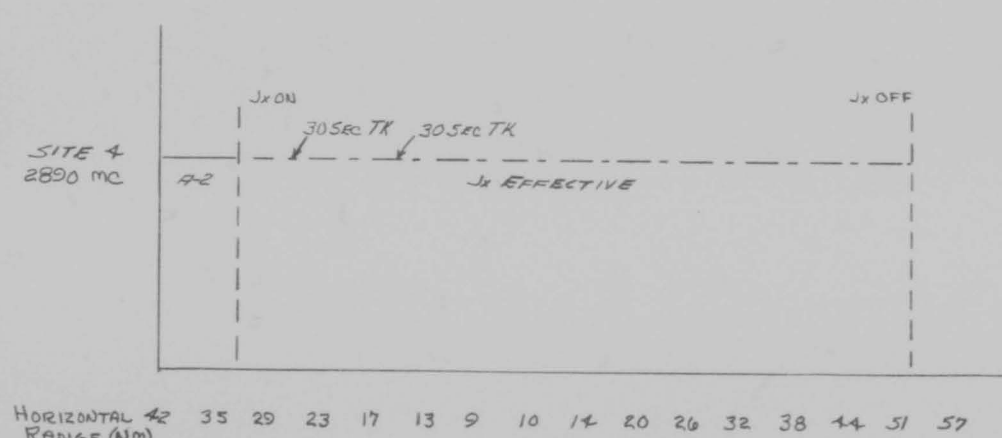

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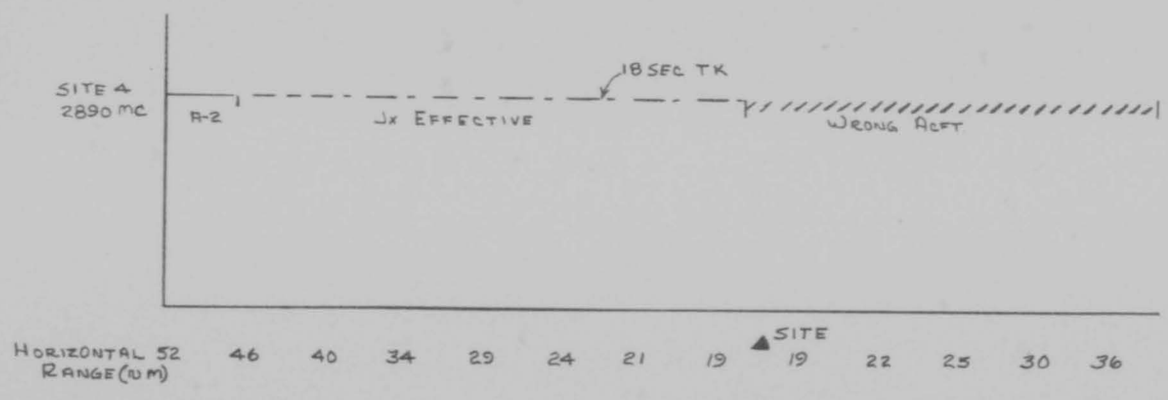

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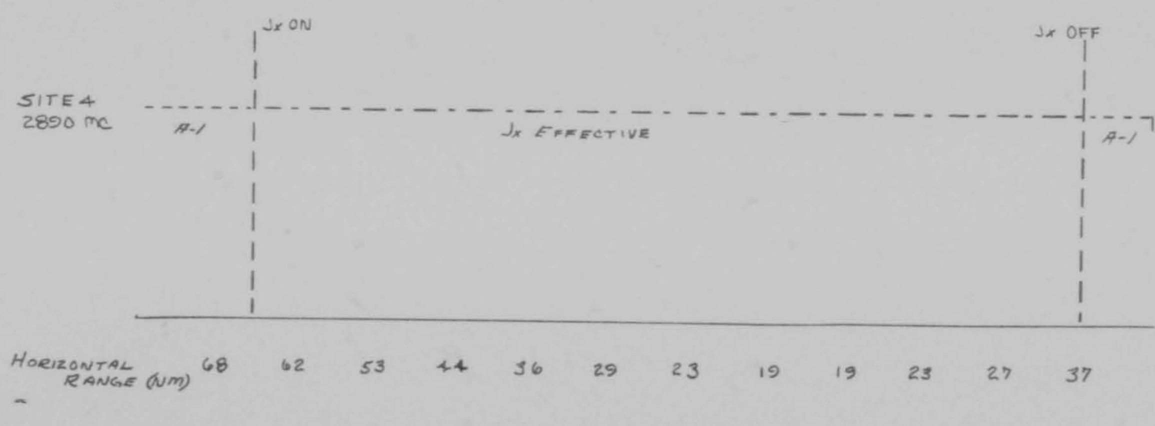

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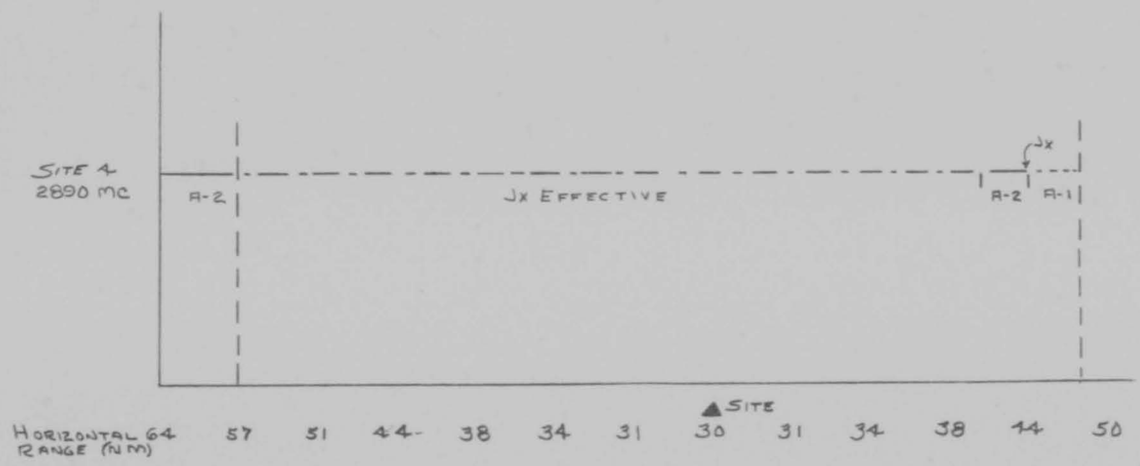

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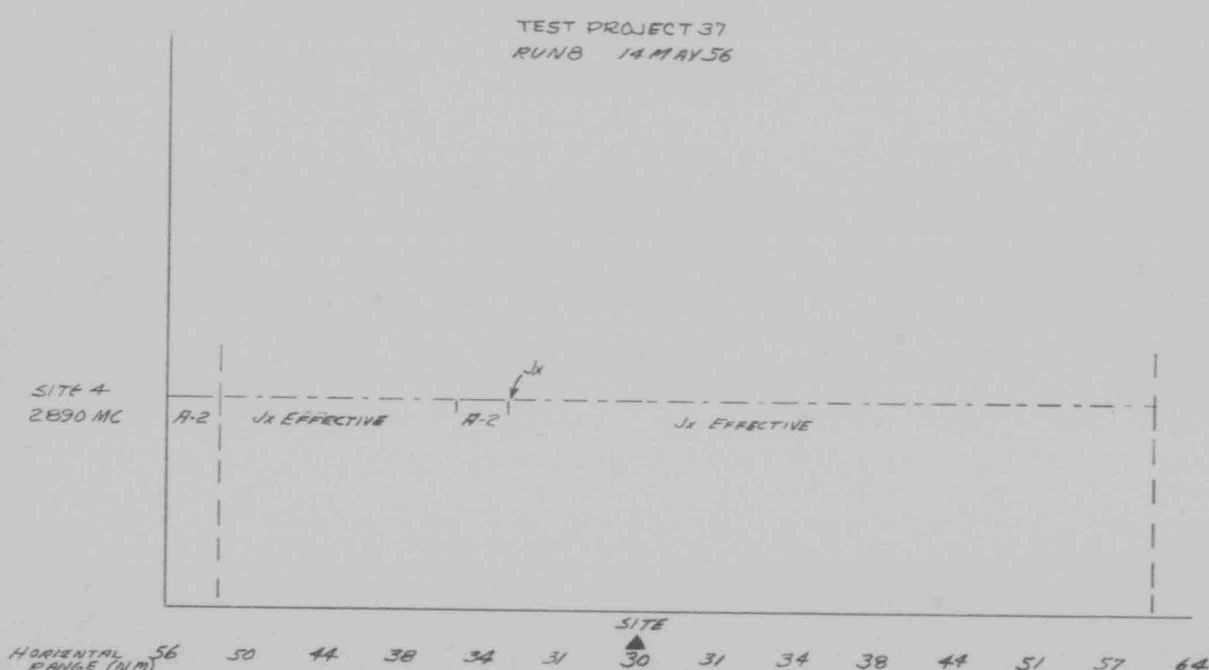

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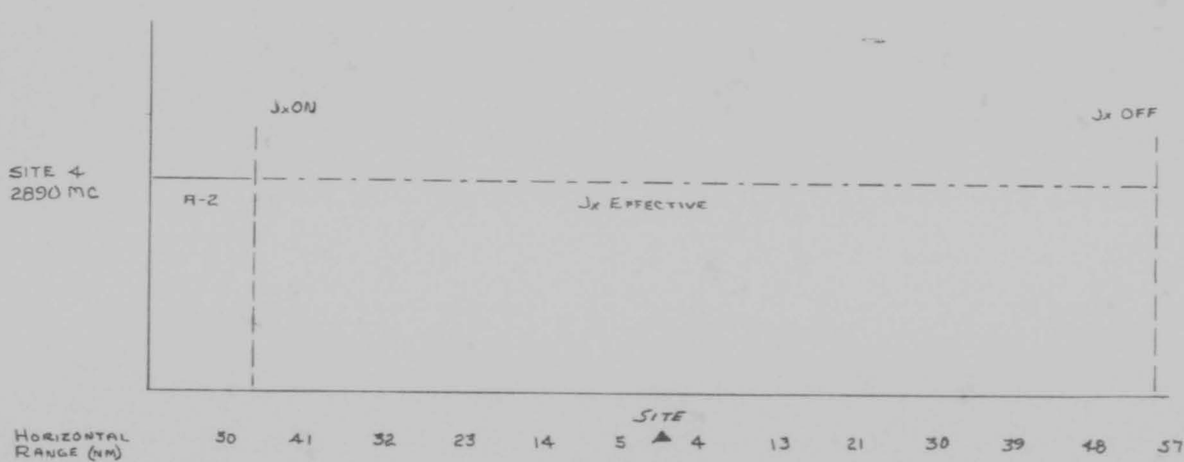

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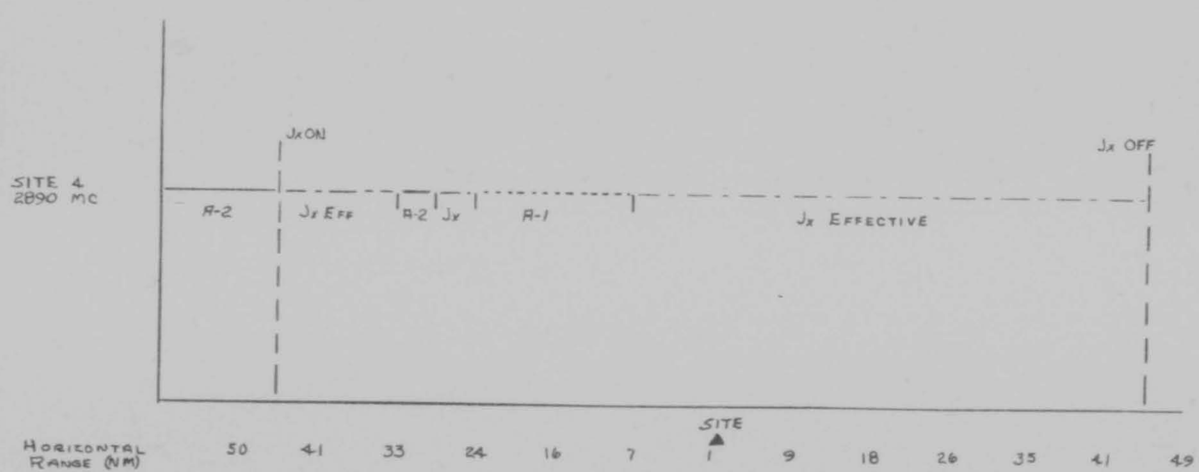

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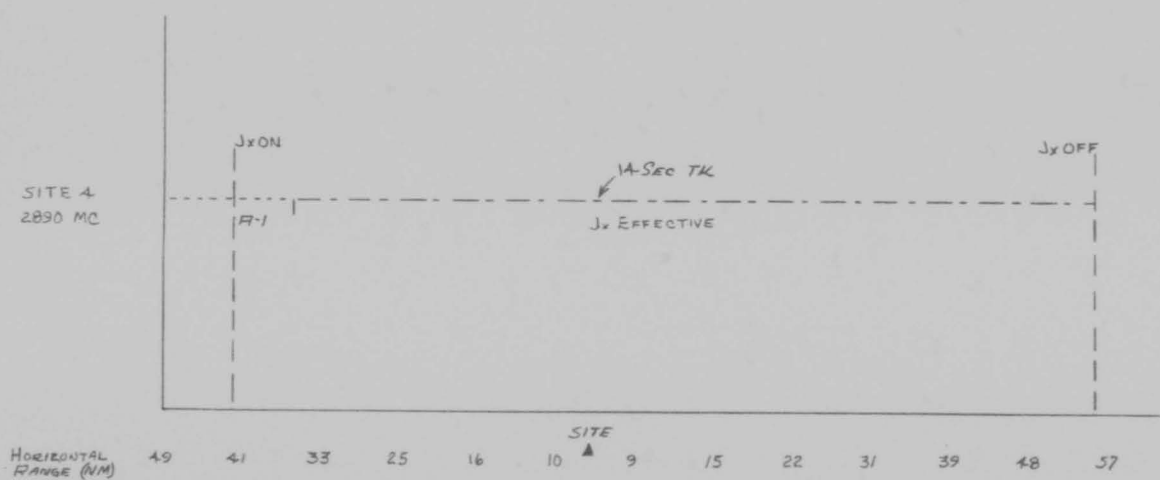

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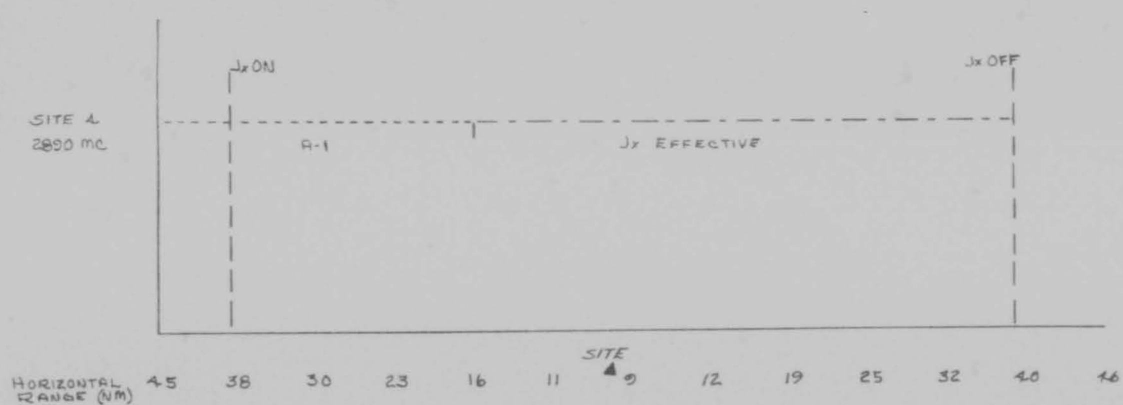

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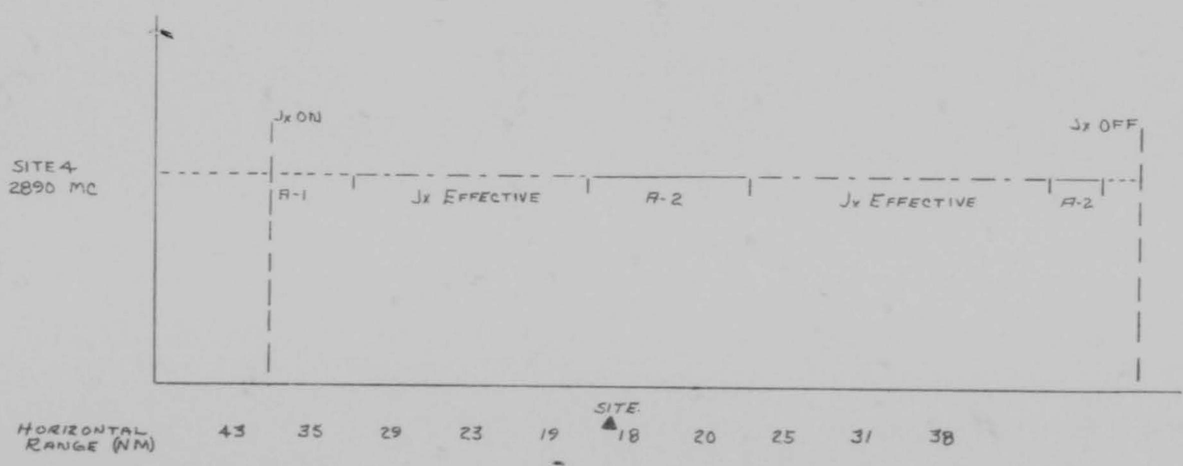

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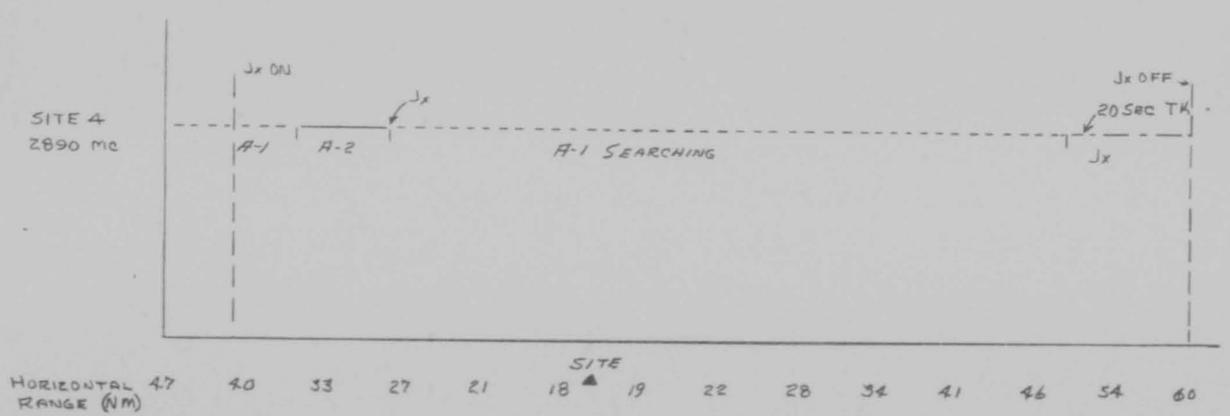

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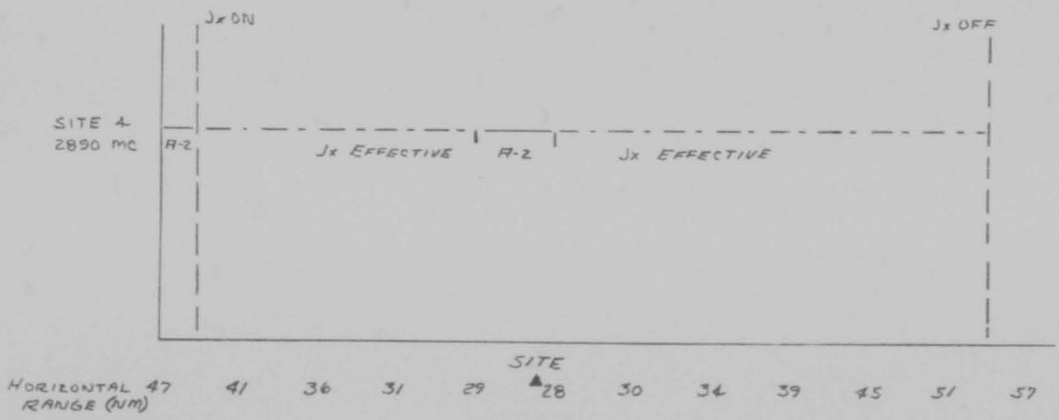

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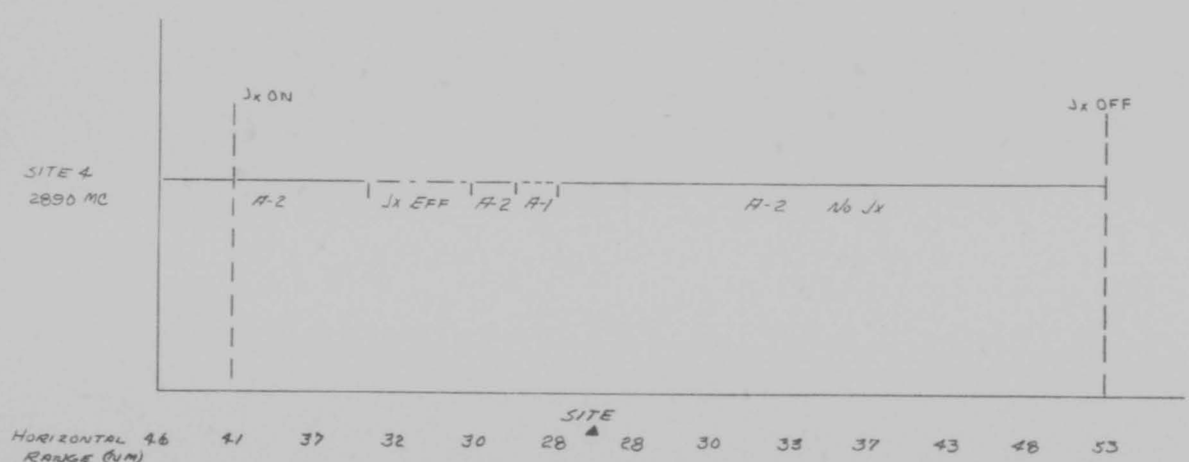

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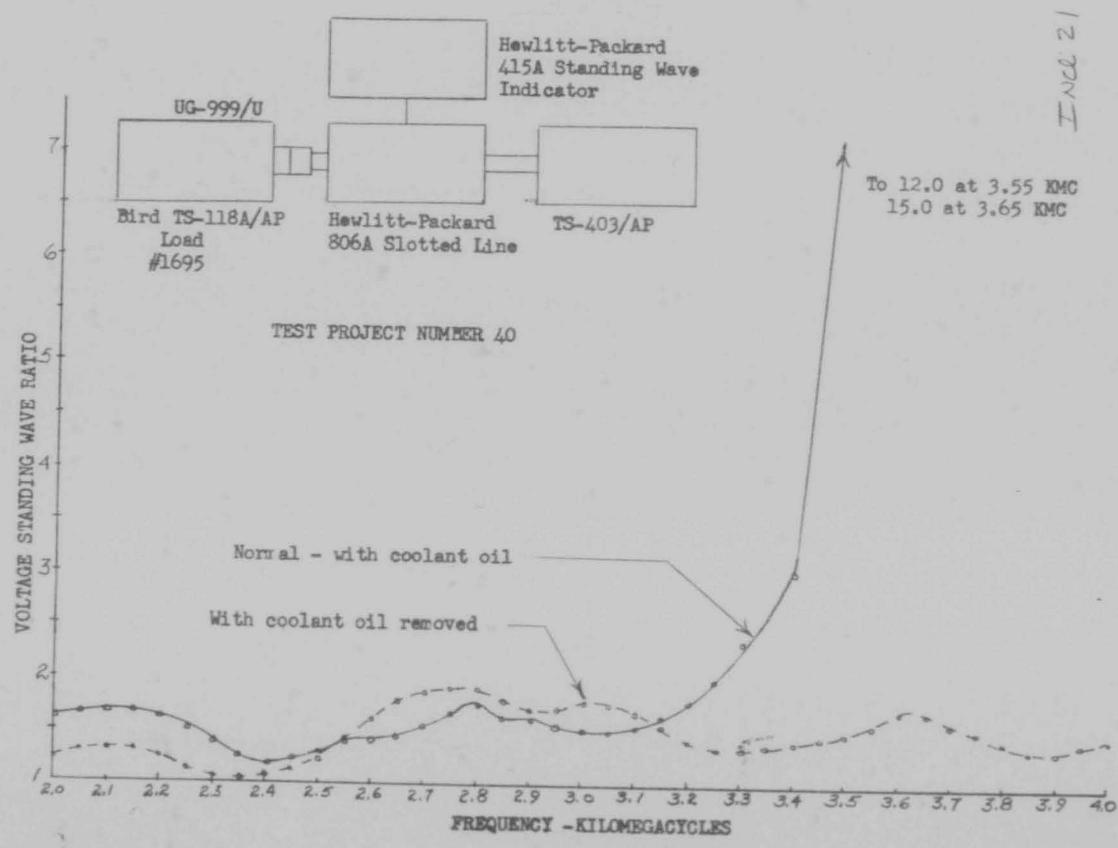

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13

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT 7 August 1956

SUBJECT: Test Progress Report (RCS: SAC U-30)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Submitted herewith is a report of the ECM projects assigned to the 376th Bombardment Wing, Medium. The period of this report is 1 through 31 July 1956. Each succeeding paragraph deals with individual project progress. (UNCL)

2. Test Project Number 34, "Development of an Unattended Communications Jammer". (SECRET)

a. Date initiated: 2 June 1953.

b. Estimated date of completion: March 1957.

c. Hours flown: 8:00.

d. Summary:

(1) The jammer designed under this project is an electro-mechanical approach to the problem of an unattended search, lock-on and spot jammer for use against GCI communications. The receiver continuously searches the band of 100 to 156 megacycles while the transmitter tracks with it in a quiescent state. When a signal is received, a tuning control relay acts to stop the tuning motor and actuate transmitter control circuits. A look-through circuit allows the unit to determine when the enemy signal shifts frequency or discontinues a transmission. In the event the signal disappears, all circuits return to normal search position and receiver recycles for normal search. The transmitter is modulated from two sources: a noise generator, and a

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supersonic oscillator. The supersonic tone thus produced is used for identification purposes and, when received by a second jammer, de-energizes the control circuits in a second jammer, thus preventing the possibility of more than one jammer occupying the same frequency simultaneously. (SECRET)

(2) The lock-on error existing between the receiver and transmitter of the original Project 34 model necessitated a different approach to the method of tuning, signal searching, and locking on enemy signals. In order to keep lock-on error to a minimum and assure that the receiver and transmitter of the jammer would be in the bandwidth of an enemy signal, a mechanical automatic frequency control system is being incorporated into the equipment. This essentially consists of a servo-motor with gear train, DC control amplifier, frequency discriminator as an error detector, and one additional stage of IF amplification. (CONFID)

(3) The servo-motor was mated to a gear train by extensive machining, which resulted in a speed reduction of 200:1. This means that with a normal motor speed of 4000 RPM, it could be expected the VHF spectrum would sweep from 100 to 156 megacycles in three seconds. However, the final speed of the search sweep can be varied by varying input to the DC amplifier. The DC control amplifier is now developed to a point where a one volt signal, positive or negative, will drive the motor to maximum speed in either direction. The direction for servo-motor rotation is dependent on polarity of the incoming signal. (CONFID)

(4) A newly designed and constructed IF amplifier strip incorporates the additional stages required for increasing gain and sensitivity to sufficient amplitude to operate the AFC system satisfactorily. In addition, discriminator circuits and coils were included on the IF amplifier chassis; the result is a compact strip neatly integrated into the present layout. As with all newly designed and constructed electronic circuits, certain reworking is necessary to realize the full gain for optimum amplifier operation. Lead dress on certain stages requires changing, by-passing of long leads must be added, and some additional shielding provided. All these minor modifications are being worked on at the present time. (UNCL)

(5) SAC representative indicated this project will be cancelled. The system under development in this project is a slow moving mechanical system; recent developments in rapid electrically tuned systems appear so much more promising that

additional effort should not be expended on the mechanical tuned system. (UNCL)

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3. Test Project Number 35, "Development of a VHF Communications Jammer Using Increductors". (SECRET)

a. Date initiated: 1 April 1954.

b. Estimated date of completion: April 1957.

c. Hours flown: None.

d. Summary:

(1) Purpose of this project is to develop a search-and-lock-on VHF communications jammer using electronic rather than mechanical tuning. Saturable reactors are used as tuning elements in both the receiver and transmitter. A system has been built consisting of a receiver and transmitter in the frequency range of 100 to 156 megacycles and incorporating circuits which sweep the receiver through the VHF band causing it to stop when a signal of sufficient amplitude is received. A control is provided to set the threshold level so the receiver will pass only signals above a desired level to the control circuits. The receiver local oscillator remains on while the RF and IF sections are turned off. Memory circuits keep the oscillator on the correct frequency, the transmitter is then turned on and sweeps over the same frequency band, stopping when it encounters the frequency located by the receiver. The victim signal is jammed for a pre-set period of time, after which the transmitter is turned off, receiver is turned on, and the system again searches the band. (SECRET)

(2) The electronically tuned transmitter uses an XR-520 increductor saturable reactor and has an output of 50 to 100 watts in the frequency range from 100 to 150 megacycles. Power supply and basic control circuits for the transmitter are all included on a standard ECM rack. The transmitter sweeps over the frequency band at approximately three sweeps per second and is capable of continuous operation on a spot frequency for an unlimited time if required. Bandwidth of the transmitter is 200 kilocycles which contains some FM and AM modulation caused by ripple in the control and switching voltages. No attempt has been made to eliminate this modulation as it may prove beneficial rather than harmful to jamming. (SECRET)

(3) The search-and-lock-on receiver uses six XH-146 increductor saturable reactors in the RF section. The receiver is built in six sections: master sweep circuits, master control

circuits, RF circuits, master multivibrator circuits, IF strip, and regulated power supply. Each section is built on a separate chassis and all are mounted as plug-in units in an 11" high standard ECM rack. Space remains for additional circuitry required for identification capability or other modifications which may be necessary. Extension cables have been made for all units so they may be removed for testing and alignment. Associated with the receiver are control circuits to automatically tune the band, locate a signal, lock-on, then tune the transmitter to the same frequency and begin jamming. The jamming period may be as long as three seconds, after which the receiver resumes scanning. The receiver scans the band from 100 to 156 megacycles in 100 milliseconds with a flyback time of 100 milliseconds, allowing five complete scans per second. Under these conditions, if there were only one signal in the swept band, it would be jammed for a maximum of three seconds at intervals of not more than 400 milliseconds. (SECRET)

(4) First checks of the system show the receiver lock-on sensitivity to be 20 microvolts at 100 megacycles, improving to three microvolts at 156 megacycles. Gain of the receiver is 120 DB at the high frequency range and 110 DB at the low frequency range. Gate and pause circuits have been adjusted so that pause and lock-on periods of as much as three seconds are obtained on test and actual signals. All receiver functions have been checked; necessary cables and connectors have been added to the receiver and transmitter and the two units interconnected. The system has been tested over the VHF band and is able to lock-on signals in the range from 96 to 158 megacycles. Further tests show that lock-on accuracy may be improved. The best bench test to date was made using the entire system. Maximum lock-on error for this test was 75 kilocycles. Accuracy was checked every ten megacycles throughout the band. Resolution or distance between signals which the system will lock-on is presently 600 kilocycles; however, this depends on signal strength and is less at the high frequency end of the band. Frequency drift of the system during lock-on has been almost entirely eliminated by modification of the sweep feedback circuit and changes in the pause and memory circuits. Additional changes in circuitry are contemplated to further improve the overall stability of the system. Changes in the transmitter chassis and layout are planned to increase power output, if possible, and improve stability. The AFC circuit in the receiver look-through is no longer used and the AFC circuit for the transmitter may be changed for greater stability. (SECRET)

(5) An AT-190/AP antenna has been shortened and the matching section changed so it may be used with the transmitter. The modified antenna was filled with foaming plastic and checked for proper operation with the transmitter. The antenna was found to be electrically suitable. It has been test flown for a period of 13 hours in an AB-109 mount located near the ATO compartment of a B-47 aircraft; so far no mechanical deterioration is evident. These test flights will continue until a total of 50 hours flight time is reached, after which the antenna, if still electrically and mechanically satisfactory, will be mounted on a B-47 bomb bay door for additional flight testing. (CONFID)

(6) A trip was made by the project engineer to WADC during June but report on this was not available for the June SAC U-30. Purpose of the visit was to determine test results obtained with the CGS Laboratories search-and-lock-on system purchased by WADC. The equipment was not available, having been returned to the manufacturer for modification. It will not be returned to WADC until after the beginning of 1957. One flight test had been run wherein successful jamming was obtained by manually adjusting the transmitter lock-on circuitry for minimum error during the test. No other tests were run because of instability and excessive lock-on errors. (SECRET)

4. Test Project Number 36, "RF Transmission Systems" (SECRET)

a. Date initiated: 1 November 1954.

b. Estimated date of completion: Continuous.

c. Hours flown: 94:05.

d. Summary:

(1) In using high-powered S-band jamming transmitters, such as the AN/APT-16, AN/ALT-6 and AN/ALT-8, considerable difficulty was encountered in multiple moding of magnetrons, low power output, and poor performance. Cause of the troubles was found to be the poor RF transmission lines and connectors used with these systems. This project was initiated to investigate transmission lines and connectors and attempt to improve the system performance. Several types of connectors and RF cables have been investigated. (SECRET)

(2) Several manufacturers were advised some time ago concerning the need for new cable with improved characteristics over the RG-117/U. (UNCL)

(a) The Rockbestos Products Corp has already produced such a cable at no cost to the government. This cable, with new connectors developed by Industrial Products Co, also at no cost to the government, is now being tested by the WCLGL6 Branch, WADC. Two six-foot lengths and one eight-foot length of cable, with connectors, were made available to the 376th Bomb Wing and are being tested. This special cable, manufactured by Rockbestos Products Corp, has several desirable features including silver-plated conductors, semi-air woven Teflon dielectric for low attenuation and greater flexibility, improved braid construction for lower loss at high frequencies, and a vinyl jacket for smooth handling properties. (UNCL)

(b) The Amphenol Electronics Corp has produced a Teflon tape cable (similar to RG-93/U) with a vinyl jacket which may also be suitable. The 376th Bomb Wing Laboratory presently has 15 feet of this cable with two newly developed Amphenol connectors for tests. (UNCL)

(c) The Phelps Dodge Co has furnished the 376th Bomb Wing with eight six-foot lengths of Styroflex cable. Tests on this cable will be made when proper connectors for it have been obtained. No Foamflex cable or connectors are available for testing. (UNCL)

(3) A study of all domestic and foreign cable manufacturers' designs is now being made by WCREM1 Branch of WADC under contract AF 33(616)3607 to determine the state of the art in cables with low loss and high temperature characteristics. This study should be completed within one year. (UNCL)

(4) Several models of Scimitar antennas have been fabricated and tested in the 376th Bomb Wing Laboratory. Results are extremely encouraging as evidenced by the voltage standing wave curve and radiation patterns, Inclosure 2. It is believed that a new model now being tested will be even more satisfactory. The following is a description of this antenna: (UNCL)

(a) The Scimitar antenna developed by the Aerial Reconnaissance Laboratory, WADC, is essentially a co-planar equi-angular stub antenna with a folded over, shorted base, making for simplicity in construction and installation. Aside from its physical properties, the Scimitar antenna has unusual bandwidth, patterns, impedance and military applications. The antenna presents a knife edge to the airstream and can be mounted almost any place on the surface of an aircraft, requiring a hole only large enough for a coaxial feed cable, a small matching section, and connector to pass through. (UNCL)

(b) The Scimitar antenna exhibits a very complex polarization response which depends on the aspect angle at which the antenna is viewed. In general, the antenna acts as a stub antenna in the plane and as a dipole antenna in the Ø plane. (UNCL)

(c) To date, no formal theory has been advanced on operation of the Scimitar antenna. Its conception was the result of applying the equi-angular principle to the conventional discone, loop, stub, and spiral antenna. It is expected that considerable time will elapse before a detailed analysis of this antenna can be made; however, this should not seriously restrict its use since its proper construction can be determined experimentally. (UNCL)

(d) Several of these antennas have been built in the 376th Bomb Wing Laboratory using QRC-27(t) mounting bases with modification only to the matching section. The most promising approach to a satisfactory match for currently used cables and connectors was reached by using an 85 ohm matching section. A curve of voltage standing wave ratio and charts of the radiation pattern of this antenna are shown on Inclosures 3 through 21 and a photograph of the Scimitar antenna mounted on the QRC-27 base on Inclosure 22. This modified antenna fits into the AB-109 antenna mount. (UNCL)

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5. Test Project Number 37, "AN/ALQ-3 Suitability Tests". (SECRET)

a. Date initiated: 2 May 1955.

b. Estimated date of completion: October 1956.

c. Hours flown: 119:35.

d. Summary:

(1) Purpose of this project is to test and evaluate tactical use of the AN/ALQ-3 search-and-lock-on jamming system. Six complete AN/ALQ-3 systems have been delivered to the 376th Bomb Wing for use on these tests. A total of 47 equipments are scheduled for delivery to the 376th Bomb Wing; to date, 39 systems have arrived: (CONFID)

(a) Systems 6, 7, 8, 9, 10 and 23 are being used for test. (CONFID)

(b) Twenty-six systems are still in crates in the 376th A&E Supply Room. (CONFID)

(c) Seven systems were shipped in accordance with SAC message DM3A6 52274, 22 June 1956. One system was shipped to White Sands Proving Ground, four to Evans Signal Laboratory, and two to Fort Hauachata Signal Laboratory. (CONFID)

(2) Two B-47E Blue Cradles have been modified for installation of the AN/ALQ-3. This modification consists of mounting two Cannon connectors in the cradle junction box, one for control box wiring to the co-pilot position using existing spare wires in the cradle junction box, and the other for primary power to the AN/ALQ-3 from power busses and circuit breakers in the cradle junction box. No aircraft or cradle wiring changes have been necessary, only the additions described. (UNCL)

(3) The following changes have been made in the project test program by Headquarters SAC: Tests of the AN/ALQ-3 against EW and GCI radars are waived, limiting testing of the AN/ALQ-3 to tracking type radars only. No modifications of the AN/ALQ-3 will be accomplished to permit operation against EW/GCI radars. (CONFID)

(4) One flight test was conducted 18 July at the Houston RBS. Purpose of this mission was to re-check compatibility of

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an AN/ALQ-3, operating in a B-47 Blue Cradle, with AN/ALT-8 transmitters, in the ATO compartments of the same aircraft. Radial and tangential passes (5, 10, 20 NM) with respect to the Houston RBS site were made by the B-47E aircraft. The RBS radar would lock-on the aircraft indicated by the white target lamp on the AN/ALQ-3 control box. After obtaining the target lamp indication, the operator in the aircraft would energize AN/ALT-8 transmitters singly. It was found that each time an AN/ALT-8 transmitter was energized, the AN/ALQ-3 receiver would lose the ground radar signal due to interference from the sweep jamming; consequently the AN/ALQ-3 transmitter could not be energized. These results are contradictory to those obtained at Kansas City RBS on 12 June 1956. It is not known why the two systems appeared compatible on that date; however, information obtained on 23 and 25 June and 18 July definitely indicates the AN/ALQ-3 is not compatible with sweep jamming equipment carried in the same aircraft. (SECRET)

(5) Flight tests conducted on 25 and 28 June were briefly reported in the June SAC U-30 but full details of results were not then available. Both missions used two AN/ALQ-3-equipped aircraft operating against a precision tracking radar complex at Eglin AFB, Fla. Each aircraft was assigned an IP and bomb target so located that the precision tracking radars would simulate a defense complex and theoretically have control of anti-aircraft fire or guided missiles. The AN/FPS-3 radar at Eglin Site 30 was used for early warning and acquisition from which target range, azimuth and altitude were continuously fed to the MSQ tracking radar sites. Aircraft operated with IFF in order to simulate reliable and continuous radar acquisition information. Map, Inclosure 1, shows aircraft tracks, IP's, targets and locations of radar sites used during the tests. Sites 4, 5, 20 and 30 were operated on 25 June, and Sites 3, 4, 30 and 32 were operated on 28 June. Primary purpose of the tests was to determine individual protection afforded an aircraft by AN/ALQ-3 when flying against a complex responsible for destroying two or more bomber type aircraft. The missions were also used to evaluate certain tactics used in conjunction with the AN/ALQ-3 equipment. Each aircraft was briefed to make three bomb runs from their respective IP's to designated targets. On Run 1, AN/ALQ-3 only was energized at the IP. On Run 2, AN/ALQ-3 and two AN/ALT-8 transmitters were energized at the IP. Run 3 used the AN/ALQ-3 and one unit of RR-20 chaff, dispensed whenever the target lamp on the AN/ALQ-3 control box indicated a tracking radar had just lost track of the aircraft. (SECRET)

(6) On the test of 25 June, the radar at Site 5 seemingly had very poor sensitivity because targets were acquired only a few times and no tracks on the target aircraft were made. On this test, Run 1 was flown as briefed by only one aircraft, the other having a delayed take-off because of aircraft maintenance. The aircraft departed Merrill, Miss., and made a bomb run on a cove in Choctawhatchee Bay. The AN/FPS-3 radar maintained IFF contact with the aircraft during the entire run. MSQ radars at Sites 4, 5 and 20 attempted to acquire and track aircraft during the inbound and outbound legs; however, the AN/ALQ-3 jamming prevented any sites from obtaining more than a two or three second track during the run. Run 2 was flown by both aircraft but it was found that when the AN/ALT-8 transmitters were turned on, the AN/ALQ-3 receiver in the aircraft would not maintain lock-on. The aircraft were ordered to keep the AN/ALT-8 transmitters on stand-by and the run was made using AN/ALQ-3 equipment only. The aircraft flying from Merrill, Miss., was protected by its AN/ALQ-3, but the AN/ALQ-3 in the other aircraft did not operate properly and Site 4 was able to maintain a continuous track of this aircraft inbound and outbound. Post-flight inspection of the AN/ALQ-3 revealed that V-2604B in the receiver sampling unit had failed, resulting in no look-through signal to the receiver. The third run was made only by the aircraft having the properly operating AN/ALQ-3. On this run the AN/ALQ-3 was energized at the IP and one unit of RR-20 chaff was dispensed manually from the aircraft each time the control box lamp indicated a radar had just lost track of the aircraft. This technique was tested because it had become common practice for the ground radar operators, when working against the AN/ALQ-3, to slew the antenna off the jamming aircraft, cause jamming to stop, then swing back and reacquire the aircraft before jamming could commence again or while the AN/ALQ-3 was jamming another radar. It was felt that if one unit of chaff was dispensed at the moment the radar broke lock, the operators would have a 50-50 chance of locking on the chaff instead of the aircraft, thus affording the aircraft a better chance to escape re-acquisition. The radar operators were not informed that chaff would be dispensed during the run. Results of the jamming and chaff combination were far better than expected. Radar operators at all MSQ sites became very confused and none realized the fake targets were caused by chaff. At various times they attributed the returns to clouds, ground clutter, fighters, and jamming even though all had observed chaff returns many times before. Winds at the altitude used were practically zero, which resulted in a zero rate of change in range for

the chaff after it had blossomed. Operators could determine by observing the range dials that a target was not moving; however, in some instances they would not believe the indication and remained locked-on chaff for considerable length of time. Statistics for Run 3 were as follows:

Total time for run - 36 minutes
Site 4 locked-on chaff 18 times - total of 5.6 minutes
Site 5 locked-on chaff 19 times - total of 3.1 minutes
Site 20 locked-on chaff 14 times - total of 3.6 minutes
Aircraft was not tracked for more than two seconds by any site and acquisitions were very few.
(SECRET)

(6) No usable data was obtained from the mission of 28 June. The test was to have been identical to that of 25 June but a number of difficulties were encountered. Sites 4 and 30 were engaged in another mission at IP time and were not in operation until 30 minutes after IP time. Site 32 had been moved and observers did not locate the site until 40 minutes after IP time. Site 3 was unable to transmit on UHF radio. The AN/ALQ-3 equipment (system 7) on one aircraft would not lock-on a radar signal, so no jamming could be obtained from the transmitter. Post-flight inspection of the equipment showed no malfunction indicating a possible high altitude breakdown. Aircraft was tracked with no difficulty by all sites at some time during the runs. The AN/ALQ-3 equipment (system 8) in the other aircraft was not emitting a jamming signal of sufficient strength or noise content to cause the radar sites to break-lock and Sites 4 and 32 made particularly good tracks through the jamming. As a result of the various difficulties, it was felt that no usable information of the AN/ALQ-3 capability was obtained from this mission. (SECRET)

(7) One flight test is planned for 30 July at the Little Rock RBS site using an AN/ALQ-3-equipped KC-97 aircraft. Purpose of this test is to verify or negate data obtained from previous KC-97 tests of the AN/ALQ-3. The majority of the earlier tests were made with systems 1 and 2 which were later found to be below equipment specifications regarding accuracy of transmitter lock-on. The 30 July test will use system 7 which has given the best results during the B-47 tests. (SECRET)

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6. Test Project Number 40, "Design of Calibration Device for AN/ALT-6 and AN/ALT-8 Transmitters". (CONFID)

a. Date initiated: 14 September 1955.

b. Estimated date of completion: September 1956.

c. Hours flown: N/A.

d. Summary:

(1) Purpose of this project is to design test and calibration equipment suitable for field use to enable rapid and accurate frequency settings of AN/ALT-6 and AN/ALT-8 transmitters on the flight line. Insofar as possible, the equipment will be designed to be independent of external power and measure sweep speed, sweep width, noise modulation and relative power by passive means. (CONFID)

(2) Electrical tests and measurements were made on the third model of the cavity device for measuring sweep frequency limits. With the present mechanical arrangement, considerable amount of spurious responses were obtained as the jammer frequency swept slowly across the S-band. These responses were not due to cavity response effects but rather to RF leakage voltages to the crystal diode by way of meters and connecting cables. Spurious responses from the powerful RF fields in the vicinity of the jammer antenna cause erroneous readings on the indicating meters which may be mistaken for true resonance readings. To eliminate these undesirable responses, RF chokes are being installed in the meter leads, by-pass condensers incorporated into the crystal diode housing, and better shielding within the metal inclosure is being added. (CONFID)

(3) Work was continued on the TS-118A wattmeter. This wattmeter, which was designed for operation up to 1400 megacycles, has an abrupt rise in standing wave ratio above about 3200 megacycles. The sharp rise in VSWR was found to be caused by resonance of the load resistor and transition when immersed in the coolant oil. A plastic "do-nut" was cast from Eccofoam FP plastic and shaped to occupy the first three inches inside the wattmeter load. The do-nut displaces the oil, which has a high dielectric constant, with plastic which has a low dielectric constant, thus destroying the unwanted resonance. Inclosure 23 shows the

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VSWR of the wattmeter load before and after insertion of the plastic do-nut. The measurement was made shortly after the plastic do-nut was inserted. The plastic is a foaming type consisting mostly of entrapped air. A measurement will be made after the plastic has been immersed in the oil for several weeks to determine if the VSWR remains low. An iron constantan thermocouple unit is being constructed using connectors compatible with those used with RG-117/U RF cable.
(CONFID)

7. Test Project Number 41, "X-Band Interference, Code Name SPOTLIGHT". (CONFID)

a. Date initiated: 29 March 1956.

b. Estimated date of completion: March 1957.

c. Hours flown: None.

d. Summary:

(1) Primary purpose of this project is to determine extent of X-band jamming interference to other airborne electronic systems and what measures can be taken to reduce the effects of such interference. The secondary purpose is to determine effectiveness of X-band sweep jamming against radar-equipped AI aircraft to include determination of optimum sweep jamming rates and bandwidths. (SECRET)

(2) Ground tests using the AN/ALT-6A were performed during June and these were described in the last monthly report but complete reduction of data had not then been made. The ground tests were performed at Perrin AFB, Tex. An AN/ALT-6A transmitter, equipped with the OA-822 oscillator kit, was operated from the back of a pickup truck located about 1500 yards from the E-4 fire control radar and in line with the radar target. An oil derrick, located about four miles from the radar, was used as a target for lock-on purpose. The radar was a mockup located inside a building with the antenna mounted to allow radiation through a window. (CONFID)

(3) Several different modes of jamming operation were used during the test which included spot jamming of the radar frequency and radar image frequency, spot jamming of the beacon frequency and beacon image frequency, slow sweep jamming at various widths and sweep rates, fast sweep jamming at various widths and sweep rates, and combination slow and fast sweep jamming at various sweep widths and rates. Two modes of radar operation were used on each test. The first consisted of jamming operation while the radar was searching across an azimuth sector containing the jammer. The second consisted of jamming operation after the radar was initially locked-on the radar target. (CONFID)

(4) Data obtained from the ground test was in the form of observers' logs and 16 mm movie film of the radar B-scope

presentation. Although the data obtained from the portion of each test when the radar was operated in the search phase provided valuable information, test performed when the radar was locked-on the target were of primary consideration in determining the jamming effectiveness of the AN/ALT-6A. The primary criteria used in determining jamming effectiveness was the ability of the jamming to cause the radar to lose the target or break-lock. The following table summarizes results of the sweep jamming tests: (SECRET)

Slow Sweep				Fast Sweep			
Sweep Width mc	Sweep Speed mc/sec	Breaks Radar Lock		Sweep Width mc	Sweep Speed mc/sec	Breaks Lock	
		Yes	No			Yes	No
50	1	x		50	100	x	
50	1.5	x		50	300	x	
50	2.5	x		50	600	x	
50	3.3	x		50	900	x	
50	10	x		50	1200	x	
50	25	x		150	600		x
50	50	x		150	1800		x
150	9.9	x		150	2700		x
150	30	x		150	3600		x
150	75	x		400	2400		x
150	300		x	400	4800		x
300	6	x		400	7200		x
300	9	x		400	9600		x
300	15	x					
300	20	x					
400	20	x		Combination Sweep			
400	40	x					
400	80	x		400-slow	40-slow	x	
400	200	x		50-fast	100-fast		
400	800		x	400-slow	40-slow		
900	60	x		50-fast	600-fast	x	
900	270	x		900-slow	60-slow		
900	1800		x	150-fast	1800-fast		x

(5) In addition to the tests listed above, spot jamming of the radar frequency and radar image frequency was also accomplished. The radar frequency was 9375 megacycles and the image frequency was 9435 megacycles (radar frequency plus twice the intermediate frequency). Results appeared to be identical at both frequencies, with the radar losing the target immediately and completely when jammed. (SECRET)

(6) Spot jamming was also performed against the radar beacon frequency and beacon image frequency. The beacon frequency was 9310 megacycles and the beacon image frequency was 9250 megacycles (beacon frequency minus twice the intermediate frequency). Results were identical at each frequency. No beacon video was available during the test for comparison with the jamming video; however, jamming video completely filled the jizzle band on the radar scope. (SECRET)

(7) In many of the tests where radar lock was broken, AGC saturation, as a result of the jamming signal, caused blocking of the radar receiver with the result that both normal and jamming video disappeared completely from the radar scope for considerable periods of time. A study of the accumulated data indicated that at all sweep widths, the slow sweep mode of jamming caused the radar to lose the target provided the sweep speed was below about 300 megacycles per second. During fast sweep mode of jamming, the radar was caused to break-lock only at relatively narrow sweep widths (50 megacycles) with decreased jamming effectiveness at greater sweep widths and sweep speeds. Combination sweep mode of jamming, as might be expected, exhibited the properties of fast sweep in that it caused loss of target only at relatively narrow sweep width (50 megacycles). (SECRET)

(8) Because the ground test was to be used only as a basis for subsequent airborne tests of the equipment, no attempt has been made to describe the optimum sweep widths and speeds to be used against AI radars. (CONFID)

(9) Jamming of both the radar and image frequencies of the E-4 fire control system radar bears out the findings made under Test Project Number 38 that the A-5 fire control system could be jammed on the image frequency. Jamming on the image frequency of radars creates a problem in developing jamming setting-on devices (receivers) to be used in conjunction with a jammer. This is especially true of a system which would employ sweep jamming of the transmitter to compensate for a lack of precision in locking of the transmitter frequency to the receiver. Assuming the use of a receiver-transmitter combination requiring a 50 megacycle sweep width to compensate for transmitter lock-on error, the following example is presented for consideration:

A-5 FCS: Radar frequency 9245 mc, image frequency 9185 mc, bandwidth 4 mc.

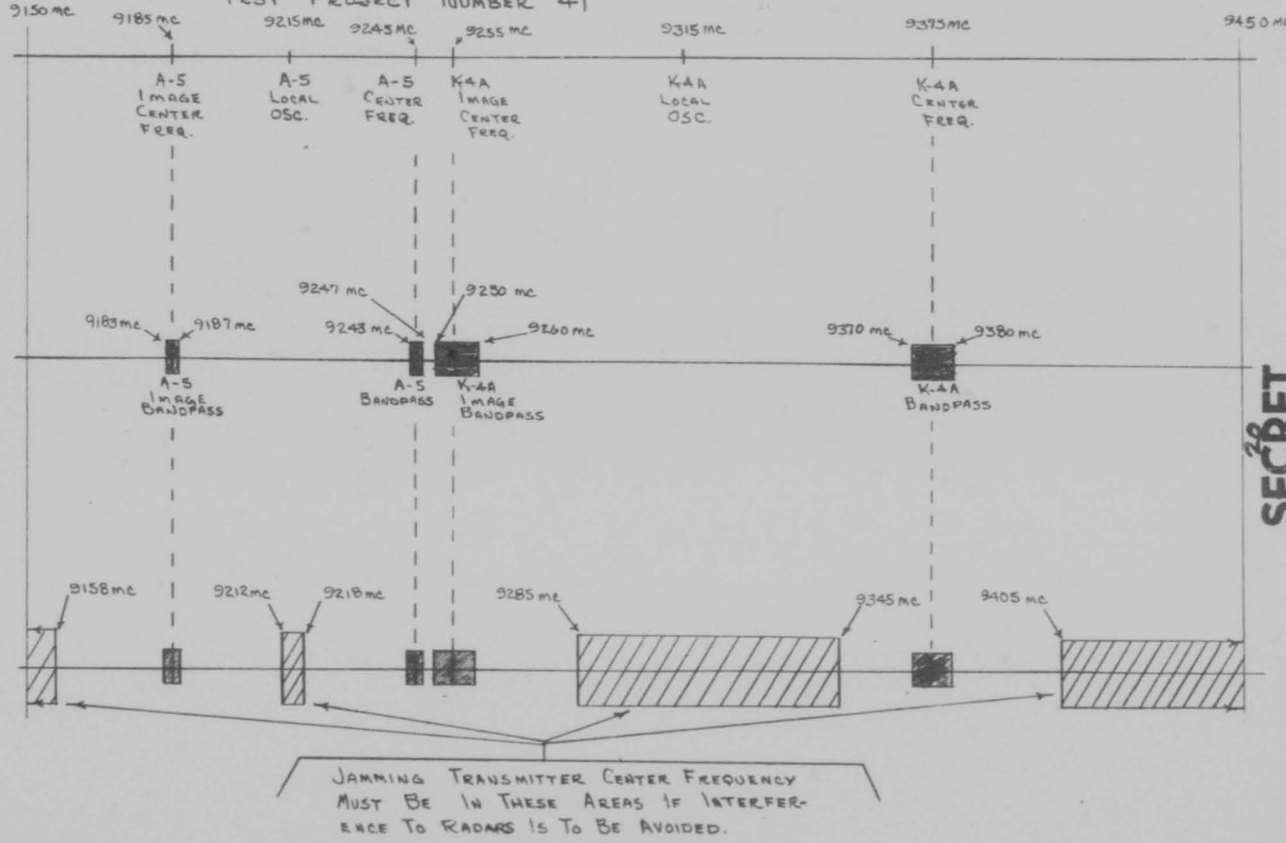
K-4A Bomb-Nav: Radar frequency 9375 mc, image frequency 9255 mc, BW 10 mc.

As shown on the diagram on page 20, it is apparent that for a frequency band of 296 megacycles, only two areas are available, one six megacycles wide, and one 60 megacycles wide, to place the center frequency of the jamming transmitter without interference to the K-4A and A-5 radars. Although use of the MA-7A bomb-nav radar will change the configuration shown, due to the fact that it uses a tunable magnetron, it is obvious that all radar and image frequencies within the band covered by the jammer must be taken into consideration in development of a companion receiver for AN/ALT-6A. (SECRET)

(10) The prototype OA-822/ALT-6A extension kit used on this project is equipped with a ridge waveguide output from the magnetron. This ridge waveguide output makes it necessary to use a ridge to standard waveguide adapter in order to operate the equipment with standard waveguide. B-47 aircraft being modified under ECP 2760 are being equipped with standard waveguide, making it necessary to have a waveguide adapter on each aircraft if the ridge waveguide is carried over into the production models of the OA-822/ALT-6A extension kits. The need for ridge waveguide on the OA-822/ALT-6A extension kits is not readily apparent since the frequency range of the OA-822 extension kit is 8750 to 10,500 megacycles, the designed frequency range of the ridge waveguide, 5200 to 9600 megacycles, and designed frequency range of standard waveguide, 8200 to 12,400 megacycles. (CONFID)

SECRET

TEST PROJECT NUMBER 41



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8. Test Project Number 42, "Attenuation of UHF Air-to-Air Transmission". (CONFID)

a. Date initiated: 15 March 1956.

b. Estimated date of completion: Not presently known.

c. Hours flown: 6:00.

d. Summary:

(1) Purpose of this project is to determine optimum method of attenuating transmitted signals in UHF frequency band and optimum attenuated UHF communications ranges for all tactical operations, i.e., enroute cells, refueling rendezvous, refueling formations, etc. (CONFID)

(2) No work was accomplished on hardware for this test project during July. Changeover relays, ordered for use on the attenuator for this project, have not yet been received. Batteries for use with the AN/URC-4 survival transceivers were received and authorization for ordering crystals for these sets was obtained. Different crystals are required so the transceivers may be operated on frequencies other than the distress frequencies. (CONFID)

(3) Considerable research has been conducted on the problems and implications of this test project, particularly with regard to air refueling. Information gathered indicates the application of the techniques proposed by this project would aggravate rather than relieve the problem of interference or enemy interception. With respect to the latter, it has been established and agreed upon by communications authorities consulted that attenuation of the aircraft radio signals would offer no assurance against detection by enemy passive detection systems. On the contrary, the low reliability of communications resulting from attenuation would require increased calling and repetition of transmissions which would give higher probability of interception by listening stations. This has been verified by results obtained by 376th Bomb Wing in the investigation of restriction of radio transmission range made under Auxiliary Test Project Number 4. It appears that attenuation of radio transmitter power output would so degrade communications that the added calling and repetition of messages necessary would actually increase interference rather than decrease it. (CONFID)

(4) A more promising attack on the problem of communications interference and passive detection would be improvement in refueling procedures and elimination of factors which cause such difficulties. In simple terms, there is far too much radio communication during refueling operations. Radio silence refueling missions have been carried out successfully and adequate procedures and precautions for such operations are well developed and spelled out in SAC manuals. However, detailed briefings, excellent navigation on the part of both tanker and receiver crews, peak performance of rendezvous equipment, and maintenance of circuit discipline are but a few of the many prerequisites for this type mission. Success of such missions is also in large part dependent on past experience of the crews on normal missions where radio silence is not imposed. If heavy reliance is placed on radio for normal operation, the restriction of this facility during silent missions seems to the crews to be a much greater encumbrance than in reality exists. Under such conditions, if difficulty arises, there is a strong compulsion to break radio silence. Recordings made of communications during refueling missions and monitoring of radio channels with ground receivers indicate a large amount of superfluous radio transmissions are being made during these operations. (CONFID)

(5) While much of the superfluous communications on missions where little or no transmissions should be made may be due to lack of communications discipline, a large amount is caused by lack of confidence in the capability of other rendezvous equipment. An investigation in the 301st and 376th Bomb Wings and discussions with aircrew personnel with long experience show this equipment has not been reliable at its designed operational distances (200-250 miles). Instead, crews are getting only marginal results at 50 miles. The cause for such deficiency in the rendezvous equipment is not known, but whatever the cause, the result is more heavy reliance on radio and many more transmissions between tanker and bomber. (CONFID)

9. Test Project Number 44, "Improved B-47 Passive Detection Capability Using Installed Radar Components". (UNCL)

a. Date initiated: 11 June 1956.

b. Estimated date of completion: Not available at this time.

c. Hours flown: None.

d. Summary:

(1) Purpose of this test project is to determine utility of the antenna and waveguide components in presently installed active radar systems, B-47 aircraft, as elements of a passive detection system. (SECRET)

(2) A conference was held at Barksdale AFB on 30 July at which time the proposed test program was reviewed with a representative from Headquarters SAC, DOPLT. Following the conference, the test program was completed and is being submitted for SAC approval. (UNCL)

SECRET

10. Test Project Number 45, "Test of X-Band Antennas for AN/APS-54". (UNCL)

a. Date initiated: 8 June 1956.

b. Estimated date of completion: March 1957.

c. Hours flown: None.

d. Summary:

(1) Purpose of this test project is to determine capability of an experimental X-band antenna-detector for the AN/APS-54, which is designed to receive X-band signals only. (SECRET)

(2) The test program for this project has been written and submitted for approval. (UNCL)

SECRET

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11. Test Project Number 46, "Test of Phase V ECM Capsule". (SECRET)

a. Date initiated: 13 September 1955.

b. Estimated date of completion: Not available at this time.

c. Hours flown: 146:00.

d. Summary:

(1) Purpose of this project is to test the tactical suitability of Phase V ECM capsule. (SECRET)

(2) The first phase was initiated under authority of Commander, Second Air Force, 13 September 1955, and conducted to test both single and multiple Phase V aircraft operating against EW/GCI multiple beam S-band radar. A complete report on phase one was forwarded to Headquarters Second Air Force, 30 April 1956. (SECRET)

(3) During the first phase testing the following 376th Bomb Wing UR's were submitted on capsule or equipment: (CONFID)

(a) UR's 56-25, 56-40, 56-41 and 56-42 on the capsule dolly. Boeing has submitted a proposal to AMC to correct deficiencies in the dolly.

(b) UR 56-57, 14 June 1956, was submitted as 57-4 Class 4 modification. It was forwarded by OCAMA to RAFD for action.

(c) UR 56-20, 20 March 1956, was submitted on the power supply of the AN/ALT-8A. Raytheon Manufacturing Company has developed a kit to correct power supply deficiency.

(4) A briefing on this test project will be presented to the SAC Penetration Panel and other SAC staff personnel 7 and 8 August 1956. At the conclusion of this meeting an effort will be made to determine what further testing is required on the capsule. (CONFID)

12. Test Project Number 32, "Cell Support Tests". (SECRET)

a. Date initiated: 17 February 1955.

b. Estimated date of completion: Continuous.

c. Hours flown: 777:10.

d. Summary:

(1) Purpose of this project is to determine tactics and ECM equipment necessary to protect certain bomber cell formations from enemy GCI, gunlaying and interceptor radars. (SECRET)

(2) Mission 32 was set up at the special request of Headquarters SAC to measure effectiveness of a Phase III aircraft against GCI and gunlaying radars, and determine the relative danger to a single Phase III aircraft penetrating a GCI and gunlaying radar area under the following conditions: (SECRET)

(a) When no jamming or chaff are employed. (SECRET)

(b) When chaff only is used. (SECRET)

(c) When jamming only is used (two AN/ALT-8 transmitters with sweep speed of 1200 mc/second over a 200 mc sweep width from 2700 to 2900 mc). (SECRET)

(d) When both chaff and jamming, as in (c) above, are used. (SECRET)

Makeup flights to complete (b) and (c) were flown on 6 July. Observers were sent to Houston RBS and the GCI radar site at Ellington AFB, Tex. The GCI radar was in such poor operating order during the aircraft runs that it was impossible to collect sufficient usable data to evaluate the mission. (SECRET)

(3) Mission 33 was set up at the special request of Headquarters SAC to determine effectiveness of an ECM support aircraft against an RBS/GCI radar area when each of the following equipment configurations are used: (SECRET)

(a) Six jammers with sweep speed of 20 mc/second from 2700 to 3100 mc. (SECRET)

(b) Six jammers with jamming rate of six hits per second over a sweep width from 2700 to 3100 mc. (SECRET)

(c) Six jammers, four at 20 mc/second and two at six hits/second, over a sweep width from 2700 to 3100 mc. (SECRET)

This mission was re-flown on 11 July against the Duncanville GCI site, Tex., and the Houston RBS. A mission report is being prepared as data is processed. Preliminary evaluation indicates the aircraft were tracked, although not perfectly. (SECRET)

(4) Mission 36 was flown against the GCI site at Bartlesville, Okla., on 18 July. Two B-47 aircraft equipped with Blue Cradles participated. The first aircraft had eight AN/ALT-6A transmitters aboard, four set for a sweep speed of 15 mc/second, and four for a sweep speed of 20 mc/second. Separate runs were made to compare these two sweep speeds. During each run at random intervals, only one transmitter was operated to check for flyback strobes (a strobe of jamming caused by the jammer passing through the frequency spectrum being jammed at a high rate of speed due to the saw-tooth wave shape of the RF output of the AN/ALT-6A when set up for slow sweep jamming). Flyback strobes were noted at various distances during the mission. The second aircraft also had eight AN/ALT-6A transmitters aboard, four set for a sweep speed of 20 mc/second, and four for 8400 mc/second. Separate runs were made to compare these two sweep speeds. The GCI site had the most difficulty in tracking the aircraft on the run using the higher sweep speed because they had trouble ascertaining the range of the aircraft. A mission report is being prepared. (SECRET)

(5) A makeup flight to complete (2)(a) and (b) above was flown on 25 July against the AN/FPS-10 EW/GCI radar site at Duncanville, Texas, and the Dallas RBS. A single Phase III B-47E aircraft flew one run with jamming only and one run with chaff only. The GCI site experienced little difficulty in tracking the aircraft on both runs. The Dallas RBS was able to automatically track the aircraft the majority of the time on both runs. A mission report is being prepared as data is processed. (SECRET)

(6) ECM calculations are normally made in terms of megacycles per second versus bandwidth based on a planned dwell time. This is also expressed in hits per second, but only as a qualifying term as rate per megacycle is the controlling factor.

(7) The AN/ALT-6A control box has its "Rate" knob calibrated in "cycles", i.e., one excursion across the desired width and return. Obviously, then, when a desired width is planned, and rate in megacycles per second (or hits per second at a desired dwell time), a quick, accurate means of converting to "cycles" is needed. To add further to the confusion, this concept has resulted in a mechanism where the width and rate are interdependent. There is a maximum width for maximum cycles per unit time and a changing rate in megacycles per second when the width is changed and the cycles held constant. To facilitate the use of the AN/ALT-6A by the A&E personnel, and simplify the planner's task of reducing requirements to knob settings (with a consequent reduction in the demand for, at present, non-existent test equipment). See inclosures 24 through 27.

FOR THE COMMANDER:

Eugene M Crook
EUGENE M. CROOK
Major, USAF
Adjutant

27 Incls
1. Map, Proj 37 (UNCL)
2. thru 21. VSWR charts, Proj 36 (UNCL)
22. Photo, Antenna, Proj 36 (UNCL)
23. VSWR Chart, Proj 40 (UNCL)
24. thru 27. Charts, Proj 32 (CONFID)

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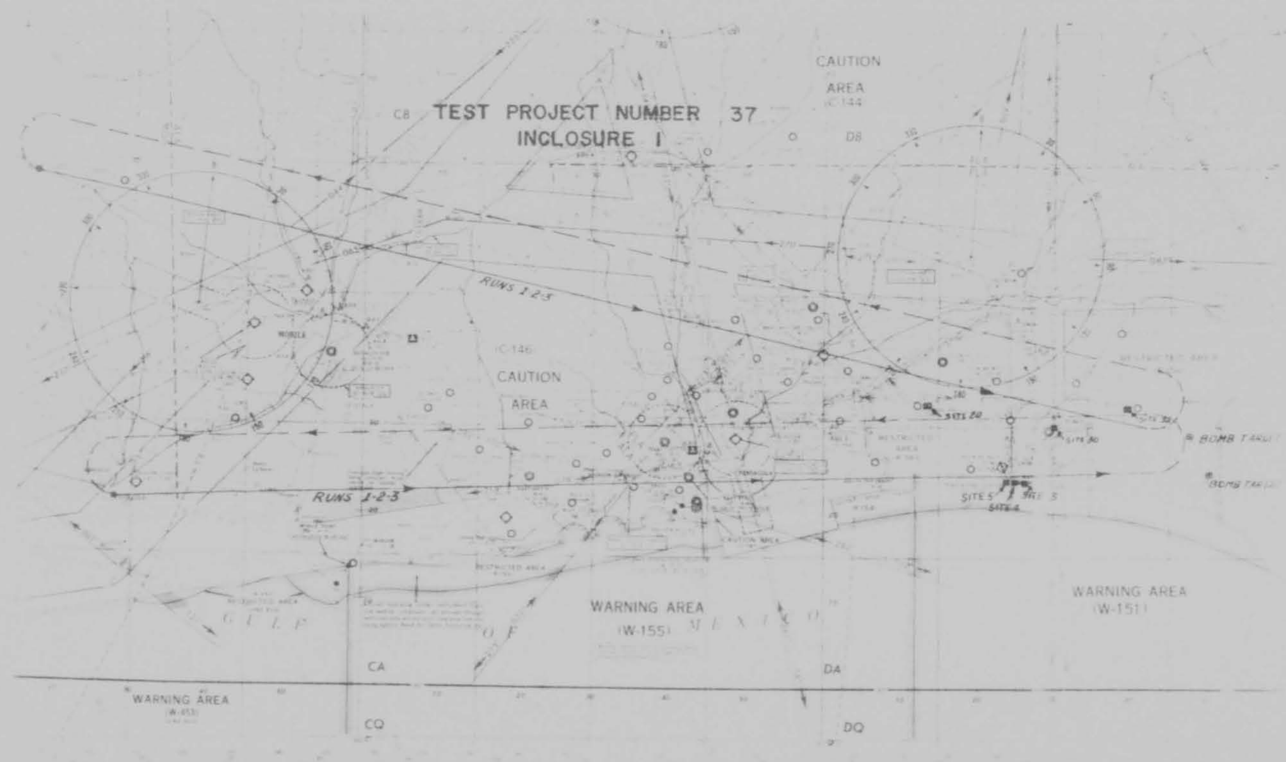

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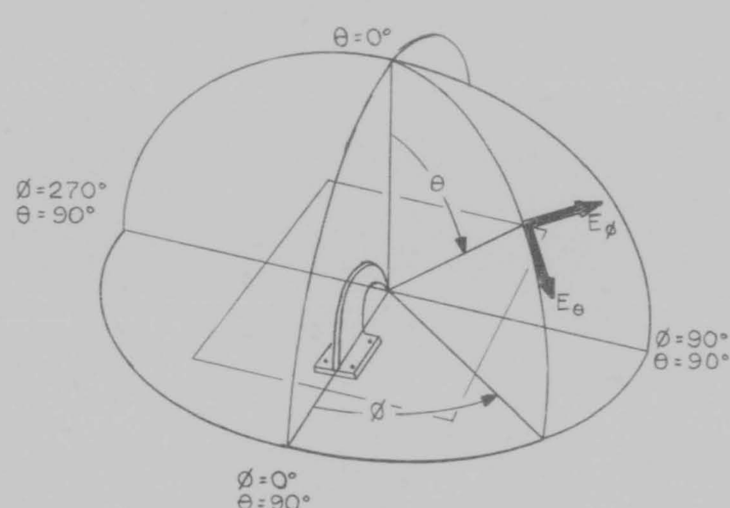

SPHERICAL COORDINATE SYSTEM
USED IN MEASUREMENTS

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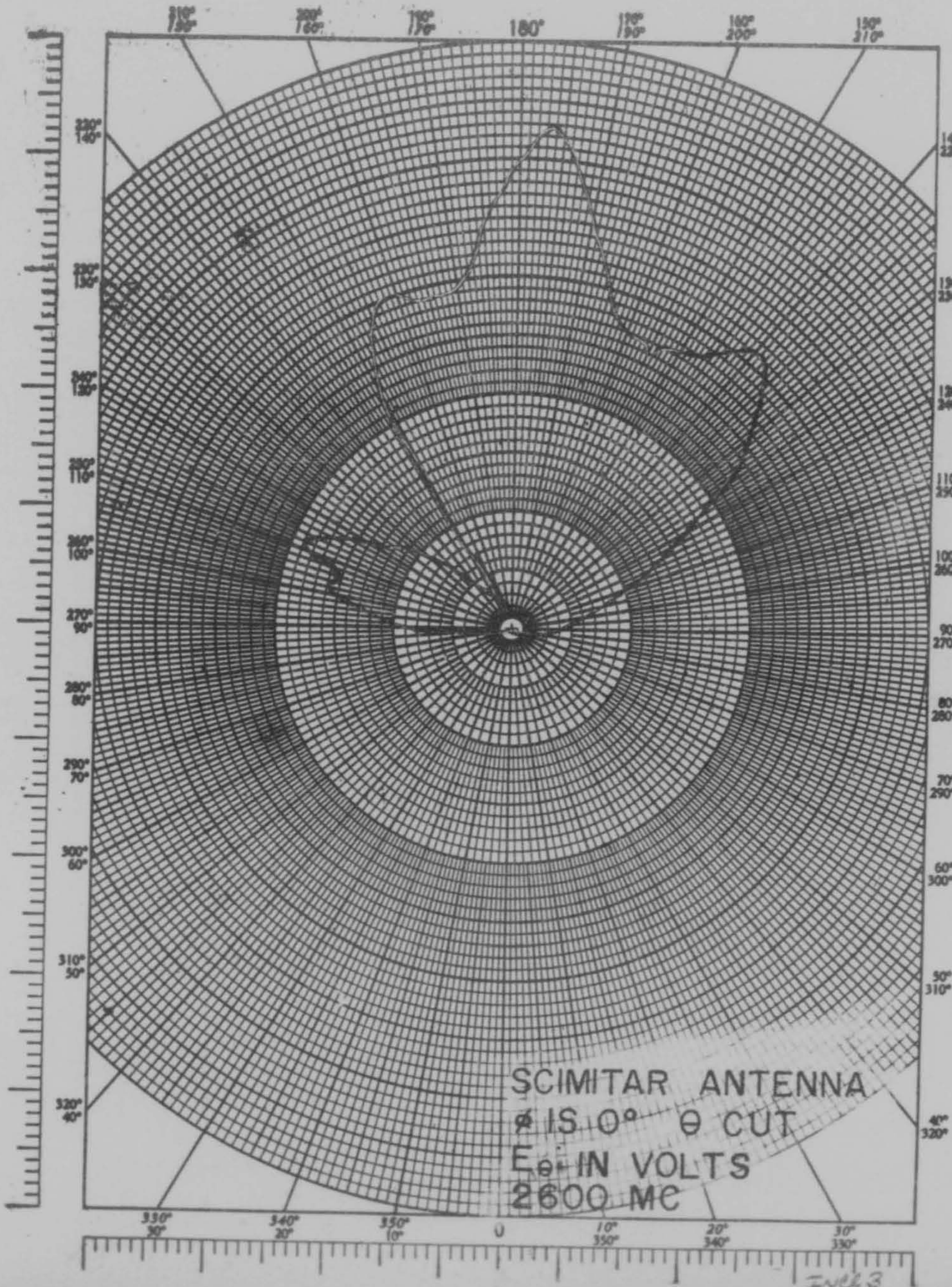

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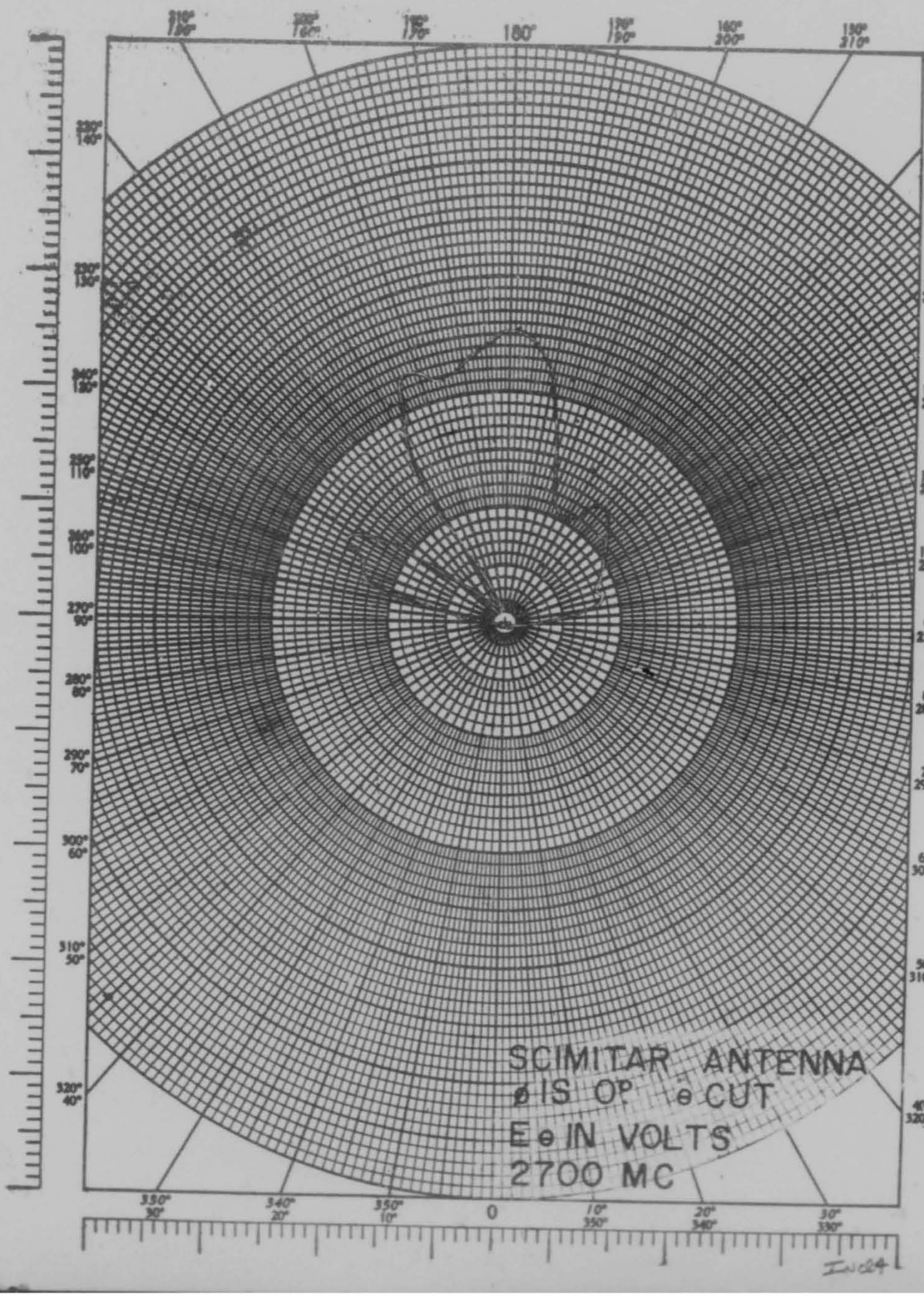

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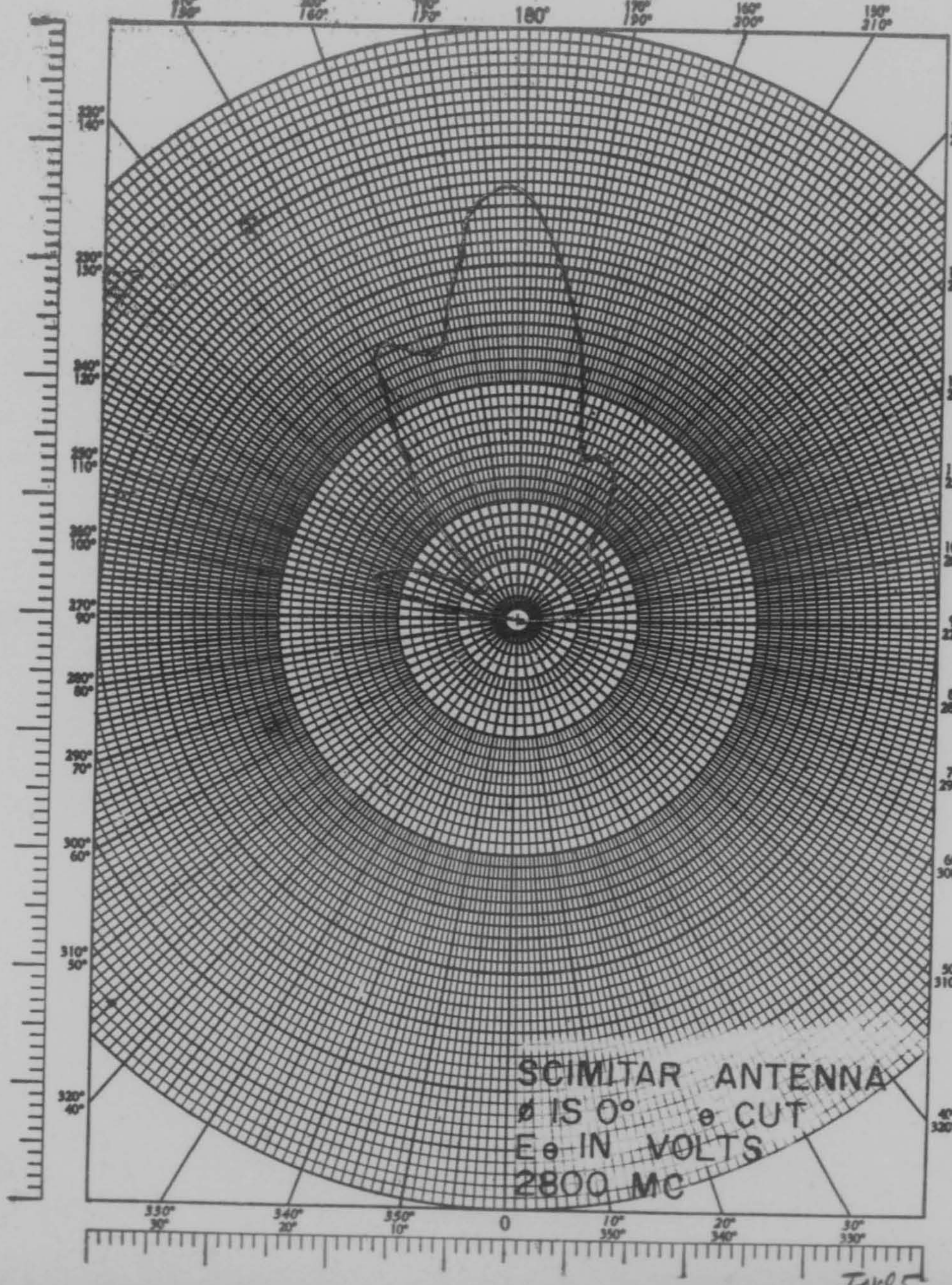

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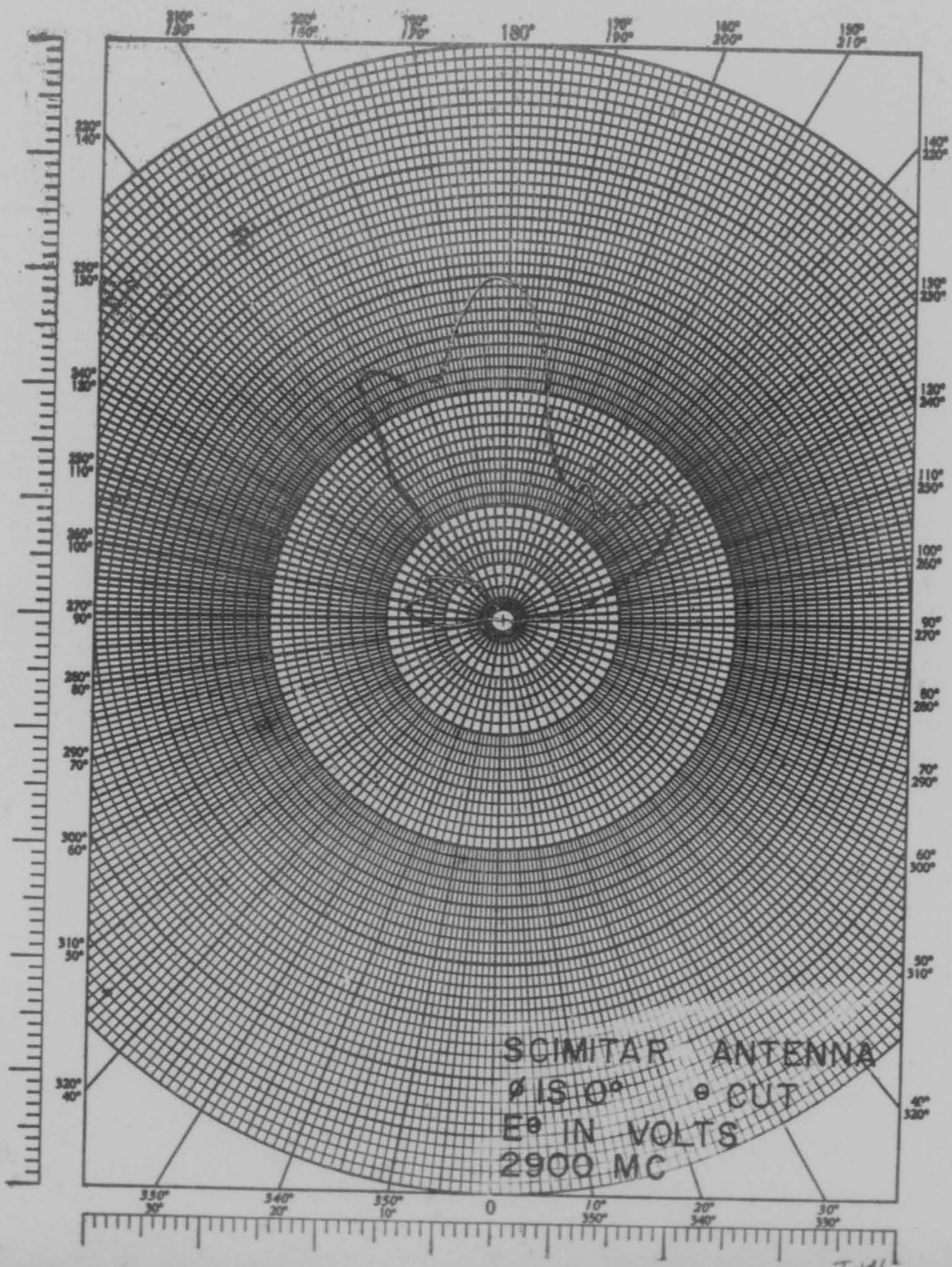

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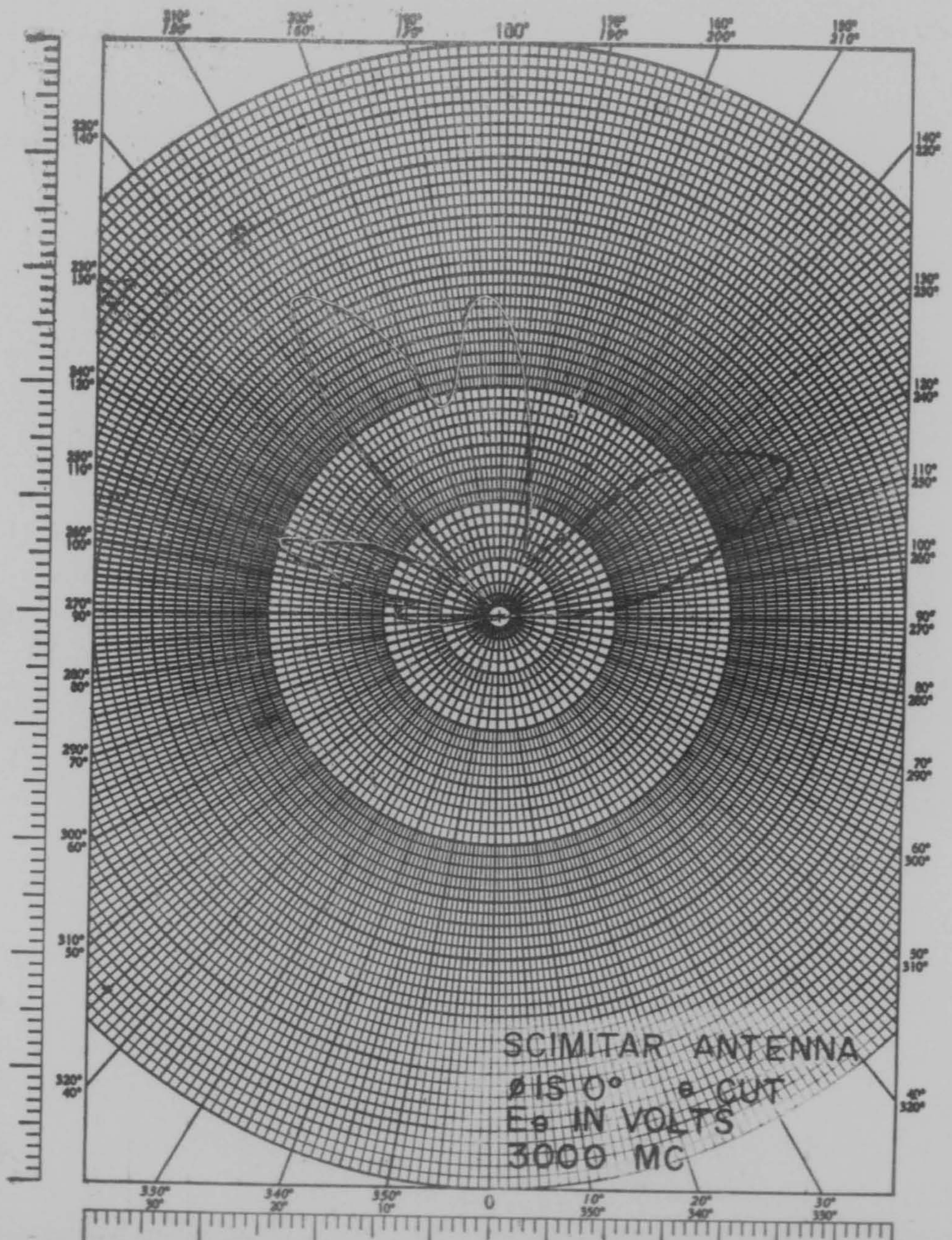

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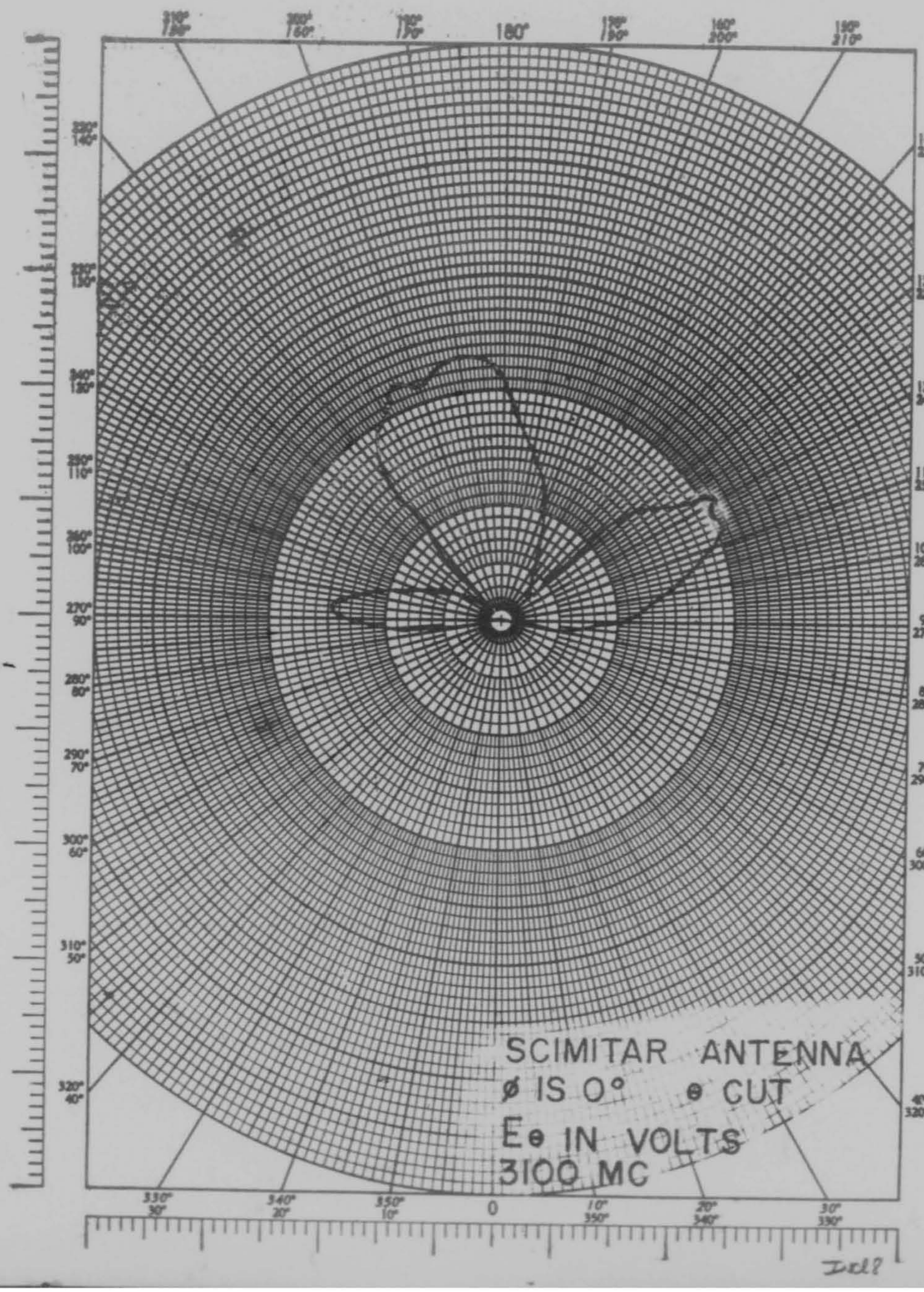
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ø IS 0° θ CUT
Eθ IN VOLTS
3100 MC

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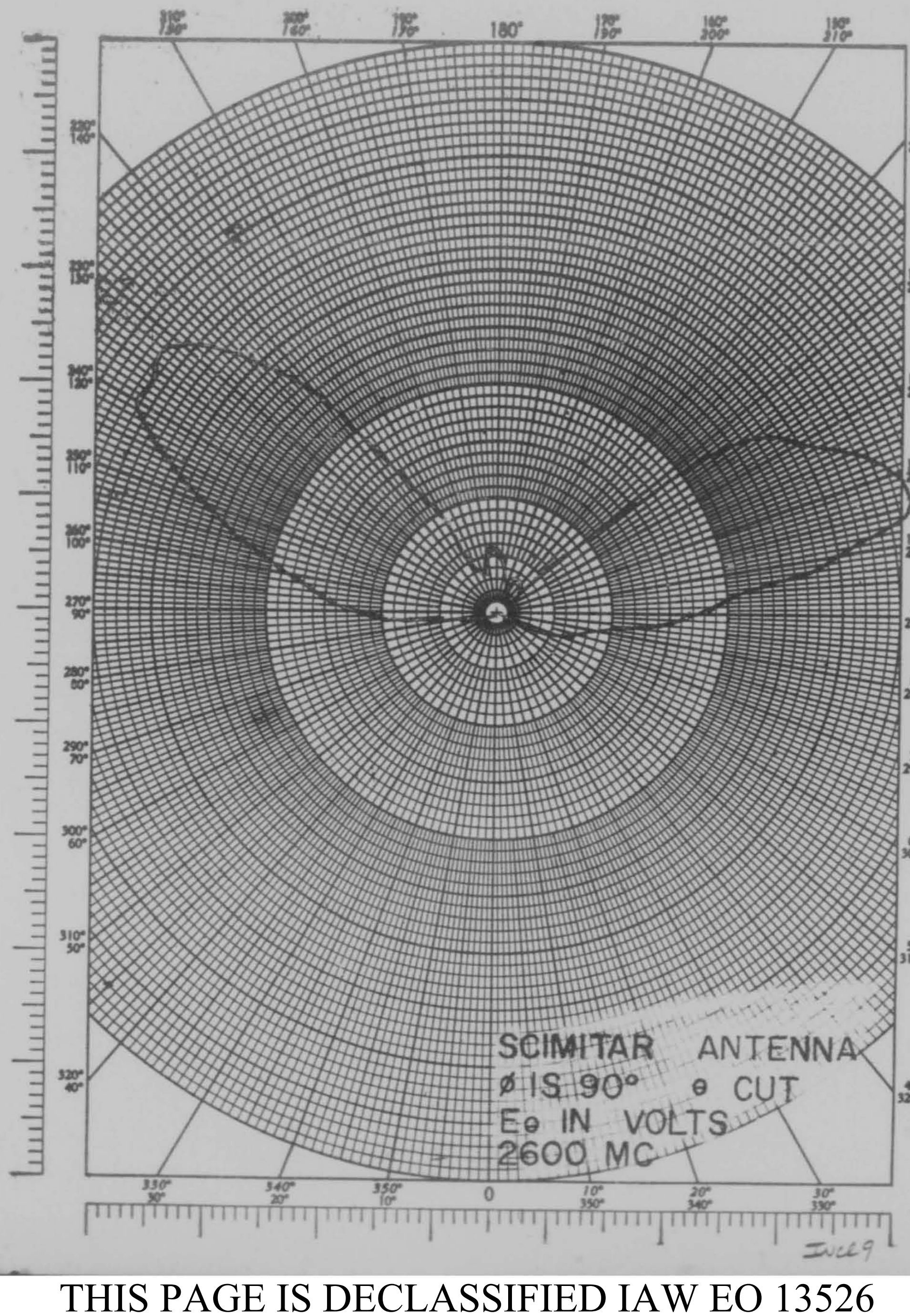

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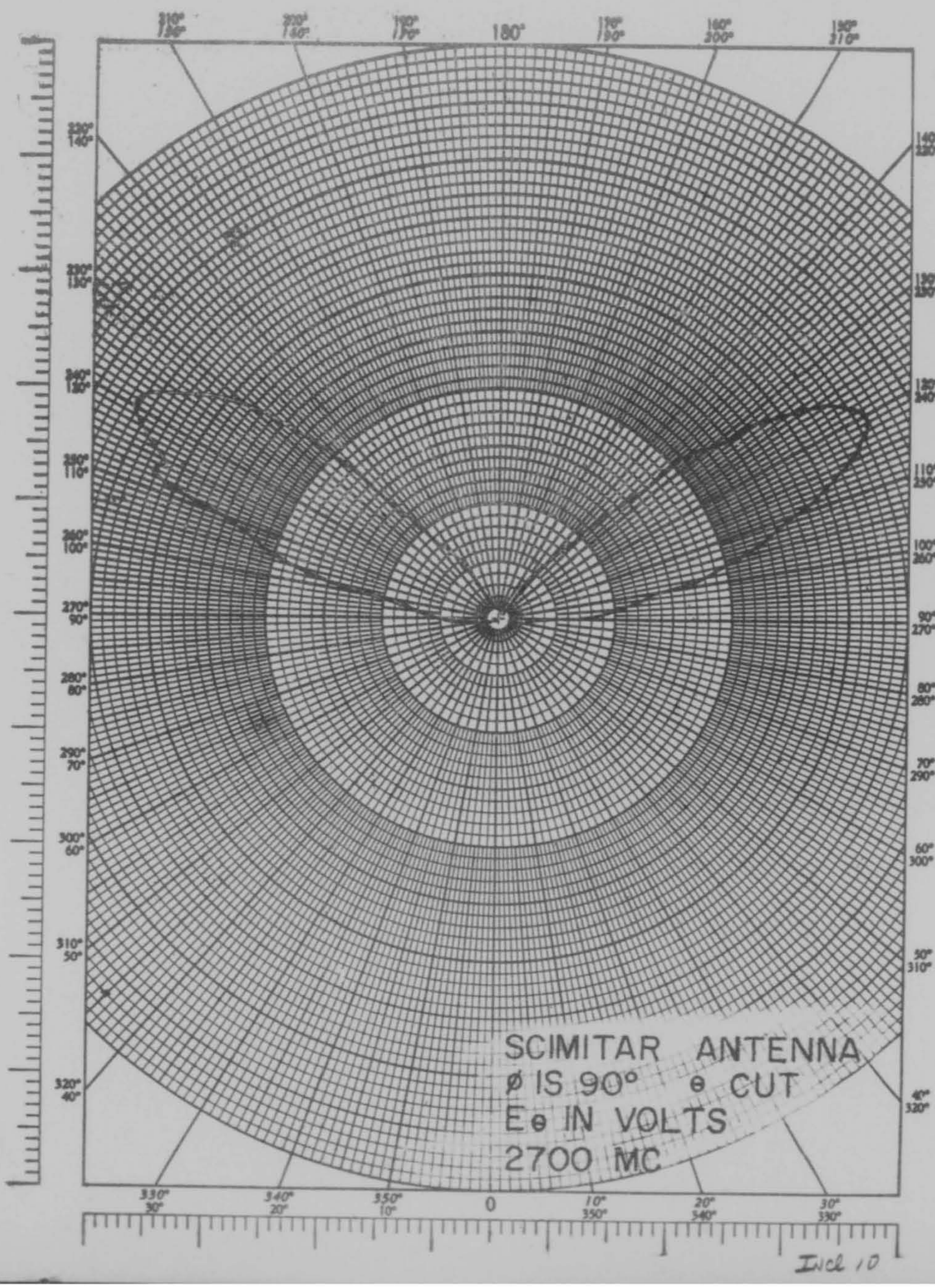

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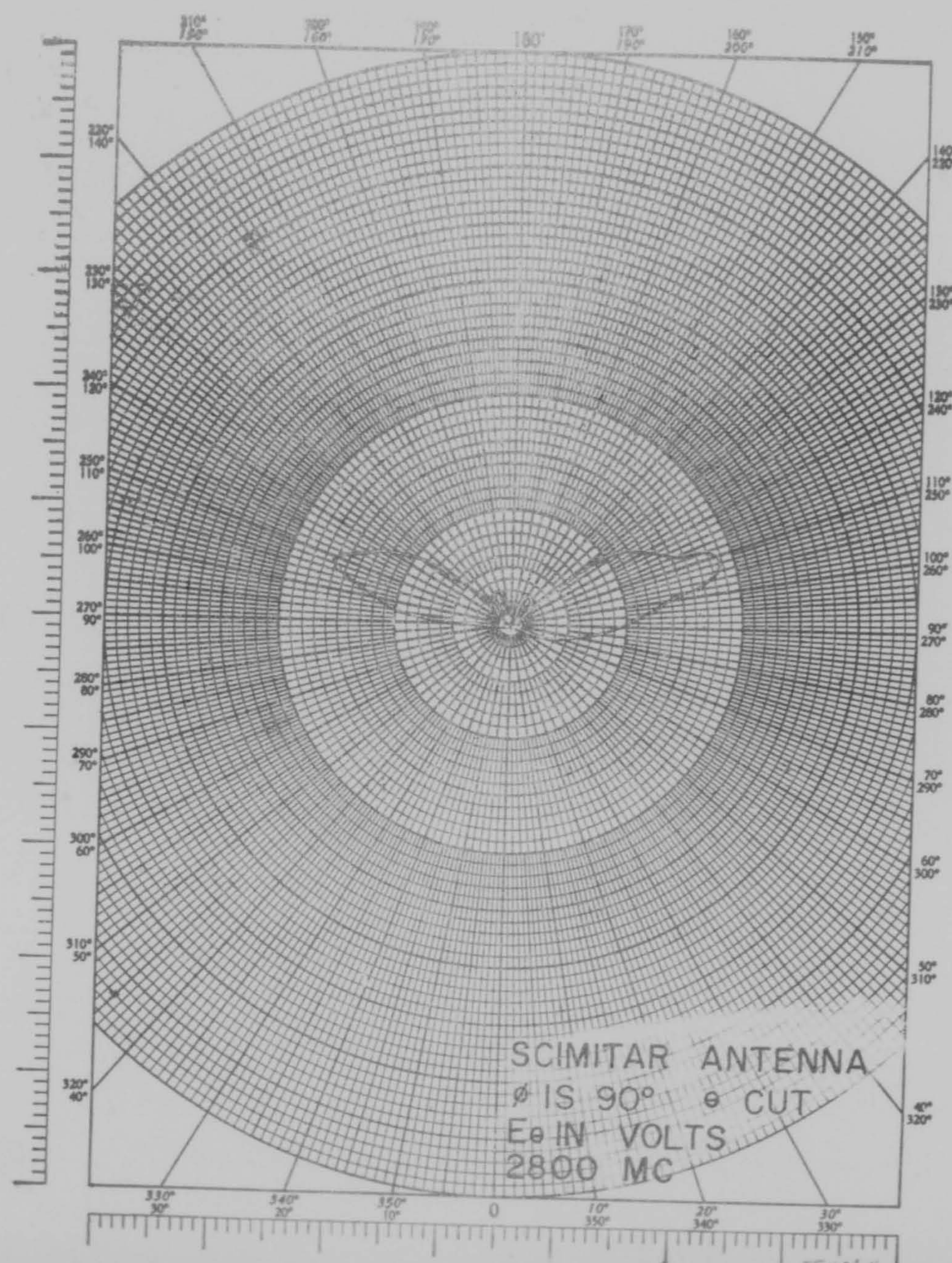
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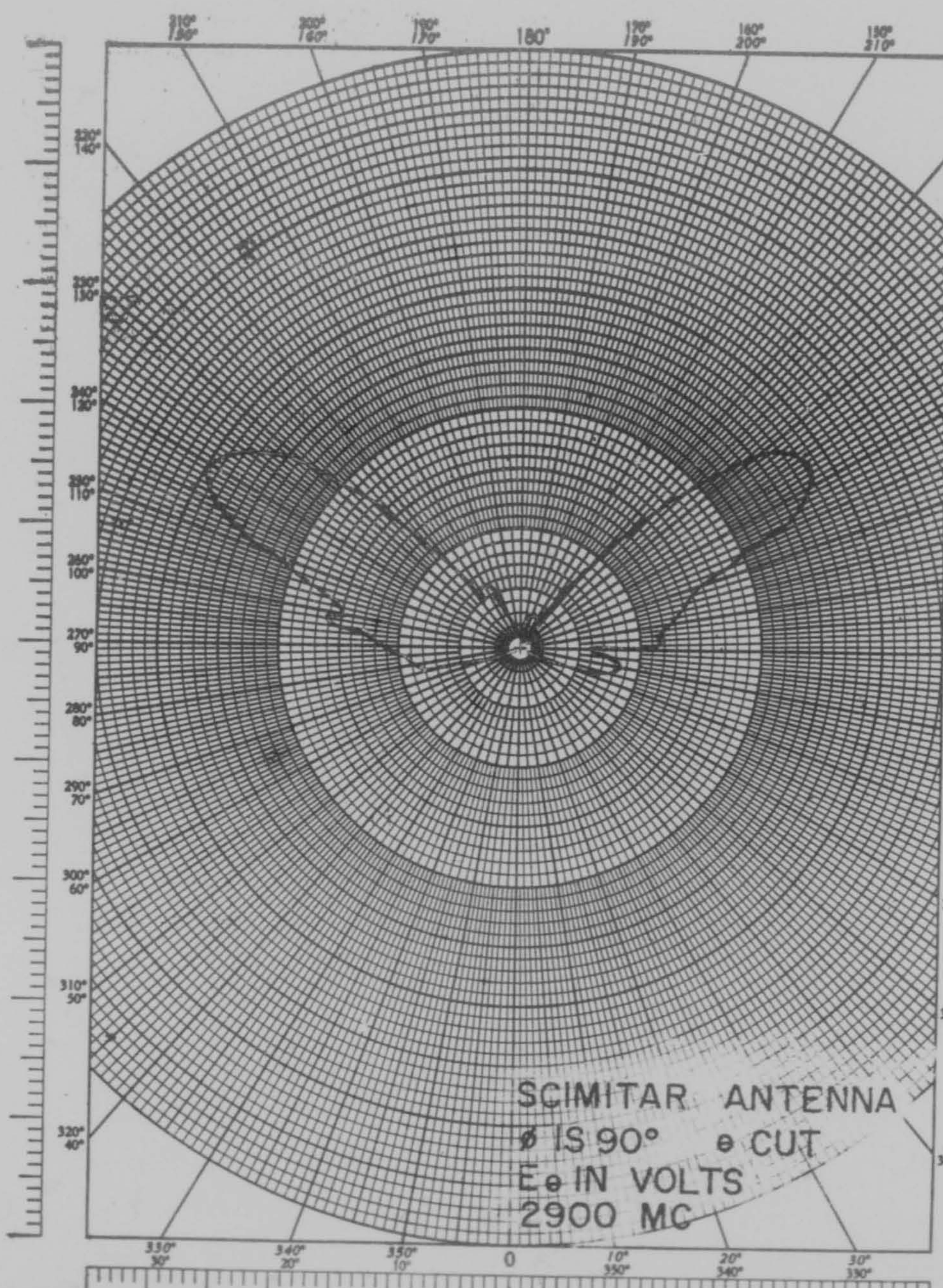
ø IS 90° θ CUT
Eθ IN VOLTS
2800 MC



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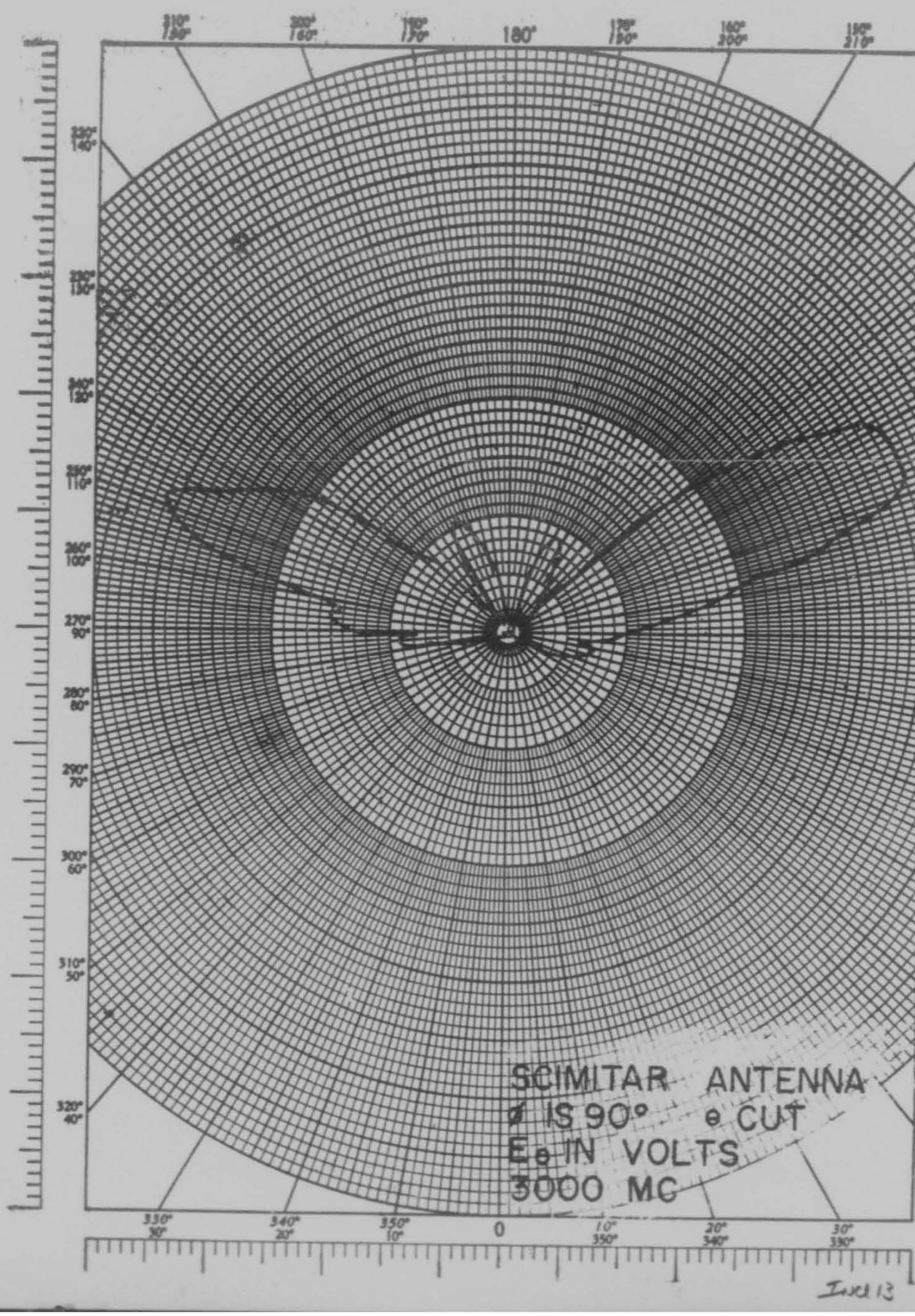
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ø IS 90° θ CUT
Eθ IN VOLTS
3000 MC
180°
0
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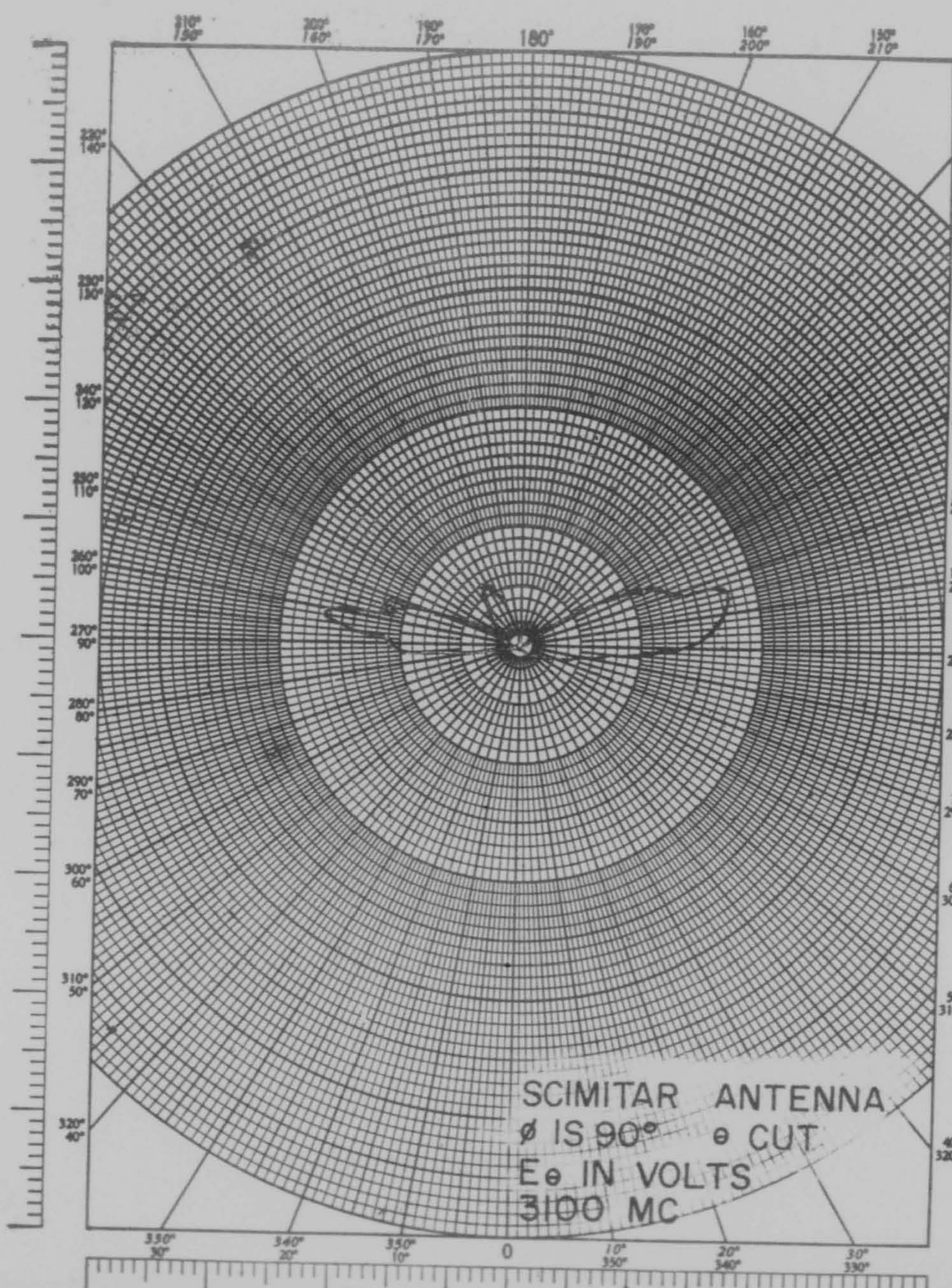

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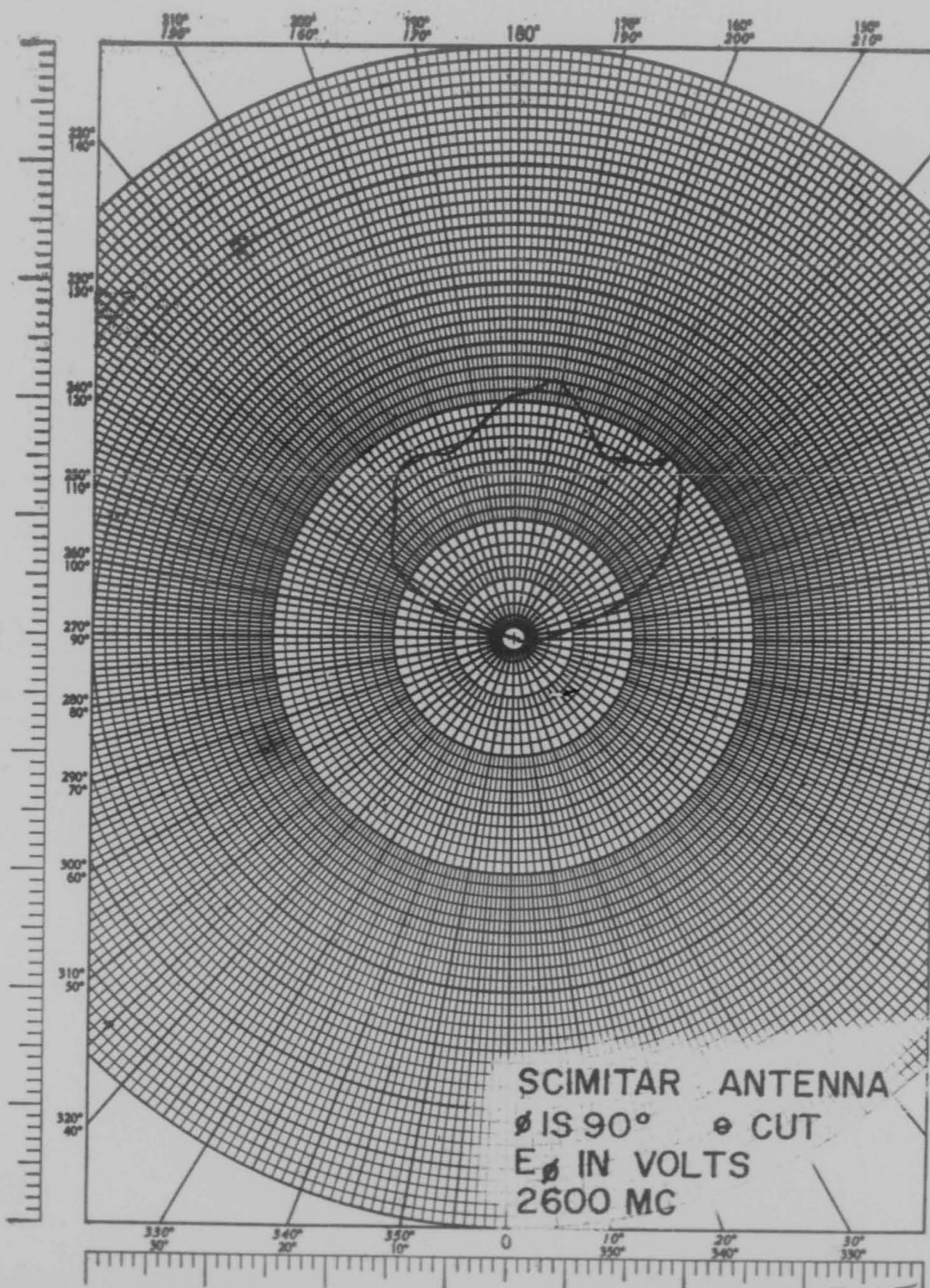

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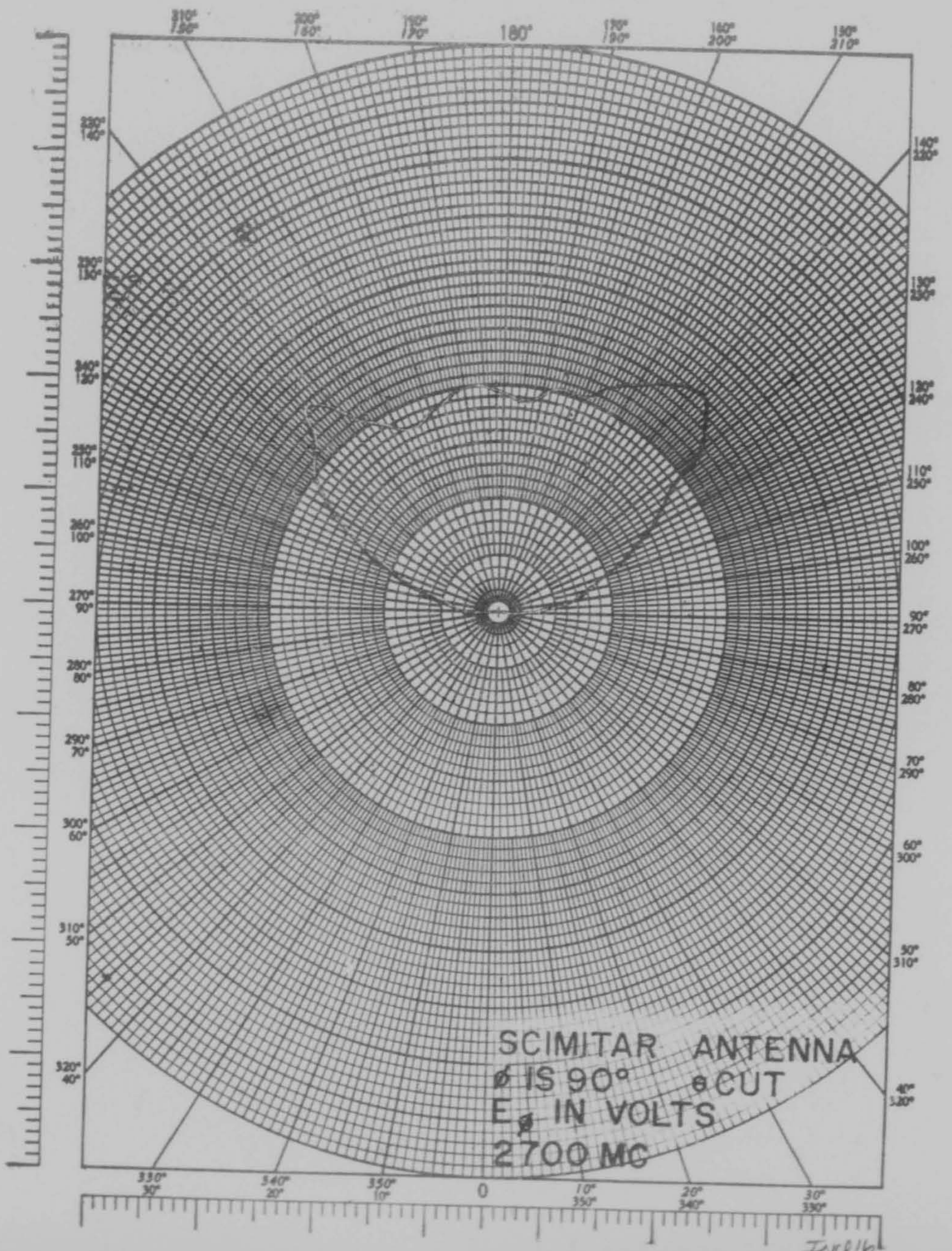
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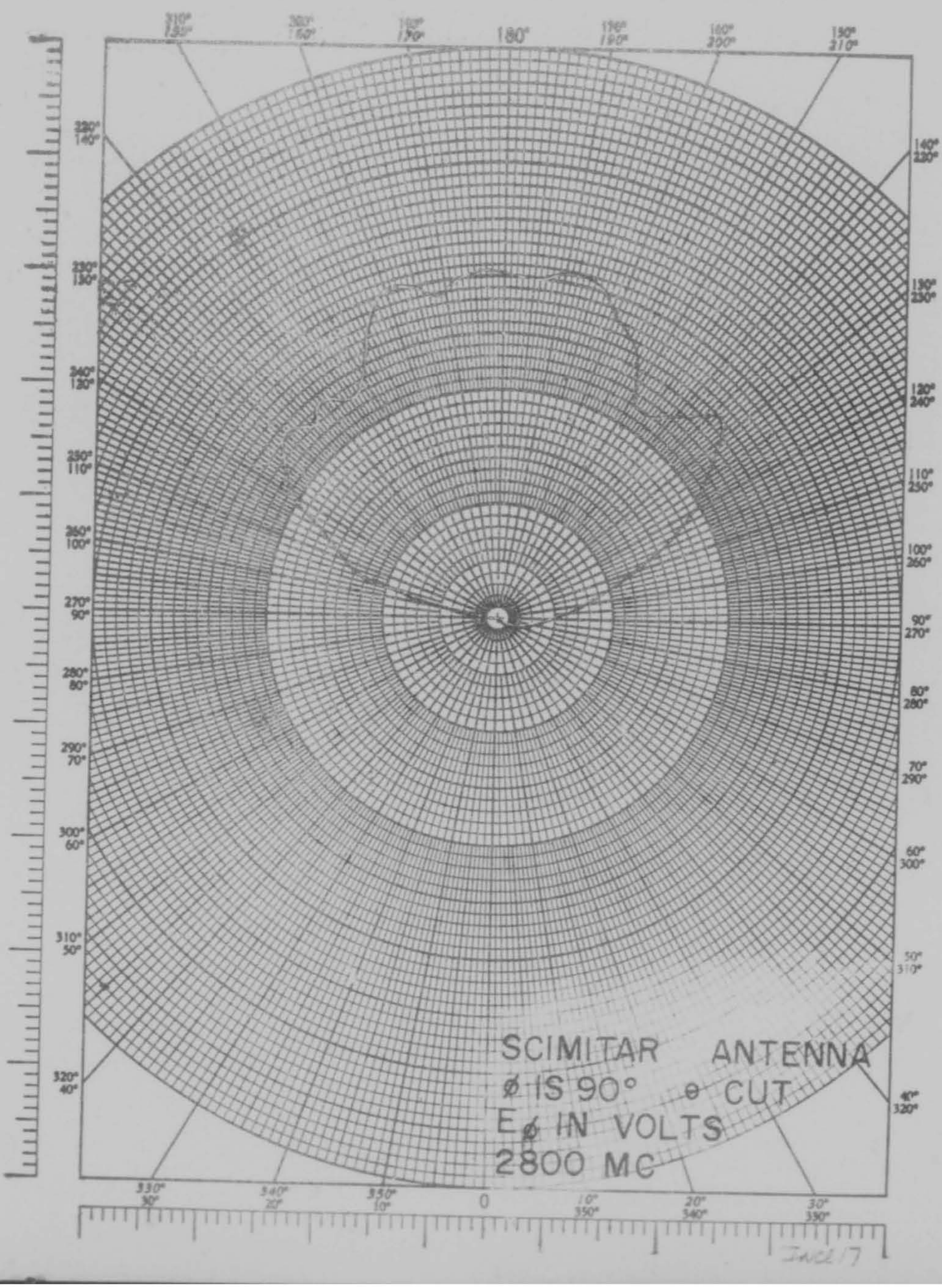
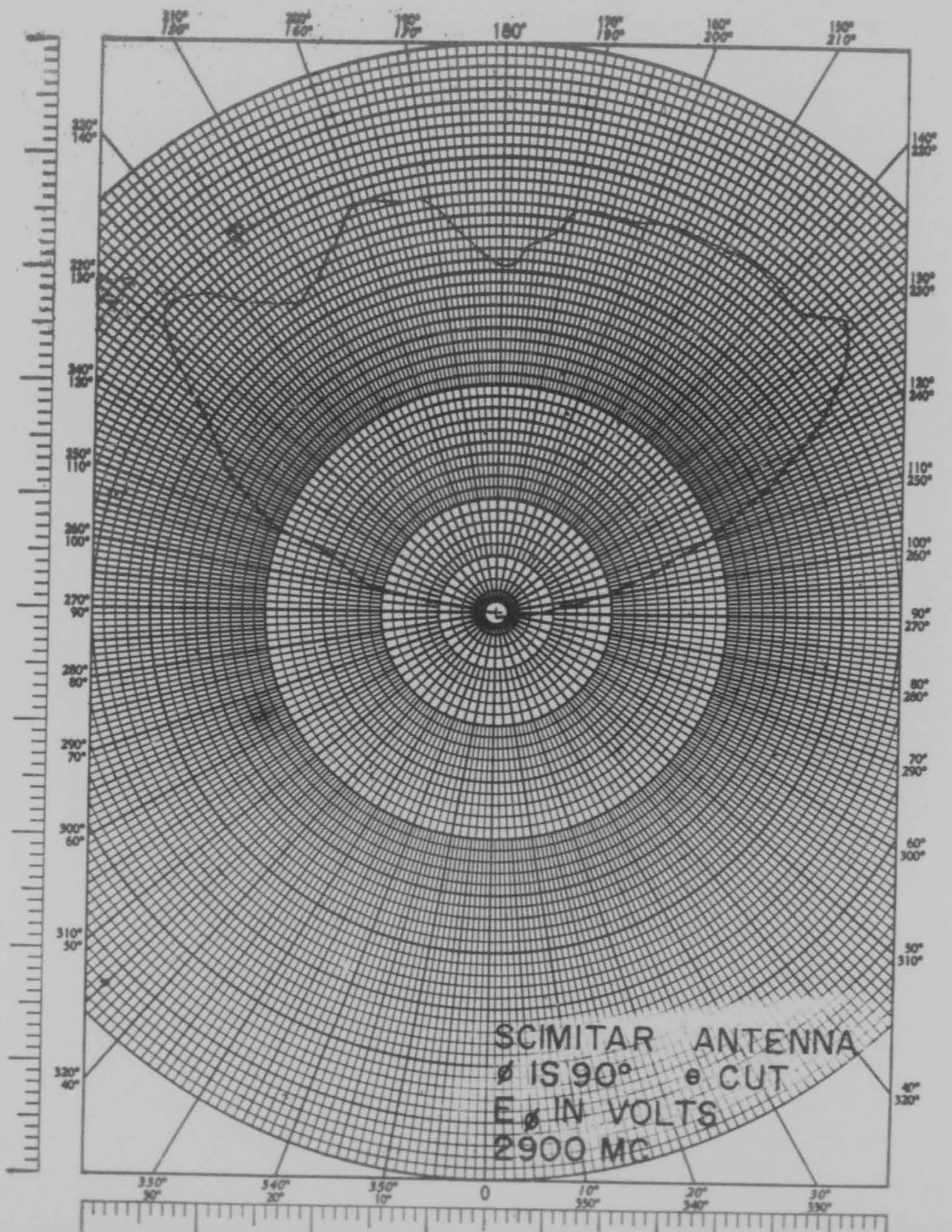
ø IS 90° θ CUT
$E_ø$ IN VOLTS
2700 MC


SCIMITAR ANTENNA
Ø IS 90° θ CUT
E_ϕ IN VOLTS
2800 MC



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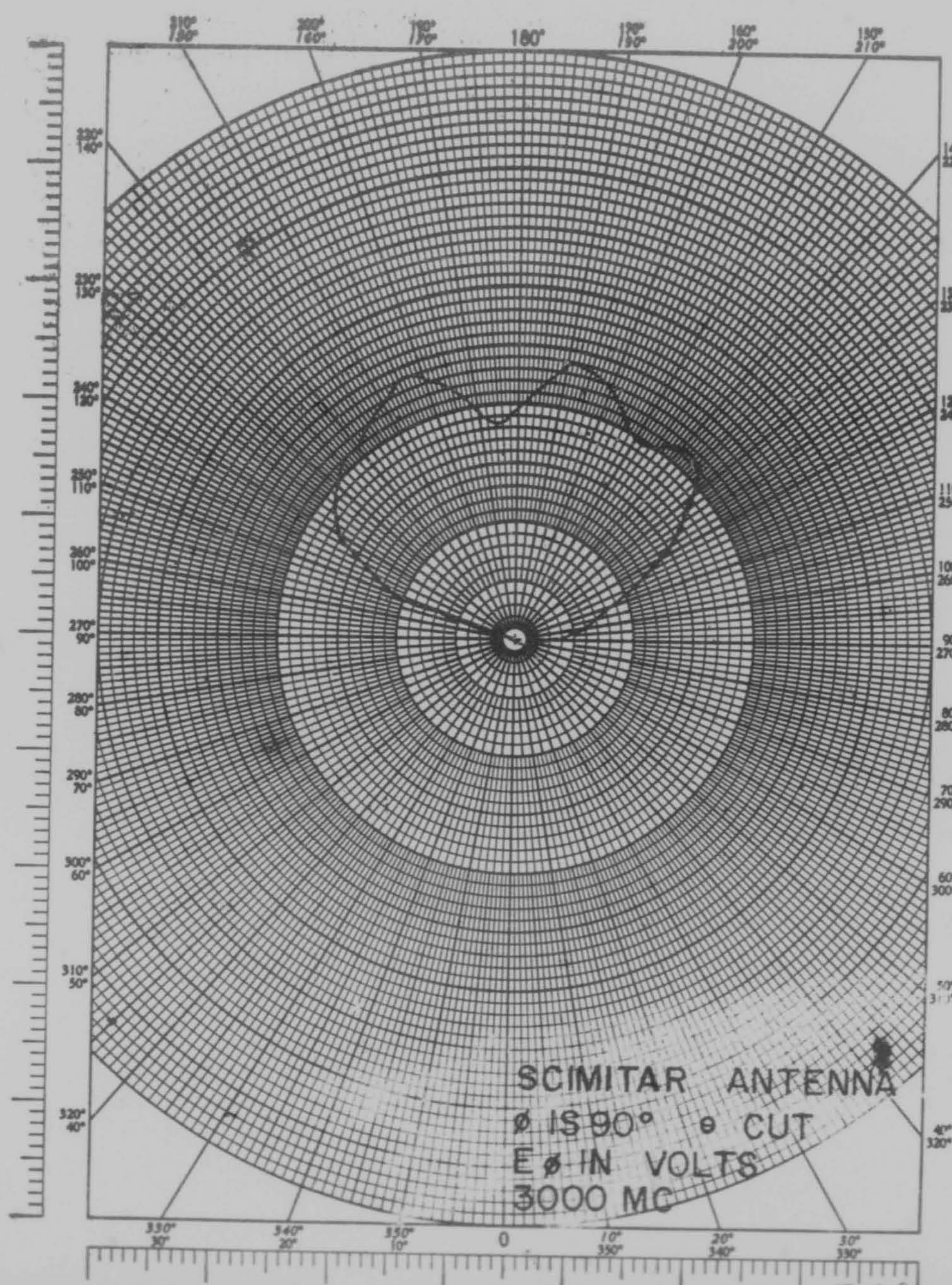

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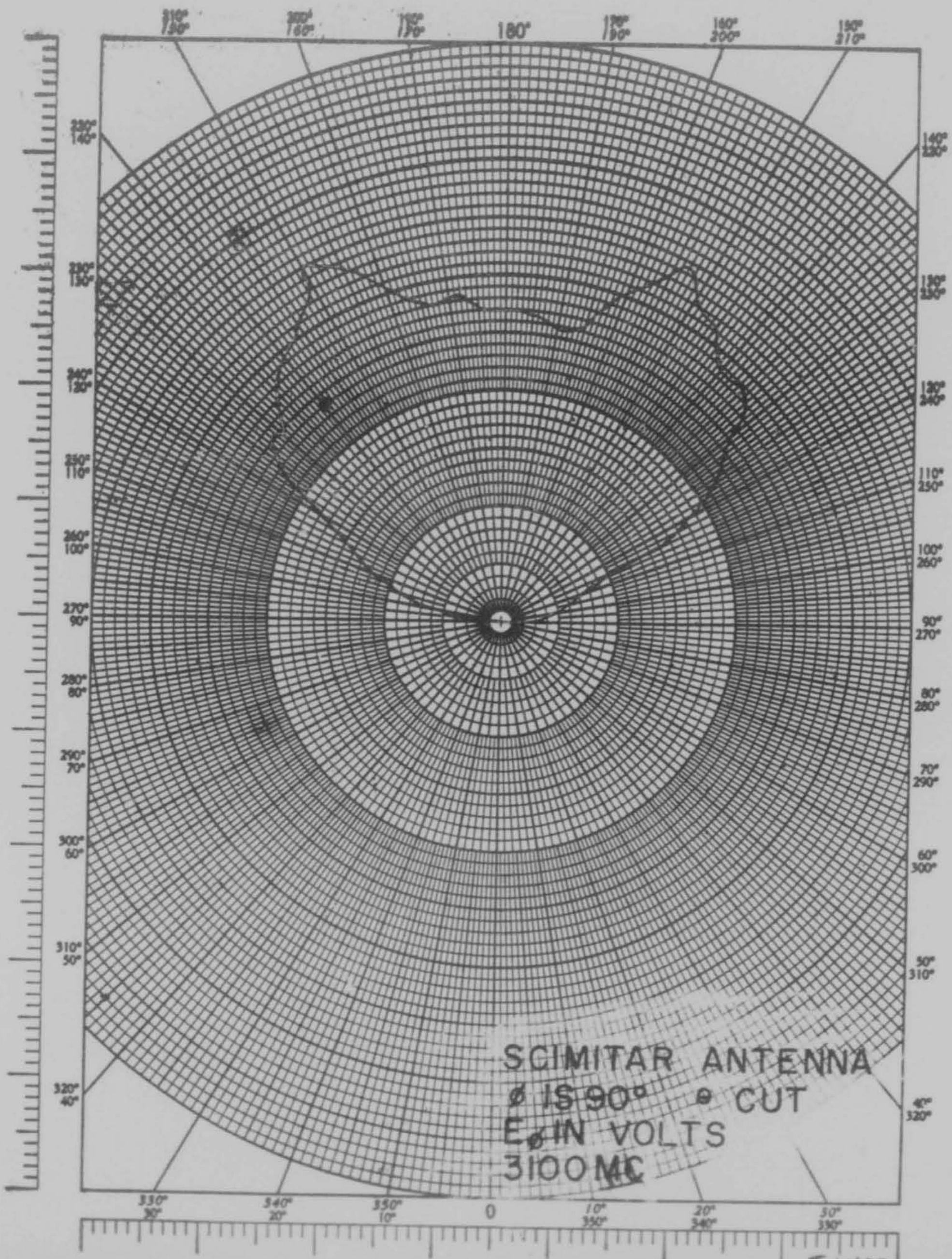
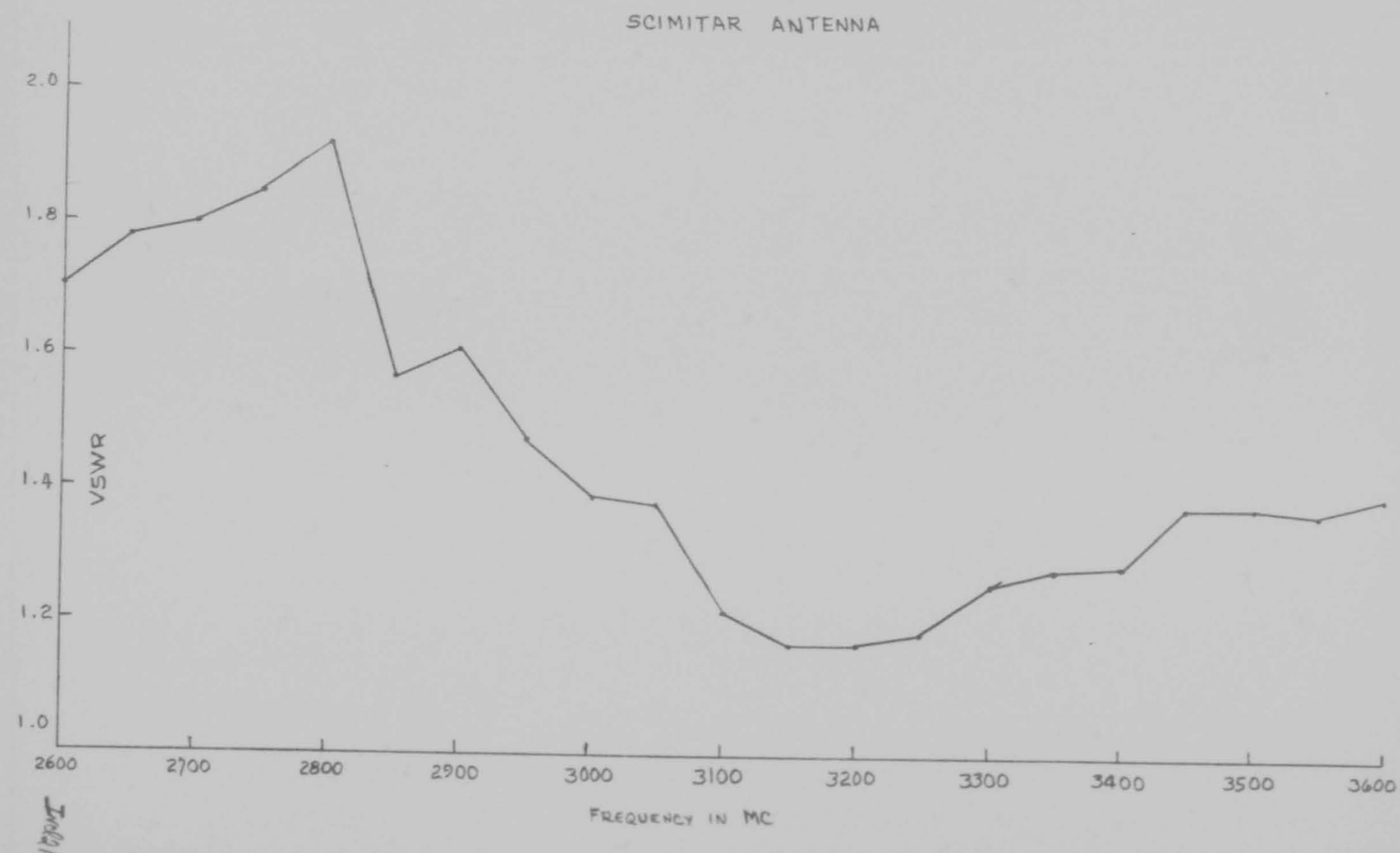

SCIMITAR ANTENNA
Ø IS 90° θ CUT
E_ϕ IN VOLTS
3100 MC



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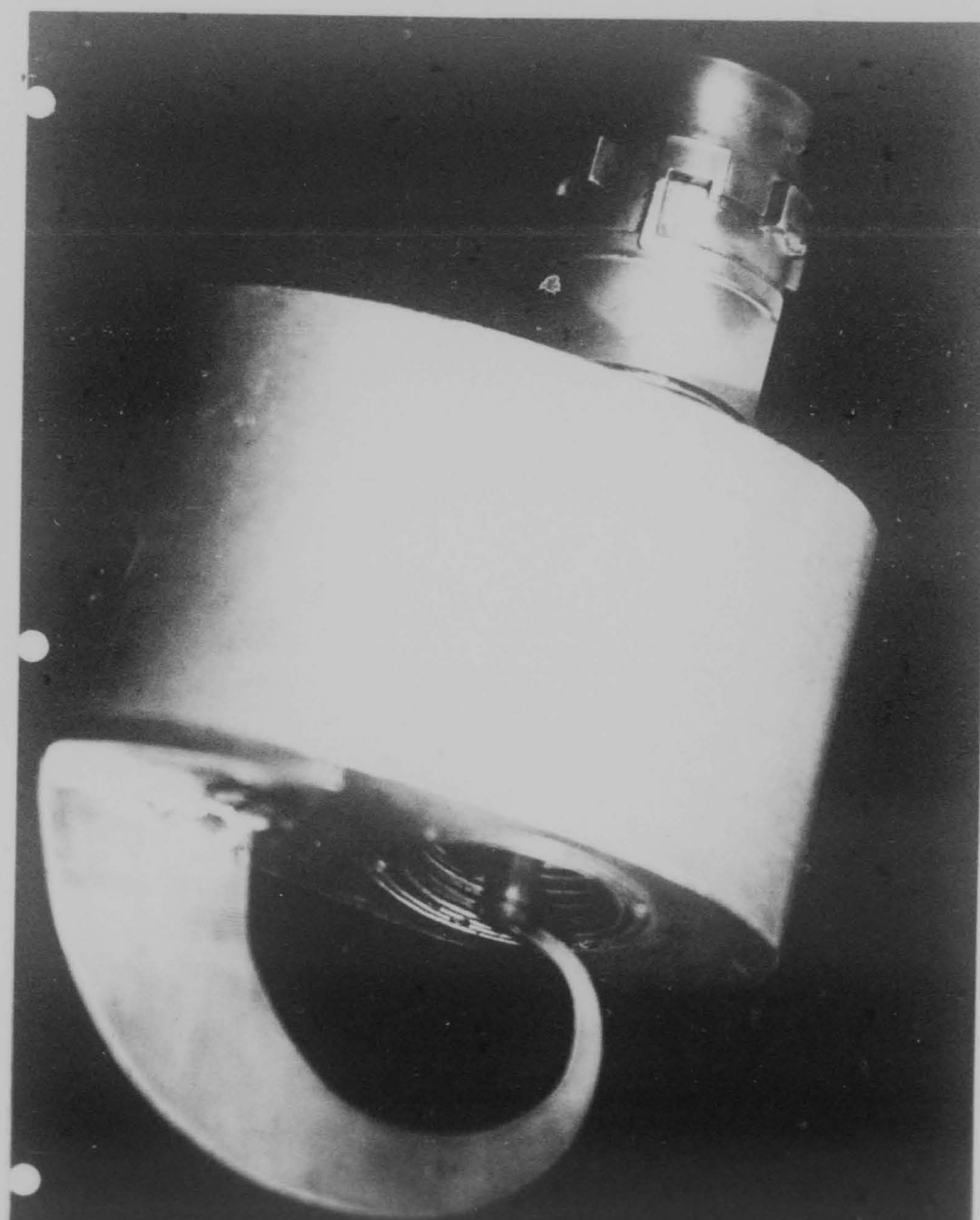

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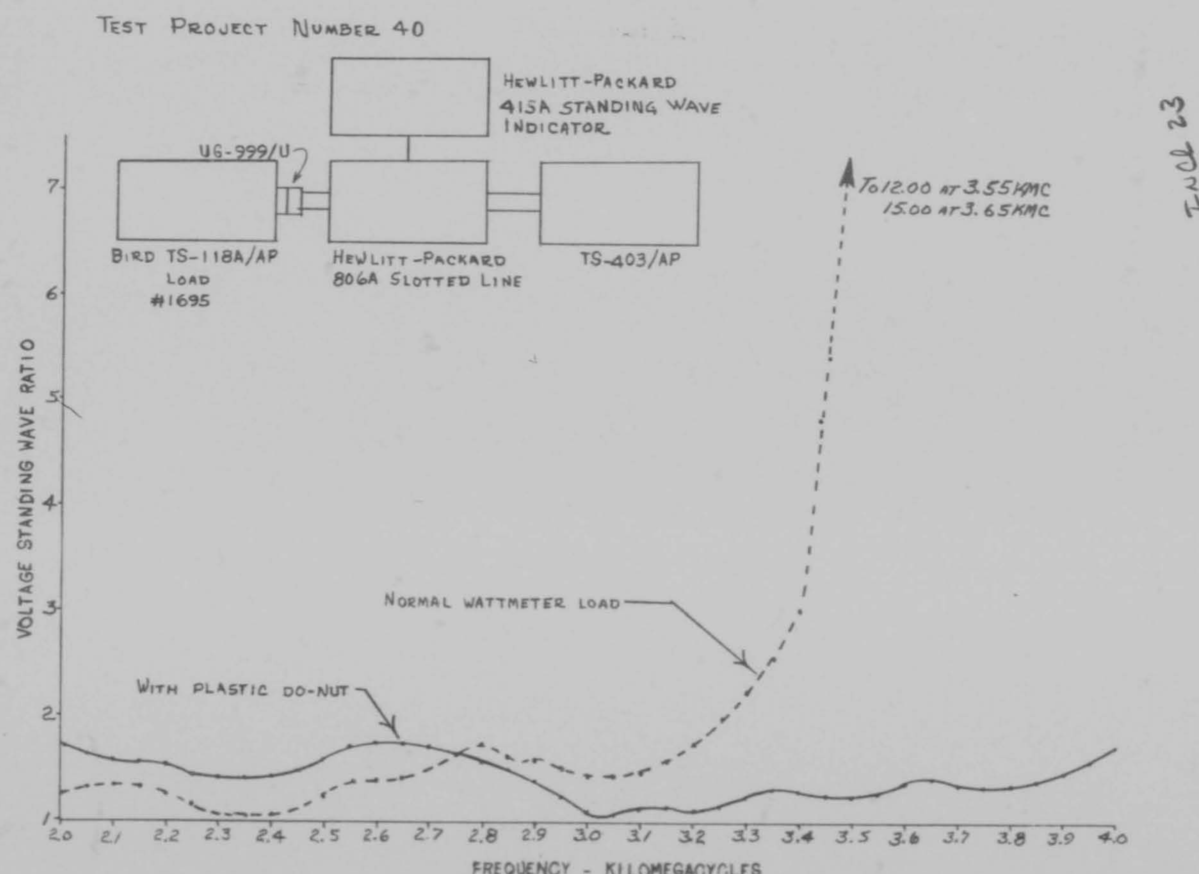

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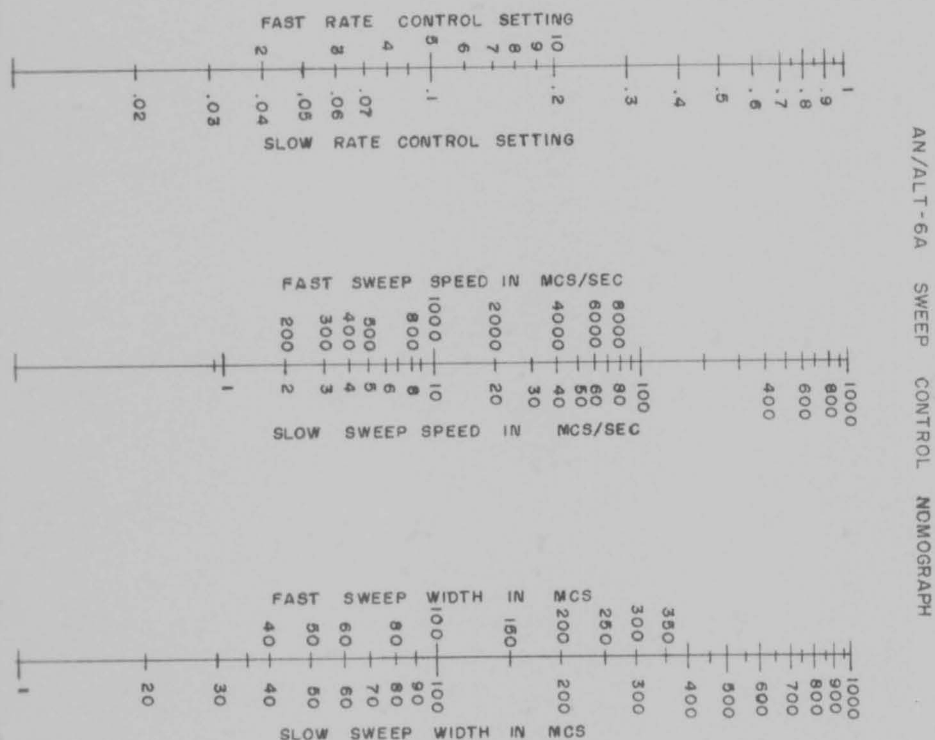

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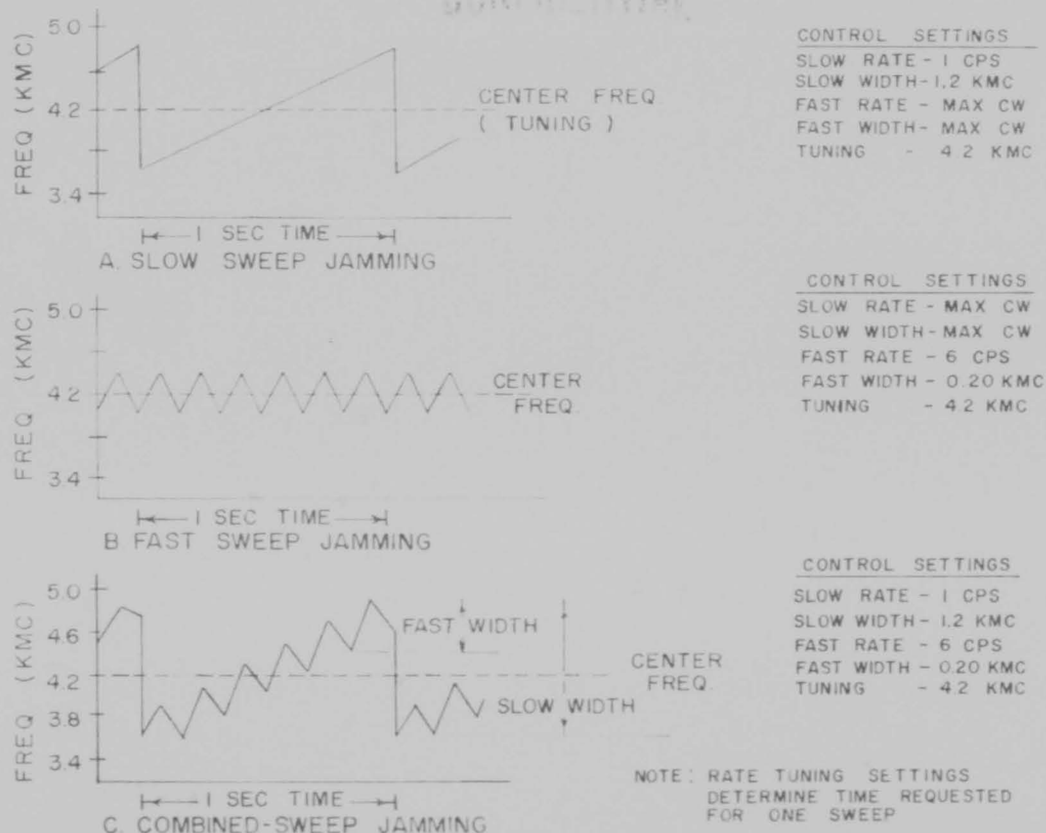


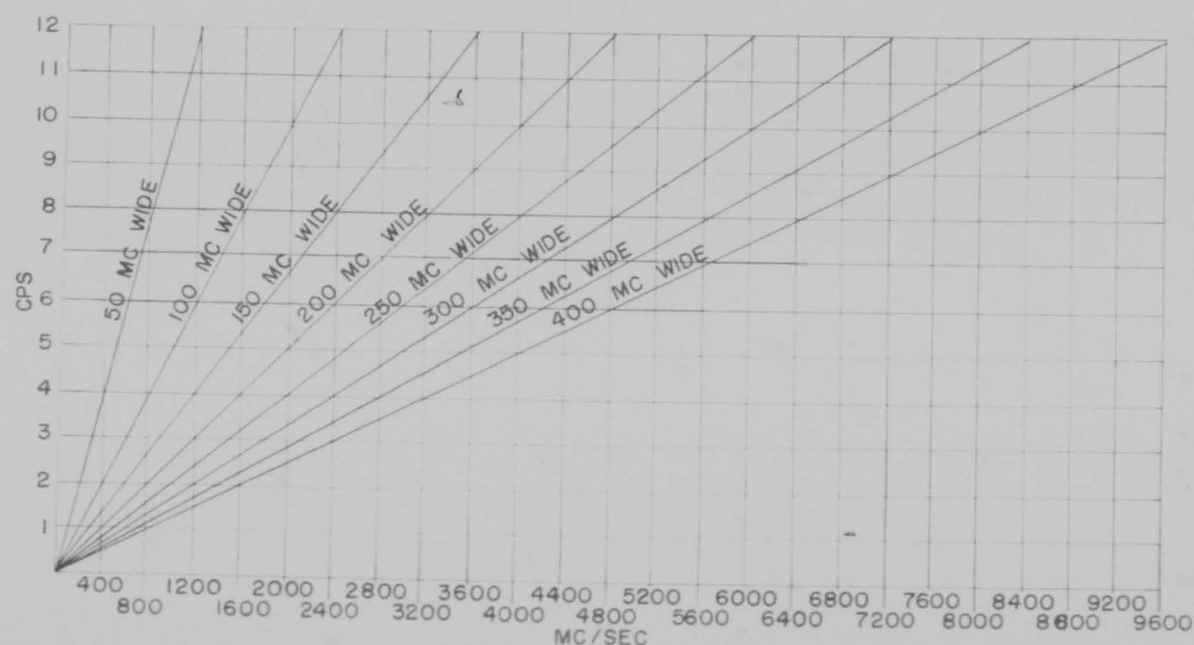
SWEEP-JAMMING MODES, USING TYPICAL TRANSMITTER GROUP (OA-870/ALT-6A)

CONFIDENTIAL

CONFIDENTIAL

FAST SWEEP SPEED SETTINGS

$$\text{DIAL SETTING} = \frac{\text{FAST SWEEP SPEED IN MC/SEC}}{2 \cdot \text{FAST SWEEP WIDTH IN MC}}$$



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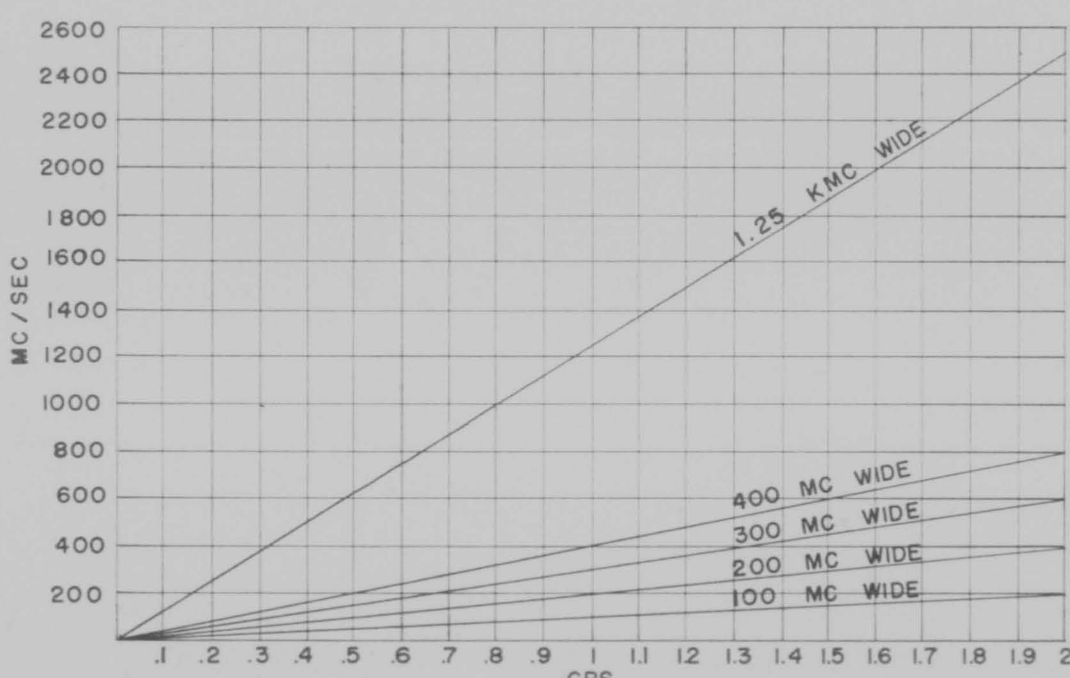
SLOW SWEEP SPEED SETTINGS

$$\text{DIAL SETTING} = \frac{\text{SLOW SWEEP SPEED IN MC/SEC}}{\text{SLOW SWEEP WIDTH IN MC}}$$



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376 TH BOMBARDMENT WING

14

BARKSDALE AIR FORCE BASE LOUISIANA

FINAL REPORT TEST PROJECT NUMBER 38

JULY 56

SECRET

SECRET

CLASSIFICATION: SECRET
AUTH: COMDR 376BOMWGN
INITIALS:
DATE:

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

6 July 1956

SUBJECT: (Uncl) Final Report on Test Project 38, AN/ALQ-7 Suitability Test

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Transmitted herewith is the final report on Test Project Number 38, the purpose of which was to determine suitability of the AN/ALQ-7 X-band, automatic jamming system. (CONFID)

2. The automatic search and lock-on principle incorporated in the AN/ALQ-7 offers good possibilities in the X-band frequency range; however, the AN/ALQ-7 equipment will not operate reliably. (SECRET)

3. Objectives of the test program were not fully realized due to the unreliability of the AN/ALQ-7, and to non-availability of the test aircraft after 20 May 1956. (SECRET)

1 Incl
a/s

STEPHEN D. McELROY
Colonel, USAF
Commander

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SECRET

SYNOPSIS

The AN/ALQ-7 suitability test was conducted by 376th Bomb Wing at Barksdale AFB, La. This test was directed by Headquarters SAC with the objective of determining the suitability of the AN/ALQ-7 jamming system and the interference caused by this system to our own X-band radars operated in the same area. Objectives of the test program were not fully realized due to the unreliability of the AN/ALQ-7, and to a time limitation imposed on the test as a result of test aircraft availability. Although the automatic search and lock-on principle incorporated in the ALQ-7 is believed to offer good possibilities in the ECM field, the AN/ALQ-7 equipment itself proved to be very unreliable in operation. The equipment also employs some features which are considered unnecessary. (SECRET)

/N3/ /

SECRET

TEST PROJECT 38

"AN/ALQ-7 SUITABILITY TEST"

SECRET

TABLE OF CONTENTS

1. INTRODUCTION:

a. Authority: This test was conducted under the authority of Strategic Air Command letter, subject: "Test Directive for Test Project Number 38, AN/ALQ-7 Suitability Test", dated 20 February 1956, as modified. (UNCL)

b. Background: The AN/ALQ-7 countermeasures system is a prototype automatic search and lock-on jamming system. Two systems were built under a research and development contract by W. L. Maxson Corporation, N.Y. The systems and spare parts procured under the contract were furnished the 376th Bomb Wing for this test project by Wright Air Development Command. (SECRET)

c. Related Reports: The monthly SAC U-30 reports from August 1955 to April 1956. (UNCL)

d. Purpose and Description of the Test Item:

(1) The AN/ALQ-7 is an airborne jamming system designed to automatically scan a pre-set band of X-band frequencies and provide automatic tracking and jamming of any radar signal encountered whose carrier frequency, pulse width and pulse repetition frequency meet pre-set system requirements. The equipment was designed to cover the frequency range from 7500 to 11,000 megacycles and is capable of sequentially jamming enemy radar signals over any selected sector within this frequency band. The receiver automatically scans the preset frequency range, detects and analyzes the received radar signal. If the radar signal PW and PRF are within the pre-set limits, the receiver locks-on and tracks the signal. The transmitter then tunes to within plus or minus two megacycles of the receiver frequency and transmits a noise modulated RF jamming signal six to ten megacycles wide. A look-through feature is incorporated to monitor the radar signal during jamming operations. The transmitter uses two klystrons to cover the frequency range and has a power output in excess of 250 watts. (SECRET)

(2) Only one system was available for test purposes until 20 January 1956. At this time the second system was received from Wright Air Development Command. (UNCL)

(3) Technical publications for the AN/ALQ-7 were not available for use during this test program or in the writing of this report. The technical information on the system was gathered from the manufacturer's representatives and from actual observations. (CONFID)

(4) Although the equipment was designed for operation from 7500 to 11,000 megacycles, the low band klystron tube, covering 7500 to 9200 megacycles, was not available for test. Three of these tubes were received with the spare parts but had been previously used and were inoperative at time of delivery. (SECRET)

2. OBJECT OF TEST:

The following primary factors were to be considered: (SECRET)

a. Capability of the equipment to jam single and multiple ground and airborne X-band tracking radars. (SECRET)

b. Degradation of the bomb/nav and fire control systems located in the same aircraft, and in other aircraft operating in the same area, due to interference from the AN/ALQ-7. (SECRET)

c. Ability of the equipment to perform discrimination functions for which it was designed. (SECRET)

3. SUMMARY:

a. Capabilities: The AN/ALQ-7 in its present state does not have the reliability necessary for employment as a tactical system. Although the equipment is unreliable in operation, it was found that during periods of test when it did operate satisfactorily, it was capable of: (SECRET)

(1) Locating, tracking and providing jamming to ground-based and airborne, conically scanning, X-band, precision tracking radars which are illuminating the AN/ALQ-7 equipped aircraft. It jammed ground-based radars at a slant range of 50 NM. (SECRET)

(2) Spot jamming. (SECRET)

(3) Spot jamming each radar signal in turn in the selected band for a pre-determined period of time from three to 21 seconds. Returning to the top of the selected band after a pre-determined period of time from ten to 90 seconds. The equipment then resumes normal activity downward in the band. (SECRET)

(4) Operation over a frequency range which is pre-selected by means of a frequency limit control on the receiver analyser. (SECRET)

(5) Following and jamming a radar signal which is changing frequency. (SECRET)

(7) Discrimination against radar signals whose PRF is not within the limits selected on the PRF control. (SECRET)

b. Limitations:

(1) The equipment is not reliable. Some of the troubles encountered were due to either faulty manufacture or installation of components, while others are the result of design deficiencies. (SECRET)

(2) The tuning system is mechanical and requires considerable time to cover the band. The total tuning time may vary from zero to 15 seconds. (SECRET)

(3) The equipment will periodically lock-on and jam the bomb/nav or fire control system radar located in the same aircraft. (SECRET)

(4) The pulse width discriminating features do not function successfully. (SECRET)

c. Maintenance:

(1) Maintenance of the AN/ALQ-7 was accomplished during this test period without any technical publications on the equipment except the schematic diagrams of the system. The maintenance was performed by two representatives of the manufacturer, one a field engineer, and the other a field technician, both of whom were associated with the equipment during production and were thoroughly familiar with the system. (CONFID)

(2) Continuous maintenance of the equipment was necessary during the test due to the great number of malfunctions which occurred. Some of these were due to component failures and were remedied. Others were of unknown origin, or were found and could not be remedied because they involved design considerations rather than component failures. (SECRET)

4. CONCLUSIONS:

a. The equipment is not reliable in operation. (SECRET)

b. Reliability cannot be appreciably increased without the modification of some circuits and replacement of some components. (SECRET)

c. The equipment will provide jamming to conically scanning X-band radars that are illuminating the aircraft containing the equipment. (SECRET)

d. The equipment causes interference to both the bomb/nav and fire control system radars located on the same aircraft containing the ALQ-7. (SECRET)

5. RECOMMENDATIONS:

a. Recommend the AN/ALQ-7 systems be returned to the manufacturer for changes in the system to increase equipment reliability so tests may be conducted against AI radar and other types of fire control systems. This recommendation is made with a view to collecting information which could be useful in establishing requirements for systems of this type. (SECRET)

b. In future equipments, provisions will be made in the X-band frequency range to allow for rejection of pre-determined frequencies to avoid interference with friendly radars. (SECRET)

c. Consideration be given to eliminating the PW and PRF discrimination circuits on this and future equipment. These circuits have little tactical use since the pulse widths and pulse repetition frequencies the equipment must accept would also include pulse widths and pulse repetition frequencies of our own X-band radars. (SECRET)

d. The TRANS and OPER switches on the control indicator be removed and their functions incorporated in the POWER switch. This will necessitate installation of a four position power switch in place of the three position switch now employed. The four positions of this switch will be OFF, STBY, RCVR ON and TRANS ON. The RCVR ON position will allow for operation of the receiver without the transmitter being turned on, a function now controlled by the TRANS and OPER switches. (CONFID)

e. The sequence control be eliminated from this equipment. No reason for its incorporation in the system is apparent. (CONFID)

6. TEST RESULTS AND DISCUSSION:

a. Test Environment and Procedures:

(1) The aircraft used as a test bed for the AN/ALQ-7 was RB-47E 53-4259 from the 61st SRS, 70th SRW, Little Rock AFB, Ark. The equipment was installed in Section 43, Stations 1099 to 1166 of this aircraft. A power cable and a control indicator cable were fabricated for use on the aircraft. The Control Indicator was located in the pressurized compartment and operated by the 376DCTT operator. The Control Indicator cable wiring utilized existing aircraft wiring of the ARC-27 HF communication set which was removed from the aircraft during the test period. The transmitting and receiving antennas were mounted on the bottom of the aircraft directly

beneath the ALQ-7 equipment. Both antennas were tilted slightly forward (about 15 degrees) from the vertical and were spaced about eight inches apart. No wiring changes of the aircraft were necessary for this test, and existing holes in the skin of the ship were utilized to mount the antennas. (SECRET)

(2) The M-33 fire control system located at Site Number 2 at Eglin AFB, Fla., was used as the victim radar during the tests against ground-based radars. The M-33 precision tracking radar is an X-band, conically scanning, precision tracking radar with a maximum tracking range of 100,000 yards (approximately 50 NM). The frequency range of this radar is from 8500 to 9600 megacycles; however, since the low band transmitting tube for the AN/ALQ-7 was not available, the radar frequencies utilized were limited to those above about 9200 megacycles. Instrumentation employed at this radar consisted of a voice tape recorder for use by the 376DCTT observer, Brush recorder for recording azimuth, elevation and AGC voltage of the radar, and 35 mm camera for A-scope photography. Tape recordings were made on all missions; however, Brush recordings and pictures were not made on all missions due to either malfunction or non-availability of equipment. Aircraft altitude during the tests was approximately 35,000 feet. Both radial and tangential runs were made on the radar site. (SECRET)

(3) Nine attempts were made to test the ALQ-7 against the E-4 fire control system radar located in F-86D aircraft at Perrin AFB, Texas. None of these missions were successful; however, some information was obtained concerning ALQ-7 receiver operation during one of the attempted missions. One mission was scheduled but not flown due to weather, six were unsuccessful due to malfunction of the ALQ-7 in the air, and two were cancelled due to the ALQ-7 not being in operating condition at the scheduled time. These two cancellations were caused by either an ALQ-7 malfunction after the equipment was installed in the aircraft, or because maintenance personnel could not locate source of the equipment failure by the scheduled flight time. One test was performed at Barksdale AFB, La., using an F-86D aircraft located on the ground, and a ground mock-up of the ALQ-7 in a truck. (SECRET)

(4) Interference tests were made to determine degradation of the K-4A bomb/nav and A-5 fire control systems on the ALQ-7-equipped RB-47 aircraft and also on another B-47 aircraft operating in the same area. The ground tests were made against the K-4A bomb/nav and A-5 fire control systems located in the test aircraft. Airborne tests were made against the K-4A bomb/nav system in the test aircraft and against

both the K-4A and A-5 systems in another B-47 aircraft in the area. (SECRET)

(5) Laboratory tests were conducted at the 376DCTT Laboratory to check the ability of control circuits in the system to perform the functions for which they were designed. Since no technical data was available on the equipment, the markings on the controls were used as a basis of what the equipment should do. In addition, the overall operation of the system was checked to determine its tactical capabilities and limitations. (CONFID)

b. Test Results and Analysis:

(1) Missions Against M-33 Fire Control System Radar. During the test program 11 missions were scheduled against this radar. Four of these were cancelled due to aircraft maintenance, one was cancelled due the ALQ-7 not being operational at scheduled time. Useful data was obtained on the remaining six missions; however, on three of these missions the ALQ-7 malfunctioned prior to the end of the test. Results of tests by mission are as follows: (CONFID)

(a) Mission 22 November 1955.

1. Useful information was obtained on this mission for a period of only six minutes, after which the ALQ-7 malfunctioned. During the first two minutes of this period the jamming appeared to be periodic in nature and small in amplitude (below height of target blip). The target could be seen at all times and tracked with little or no difficulty. After two minutes of operation, frequency of the radar was raised to a point near the maximum frequency (9600 megacycles). The frequency was not changed again during the remaining four minutes of the test. Immediately upon raising the frequency of the radar, the jamming became continuous and of maximum amplitude (high as main bang). The target was lost immediately and completely. All radar operators were completely baffled and considered target tracking impossible. The ALQ-7 transmitter was turned off, allowing target to be re-acquired; however, the target was lost again immediately upon reappearance of the jamming. It was also noted during this test that the jamming disappeared when the target was not illuminated by the radar. While the operators were trying to re-acquire the target, the jamming reappeared before a lock-on could be obtained. (SECRET)

2. Effectiveness of the ALQ-7 against the radar during this short test was believed to have been due, in part, to the relatively short range of the target aircraft and lack of experience of radar operators in tracking through jamming of this nature. All operators stated they had never experienced jamming of this nature before on this type radar. (SECRET)

3. No fire control data would have been available from the radar at any time during jamming operations after the radar frequency was raised at the end of approximately two minutes of operation. It is believed that during the first two minutes of operation the ALQ-7 was not locked on the M-33 signal but on a signal in close proximity. (SECRET)

(b) Mission 5 December 1955.

1. Useful information was obtained on this mission for a period of approximately two and a half hours. The ALQ-7 did not malfunction at any time. It was noted by the operator in the aircraft that the equipment would lock-on and provide jamming on both the M-33 radar and APS-23 bomb/nav radar frequencies. Results and analysis of equipment operation against the bomb/nav radar system is covered later in the report. (SECRET)

2. During the first hour of operation, the operators were not able to track the target through the jamming at any time. Magnitude of the jamming was very high (near height of main bang) and completely obliterated target blip. It was also noted that the jamming disappeared, as expected, when the target aircraft was not being illuminated by the radar. At the beginning of the second hour the radar elevation operator (upon advice of 376DCTT observer) devised a so-called "system" of tracking the aircraft approximately 80% of the time with no jamming. The system worked as follows: upon observing jamming on the A-scopes of the radar, the elevation operator would quickly move the radar off the target about 100 mils in elevation. This would cause the ALQ-7 receiver in the aircraft to lose the radar signal, which would cause the transmitter to cease jamming. The ALQ-7 receiver would then go into the search phase. As soon as the jamming disappeared from the A-scopes, the elevation operator would then quickly re-acquire the target. The radar operators would then track the target in the aided manual mode for approximately ten seconds, at

which time the jamming would reappear. Upon reappearance of the jamming, the process would be repeated. The off-target time under these conditions was about two and a half seconds. The azimuth and range operators were not required to move off the target but merely set in the proper rates to insure immediate acquisition of the target when the elevation operator moved back to the proper elevation. It was noted also during the second hour of operation that when the aircraft arrived at shorter ranges, the system of tracking described above began to break down due to the fact that the elevation operator had to move off target progressively greater distances in order to cause the ALQ-7 to go into the search phase. At extremely short ranges, it was impossible to cause the ALQ-7 to lose the radar signal by this method. (SECRET)

3. It should be noted that at no time during the entire mission did the radar operators track the target through the jamming. Operators were firmly convinced that target blip could not be seen through jamming and did not make a constant, concerted effort to read through it at all times. Upon discovering so-called system of operation described above, operators were quite satisfied with this method, as it was considered a vast improvement over prior efforts. It was noted that magnitude of the jamming that appeared on the A-scopes of the radar varied very little with range of the aircraft from the radar. Frequency of the radar was not varied during this mission at the request of the 376DCTT observer. (SECRET)

4. Although periods to a maximum of ten seconds of continuous tracking with no jamming were available for fire control purposes, it is believed no valid fire control data would have been available from the radar during use of the so-called system of tracking. (SECRET)

5. The delay of approximately ten seconds between the time the target aircraft was picked up by the radar and jamming appeared, while using the system described above, does not represent the normal operation of the ALQ-7, but results from failure of the image reject circuit of the receiver to function properly. An explanation of effects of the circuit failure is as follows: The receiver and transmitter searches down the selected band of frequencies, and slews back up

the band. Neither receiver nor transmitter is capable of locking-on while moving up the band. Assume that both receiver and transmitter are locked-on a signal and the signal suddenly disappears, as is the case when the radar elevation operator moves off the target aircraft while using the system of tracking. The transmitter ceases jamming and the receiver searches down the band; the transmitter does not search but remains on the radar frequency. The receiver, upon reaching the lower limit, then slews to the top of the band and starts its search downward. When it reaches the image frequency (radar frequency plus i-f frequency of receiver) it temporarily stops due to failure of the image reject circuit. This causes the transmitter to start searching downward. Immediately thereafter the receiver breaks-lock and starts seaching downward again, causing the transmitter to stop searching. The receiver then proceeds on down the band and stops on the proper frequency. The transmitter than has to make an almost complete round trip over the band to get back to frequency of the radar. If the image reject circuit had worked properly, only the receiver would have searched over the band because the transmitter would have remained on the radar frequency until the receiver returned to the signal frequency. The image reject circuit did not work properly or reliably at any time during equipment tests within the 376th Bomb Wing. (SECRET)

(c) Mission 21 December 1955.

1. The ALQ-7 was operated for a period of approximately three hours during this mission. As soon as jamming became evident, the elevation operator started using the system of tracking devised during the mission of 5 December. This system of tracking worked as before, allowing the radar to track the target approximately 80% of the time with no jamming. No effort was made early in the mission to track the target through the jamming since operators assumed this was not possible. After approximately 30 minutes of operation, and throughout the remainder of the mission, the radar operators were allowed to change the radar frequency at will. It was found that by changing frequency constantly, the ALQ-7 could be kept from jamming about 90% of the time. The operators discovered during the first hour of operation that the target could be tracked part of the time through the jamming. These conditions existed throughout the remainder of the mission. Magnitude of the jamming

appeared to be less than on previous missions (about 1/2 to 3/4 of main bang height). At times the target could be seen easily through the jamming. At other times the target appeared only periodically and was most difficult to see when it did appear. It was also noted that as the range of the target increased, the range operator experienced progressively greater difficulty in keeping the target in the range notch. Aided manual range tracking was used during this mission. (SECRET)

2. Although the target was tracked periodically by use of the system devised on a previous mission, or by continuously manipulating the frequency of the radar, neither of these methods of tracking were necessary after the operators discovered they could track through the jamming. The operators used these methods from time to time merely for variety. It was also noted that the ALQ-7 provided jamming to the radar when the range of the aircraft exceeded the maximum range of the radar (about 50 NM). Magnitude of this jamming was not noticeably inferior to jamming received within range of the radar. The jamming appeared only when the radar antenna was pointed in the direction of the aircraft. (SECRET)

3. The ALQ-7 equipment should be capable of tracking the radar signal during frequency changes. However, a malfunction existed in the tracking circuits during this mission allowing the operators to keep the equipment "lost" about 90% of the time by continuously changing frequency. (SECRET)

4. It is believed that valid fire control data would have been available only part of the time while the operators were tracking the target through the jamming. This is due to the fact that during a large percentage of the time, the range operator could not get continuous range information, resulting in range data which was only approximately correct. (SECRET)

(d) Mission 5 January 1956.

1. The ALQ-7 was operated for a period of approximately two and a half hours during this mission. Magnitude of the jamming, except at very close ranges, appeared to be inferior to jamming on previous missions (less than half the height of the main bang). Operators could track the target through the jamming

almost at will. Due to inability of the first range operator to accurately track the target, a second operator was utilized after the first hour. While the first operator was tracking the target through the jamming, range errors up to several hundred yards were common even though the target blip was visible most of the time. It is believed that inexperience in tracking through jamming, fatigue, or both, were factors contributing to the inability of the first operator to accurately track the target. The second range operator could track the target with far greater accuracy than the first. Both range operators experienced greater difficulty in tracking the target at long ranges than at short ranges. This was due to deterioration of the target blip with increasing range without a corresponding decrease in jamming magnitude. Aided manual range tracking was used. Azimuth and elevation operators experienced far less difficulty in tracking than the range operator, presumably due to the much slower rate of change for information involved. Radar operators were allowed to change frequency of the radar at will. It was found that about 90% of the time the ALQ-7 could continue jamming on the radar frequency, while the frequency was being changed. The ALQ-7 could never be kept "lost" for over a few seconds by mere manipulation of the frequency. Changing frequency was found to be detrimental to tracking as it did not cause the jamming to cease and frequently caused loss of target. From time to time throughout the mission radar operators resorted to use of the so-called system of tracking. The system worked as described, allowing the target to be tracked about 80% of the time with no jamming. Although this method of tracking was used periodically on this mission, it was not considered necessary since the target could be tracked through the jamming. (SECRET)

2. It is believed data furnished by the radar for fire control purposes during the period of operation of the first range operator was not valid, at least part of the time, due to the periodic range errors of several hundred yards. It is also believed that fire control data could have been furnished by the radar during the period of operation of the second range operator which was quite valid. Errors in range of up to 100 yards were believed to be maximum during this period and these occurred at near maximum ranges of the radar. (SECRET)

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(e) Mission 6 March 1956.

1. Useful information was obtained on this mission for a period of approximately 20 minutes, after which the ALQ-7 malfunctioned. Throughout this mission visual display of jamming as seen on the A-scope appeared to be radically different from jamming observed on previous missions. Magnitude of jamming upward from the normal position of the base line was quite small (rarely exceeding 1/3 the height of the main bang); however, magnitude of the jamming downward from the normal position of the base line was quite large. The normal base line itself was not in evidence. A band of jamming, however, appeared well below the normal position of the base line, resulting in two bands of jamming separately by a band in which there was very little, if any, jamming. At other times during the mission, when the jamming magnitude was reduced, the lower band of jamming moved upward and joined the upper band, eliminating the internal area of no jamming. Radar operators experienced a great deal more difficulty in locating and tracking the target during this mission than in the two previous missions. The target could not be seen through the jamming most of the time, and when seen, it appeared to be very small and very difficult for the operators to track. It is believed that some of the tracking difficulty experienced was the result of difference in the visual display of the A-scopes between this and earlier missions. The so-called system of tracking the target was used from time to time on this mission. The system worked as described, but was no longer satisfactory to the operators as they were accustomed to tracking the target through the jamming. Frequency of the radar was not changed at any time during the mission. (SECRET)

2. No fire control data could have been furnished by the radar a large percentage of the time due to the fact that the radar operators could not locate or track the target through the jamming. During the time the target was being tracked, validity of any fire control data from the radar would have been very questionable since the range operator had considerable difficulty keeping the range gate within 250 yards of the target blip. Aided manual tracking was used by the radar operator. (SECRET)

(f) Mission 9 March 1956.

1. Useful information was obtained on this mission for a period of approximately 13 minutes, after which the ALQ-7 malfunctioned. Frequency of the radar was not changed at any time during jamming operations. Throughout the mission test time, magnitude of the jamming was quite large (rising to almost the height of the main bang) and moving downward from the normal position of the base line by the same amount. The base line itself, and the 100 yard range notch (located in the center of the 500-yard expanded sweep), were not in evidence. Although the jamming moved downward, it did not separate and form bands, as was the case in the previous mission. The visual display presented was not experienced on any of the previous missions. Radar operators did not see the target blip at any time during the mission due to the appearance of jamming on the scopes when trying to locate the target. When the target was at close ranges, it was found that moving the radar beam in elevation would not cause the ALQ-7 to cease jamming. (SECRET)

2. No fire control data could have been delivered by the radar at any time during jamming operations because the radar operators could not track the target. (SECRET)

(2) Test Against Airborne Intercept Radars:

(a) The ALQ-7 transmitter was not operated in the air against an AI radar due to malfunctions. On one mission the transmitter malfunctioned but the receiver continued to operate; therefore, some information was obtained from the receiver alone. It was found that the receiver would initiate and maintain a lock-on on the F-86D AI radar when the AI radar was locked-on the ALQ-7-equipped aircraft. Since the ALQ-7 antennas were mounted in the bottom of the test aircraft, emphasis was placed on determining how high above the test aircraft an AI radar would be at the point where the ALQ-7 receiver could no longer maintain a lock-on. During the test, the F-86D aircraft was flown at azimuths of 135, 180 and 225 degrees with respect to the test aircraft, and at ranges of approximately five nautical miles. Altitude of the test aircraft was maintained at 25,000 feet, and altitude of the fighter was varied from 20,000 to 30,000 feet while maintaining azimuth and range location. At each of the azimuth positions, the ALQ-7 receiver remained locked-on the AI radar signal while fighter was below 30,000 feet.

Above 30,000 feet, the receiver became intermittent and would not remain constantly locked-on the radar signal. (SECRET)

(b) An F-86D AI radar-equipped fighter was used on the single ground test that was performed. This aircraft contained a tunable magnetron whose frequency was variable from 8750 to 9250 megacycles. This fighter was parked on the compass rose at Barksdale AFB directly facing a water tower (used as a radar target) located approximately 1¼ miles from the aircraft. The ALQ-7 was mounted in the back of a pickup truck which was placed directly in line with the water tower and at a distance of approximately 2700 feet from the aircraft. Considerable difficulty was experienced in tuning the AI radar magnetron to a frequency high enough for operation of the ALQ-7. This was due to the fact that no indication of frequency was available at the aircraft. It was found that very little jamming appeared on the radar scope while the radar was in the search mode or while pointed in some direction other than toward the ALQ-7. When the radar was locked-on the water tower and the ALQ-7 was transmitting, jamming appeared in the jizzle band at all ranges. Jamming was severe enough to cause the radar to break-lock periodically. (SECRET)

(c) The data obtained on these tests is not adequate for evaluating performance of the ALQ-7 equipment against airborne intercept radars. (UNCL)

(3) Airborne Tests Against K-4A Bomb/Nav System Located in the ALQ-7-Equipped Aircraft. These tests were not performed separately, but in conjunction with other tests. Information was collected on four missions in the form of standard O-15 camera pictures of the radar scope during normal navigational procedures. On all tests it was impossible to distinguish radar targets through the jamming strobes themselves; however, targets appearing in other scope areas were not affected. Test results by mission are as follows: (SECRET)

(a) Mission 5 December 1955. The ALQ-7 provided jamming on the APS-23 radar scope. One hundred and eleven frames of O-15 film were exposed upon which the jamming activity appeared. Jamming coverage of 360 degrees of the scope appeared on 18% of these pictures. This jamming coverage was fairly uniform over the entire scope. On 82% of the pictures the jamming appeared between 90 and 270 degrees on the scope (while the radar antenna was directed toward the rear of the aircraft), with occasional jamming strobes appearing in the forward quadrants. (SECRET)

(b) Mission 21 December 1955. On this mission 56 frames of O-15 film showed jamming activity. Maximum jamming coverage on the scope was 180 degrees and this appeared very rarely. It was also noted jamming activity was periodic, seldom appearing in several frames in succession. Jamming activity while sector scanning was rare and when present appeared as a single thin strobe and was not at all severe. Approximately 75% of the O-15 pictures taken which indicate jamming show this activity in the rear quadrants, or while the radar antenna was directed toward the rear of the aircraft. About 15% indicate activity toward the front of the aircraft, and the remainder, in both front and rear quadrants. (SECRET)

(c) Mission 5 January 1956. On this mission approximately 135 frames of O-15 film showed jamming activity. On approximately 7% of these pictures, jamming covered the full 360 degrees of the scope. On 15% of the pictures jamming appeared entirely in the front quadrants (while the antenna was directed toward the front of the aircraft). On 53% of the pictures jamming appeared in only the rear quadrants (antenna directed toward the rear); and on the remaining 25%, jamming appeared in both the forward and rear quadrants, with a predominance toward the rear quadrants. (SECRET)

(d) Mission 6 April 1956. On this mission only 16 frames of O-15 film showed jamming activity. None of the jamming strobes were more than a few degrees wide. Jamming appeared in the rear quadrants (antenna directed to the rear) on eight of these pictures, in the forward quadrants on three, and in both forward and rear quadrants on five of the pictures. (SECRET)

(4) Airborne Tests Against K-4A Bomb/Nav and A-5 Fire Control Systems Located in Same Area as ALQ-7-Equipped Aircraft. On these tests two aircraft were used, the target and the ALQ-7-equipped aircraft. The target aircraft flew a pre-determined flight path and the ALQ-7-equipped aircraft flew various formation positions with respect to the target aircraft. Logs of jamming effectiveness were kept by the target aircraft observer and copilot. In addition, O-15 pictures were made of the APS-23 scope in the target aircraft. A log was also kept by the ALQ-7 operator. (SECRET)

(a) Tests Against K-4A Bomb/Nav System Radar.

1. Although several of these tests were scheduled, only the 9 March mission was flown. The ALQ-7 locked-on and jammed the radar frequency several times for

periods of a few seconds. The target aircraft observer, however, observed very little, if any, jamming on the radar scope during these periods. This is also verified by the O-15 pictures taken during these periods. During the test the receiver of the ALQ-7 locked-on the radar signal many times but did not remain locked-on long enough for the transmitter to start jamming. (SECRET)

2. It is believed that very little jamming interference to the bomb/nav system of other aircraft in the area can be expected from the ALQ-7, provided the signal source for the ALQ-7 is from these radars. This is believed to be true because the APS-23 signal is not normally available to the ALQ-7 long enough for the transmitter to start jamming operations. (SECRET)

(b) Tests Against A-5 Fire Control System Radar. (UNCL)

1. Although several of these tests were scheduled, only the 9 March mission was flown. During this mission the copilot in the target aircraft operated the A-5 system radar, and, when possible, locked-on the ALQ-7 equipped aircraft. Lock-on was not possible in some of the formation positions. The ALQ-7 was then operated against the A-5 system radar. (SECRET)

2. The only test data available was a log kept by the target aircraft copilot. The ALQ-7 would lock-on and provide jamming to the radar when the radar was illuminating the ALQ-7-equipped aircraft. Jamming appeared only in the jizzle band of the scope, and the target blip could not be seen through the jamming. (SECRET)

3. No interference from the ALQ-7 system can be expected on fire control systems on other aircraft in the area provided these radars do not illuminate the ALQ-7-equipped aircraft or unless the transmitter is jamming some other signal on the same frequency. (SECRET)

(5) Ground Tests Against K-4A Bomb/Nav and A-5 Fire Control Systems Located in ALQ-7-Equipped Aircraft. (SECRET)

(a) K-4A Bomb/Nav System Tests.

1. Purpose of the first ground test run against the bomb/nav system was to determine degradation of the APS-23 radar by the ALQ-7 while aircraft was on the

ground. O-15 pictures were made of the radar scope during all modes of radar operation. It was found that under the various modes of operation, and in each case including use of the radar anti-jam circuits, the jamming video completely covered the appropriate section of the radar scope, completely eliminating the normal radar presentation. (SECRET)

2. The second ground test was performed to determine how close the ALQ-7 must be to the frequency of the APS-23 radar before interference to the radar is encountered. A TS-622U signal generator was used to provide a signal input to the ALQ-7. Both the radar and ALQ-7 signals were observed on a TS-148UP spectrum analyzer. It was found that the ALQ-7 would provide jamming on the radar scope when the center frequency of the ALQ-7 was as much as 4½ megacycles below or 12 megacycles above the center frequency of the radar. Jamming effectiveness varied over this frequency range, being barely discernible at the limits given above. Test results are questionable due to the difficulty encountered in measuring the exact center frequencies involved and observing the jamming on the radar scope; however, the results are in line with the expected values. Since the bandwidth of the APS-23 radar is 10 megacycles and width of the jamming signal is 12 megacycles, it was expected that jamming would appear when the center frequency of the ALQ-7 was approximately 11 megacycles from the center frequency of the radar. (SECRET)

3. A test was also run to determine if any interference to the K-4A Bomb/Nav radar was caused by internal radiation from the ALQ-7. A dummy load was installed on the ALQ-7 for this test. It was found that no interference to the radar was encountered when the ALQ-7 was operated under these conditions. (CONFID)

(b) Ground Tests Against A-5 Fire Control System Radar.

1. This test was performed to determine how close to the frequency of the A-5 system radar the ALQ-7 would be when interference to the radar was encountered. A TS-622U signal generator was used to provide a signal input to the ALQ-7. Both the radar and ALQ-7 signals were observed on a TS-148UP spectrum analyzer. It was found that the ALQ-7 would provide jamming on the radar scope when the center frequency

of the ALQ-7 was as much as 7 megacycles below or 12 megacycles above the center frequency of the radar. Interference was also encountered from 49 to 64 megacycles below the radar frequency. This is caused by the ALQ-7 signal being below the local oscillator frequency by 30 megacycles, which is the IF of the radar. (SECRET)

c. Collective Analysis:

(1) The ALQ-7 equipment is not reliable in operation, however, the system of automatically searching and jamming X-band signals as used in this equipment is very good. The jamming of X-band signals poses a different problem from that of S-band signals due to the use of the X-band frequencies in nearly all of our own radars on the aircraft, such as the Bomb/Nav, fire control and rendezvous radars. The interference to the airborne radars by the ALQ-7 is not considered a unique feature of this particular equipment, but can be expected from any jamming equipment, including sweep jammers, that do not employ a satisfactory means of discriminating against these airborne radar frequencies. (SECRET)

(2) While using an automatic search and lock-on system such as that employed in the ALQ-7, very little, if any, mutual interference between aircraft operating in the same area can be expected unless the jammer-equipped aircraft is continuously illuminated by a radar signal from the other aircraft, or the airborne radar happens to be on the same frequency as the victim signal. The Bomb/Nav and fire control radars on the same aircraft will experience interference from the ALQ-7 while jamming operations are under way in their frequency range due to the lack of a satisfactory system for rejecting these radar frequencies. (SECRET)

(3) During the periods of time when the ALQ-7 was operating properly, it provided enough interference to X-band radars to seriously affect any fire control data output from these radars. One contributing factor was the lack of experience of the radar operators during jamming operations in this X-band frequency.range. (SECRET)

(4) During the ground tests it was noted that the ALQ-7 provided interference to the fire control system radar at two different frequencies: the true radar frequency and a frequency 60 megacycles below the radar frequency. When the jamming transmitter is at this lower frequency, it produces the IF frequency when beat against the ALQ-7 receiver local oscillator and appears as interference on the radar scope. This phenomenon does not present a problem to automatic search-and-lock-on spot jamming systems such as that employed in the ALQ-7; however, it could produce a problem in sweep

jamming activities since two seperate frequencies would have to be discriminated against to avoid interference to the aircraft's own radars. Radars employing pre-selectors should not be as susceptible to this "double frequency" interference as those not employing pre-selectors. (SECRET)

SECRET

CHARACTERISTICS OF AN/ALQ-7

1. Frequency range: 7500 to 11000 megacycles.

   a. Low Band 7500 to 9200 megacycles.
   b. High band 9100 to 11000 megacycles. (SECRET)

2. Pulse width selection: 0.1 to 50 microseconds. (SECRET)

3. Pulse repetition frequency: 100 to 10,000 pulses per second. (SECRET)

4. Duration (jamming time): (SECRET)

   a. 3 to 21 seconds on each signal.
   b. Spot - continous as long as signal is present.

5. Sequence (maximum time before return to first signal, for use with duration time control). (SECRET)

   a. 10 to 90 seconds.

6. Power output: Over 250 watts. (SECRET)

7. Power requirements: (SECRET)

a.	3 phase, 208 volts, 400 cps	2500VA
b.	3 phase, 208 volts, 380 to 1000 cps	5000VA
c.	DC, 28 volts	50 watts

8. Weight: Components 280 lbs plus 27 lbs of connecting cable and wave guide. (SECRET)

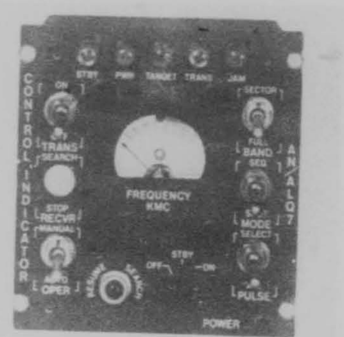
9. Components: (CONFID)

a.	Control Indicator	C(XA-1634)/ALQ-7
b.	Receiver Analyzer	R(XA-652)/ALQ-7
c.	Transmitter	T(XA-546)/ALQ-7
d.	Power Supply (low volt)	PP(XA-1283)/ALQ-7
e.	Power Supply (high volt)	PP(XA-1282)/ALQ-7
f.	Liquid-Cooler	HD(XA-220)/ALQ-7
g.	Antennas	AT(XA-583) AT(XA-584) AT(XA-585)/ALQ-7

10. Output: Noise modulated, 12 mcs wide. (SECRET)

11. Look Thru: Three microsecond look thru at a random rate which averages one every 40 microseconds. (SECRET)

SECRET



CONTROL INDICATOR C(XA-1634)/ALQ-7

1. This unit weighs 4 pounds. It is 6 inches high, 5-3/4 inches wide, and 2-3/4 inches deep. (CONFID)

2. The control indicator is mounted in the operator's position and provides the following control of the system: (SECRET)

   a. POWER - off, Standby and On
   b. SECTOR - For using pre-selected sector of frequencies or the full band.
   c. MODE - Provides selection of pre-set Duration and Sequence jam time or use of spot jamming.
   d. PULSE - Selection of pre-set PW and PRF or acceptance of all PW and PRF signals.
   e. TRANS - Transmitter ON/Off switch.
   f. OPER - Selection of automatic operation or manual control of transmitter by use of TRANS ON/Off switch.
   g. RESUME SEARCH - Provides means of rejecting received signal causing the receiver to continue searching.

3. Five indicator lights are provided to indicate the following: (SECRET)

   a. STBY - Warm up power is applied.
   b. PWR - High voltage is applied.
   c. TARGET - Receiver is locked on frequency.
   d. TRANS - Transmitter has been energized and tuning to or locked on frequency of the receiver.
   e. JAM - Transmitter is on receiver frequency and output is modulated.

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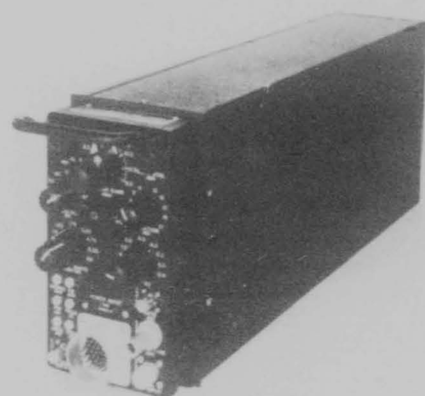


RECEIVER ANALYZER R(XA-652)/ALQ-7

1. This unit weighs 26 pounds. It is mounted on a half rack and is 8-3/4 inches high, 5 inches wide, and 24 inches deep. (CONFID)

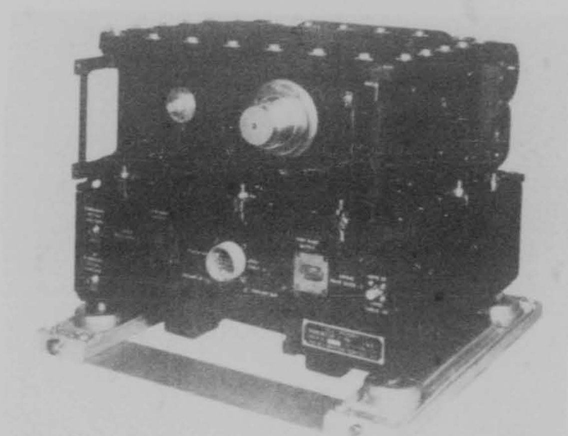
2. The following controls are mounted on the front panel for ground adjustment. (SECRET)

   a. SEARCH BAND - Limit settings to select the frequency band to search and jam.
   b. PULSE WIDTH - Limit settings to select pulse widths to be accepted by the receiver.
   c. PRF-KC - Limit settings to select the pulse repetition frequency to be accepted by the receiver.
   d. SEQUENCE - Selection of time in seconds until receiver returns to first signal jammed.
   e. DURATION - Selection of time in seconds that transmitter jams any one signal frequency.

3. The following sub-assemblies make up the receiver analyzer. (SECRET)

   a. Local Oscillator
   b. Receiver IF
   c. Video Amplifier
   d. Pulse width discriminator
   e. Pulse repetition frequency discriminator
   f. IF strip - part of the transmitter loop.
   g. Look through gate generator.
   h. Serve control assembly (containing serve amp and image reject circuit).
   i. Programming unit (containing lost target timer, CW detector, and jam and sequence timing circuits.

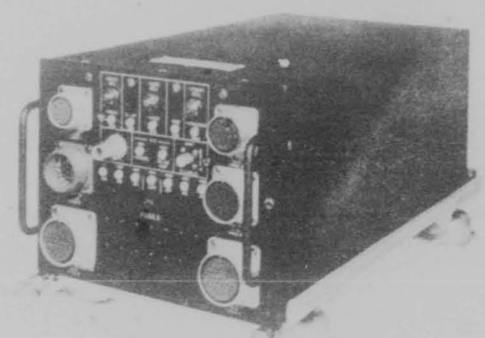
SECRET



TRANSMITTER T(XA-546)/ALQ-7

1. The transmitter weighs 115 pounds. It uses a non-standard rack for mounting and is 12 inches high, 15-3/4 inches wide and 16-3/4 deep. (CONFID)

2. The transmitter employs two noise modulated klystrons (Varion V-22), which are liquid cooled and terminate in X-band wave guides. With frequency ranges of: low band 7500 to 9200 megacycles, high band 9100 to 11,000 megacycles. The unit consists of two compartments, one is air-filled, the other utilizes Dow Corning Silicone Oil (DC-200) to increase insulation and allow for better heat exchange between components and to the outside of the case. The elements of the klystrons and its associated power supplies, the beam current regulator, and the noise modulator and its power supplies are located in the oil-filled section. The body of the klystron, on which is mounted the transmitter servo system, the search track assembly and transmitter discriminator, is located in the air-filled compartment. (SECRET)



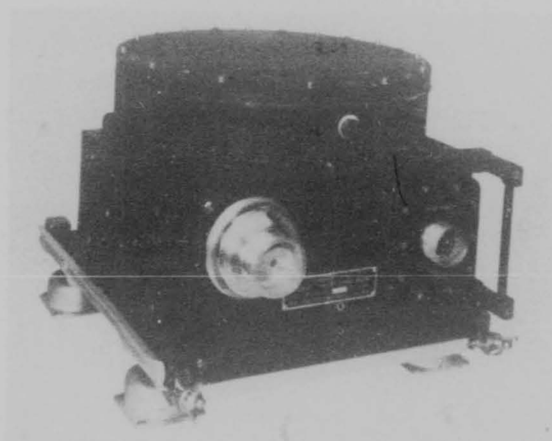
POWER SUPPLY PP(XA-1283)/ALQ-7

1. This power supply weighs 61 pounds. It occupies one full rack space. It is 7½ inches high, 10 inches wide, and 19 inches deep. (CONFID)

2. This unit contains the low voltage power supply for the system plus the power and associated control relays and the stepping switch control circuit for the rest of the system. This power supply also serves as a junction box and has several tests points for the system. (CONFID)

3. The following voltages are supplied by this unit: (CONFID)

   a. B plus at 150 volts, 600 MA regulated to 25%.
   b. B minus at minus 105 volts, 100 MA regulated to 25%.
   c. Local Oscillator voltage, 1780 volts at 20 MA. This supply is contained in a sealed unit using Dow Corning Silicone Oil (DC-200) as insulation. It contains the transformer as well as the rectifier tubes. The unit is 3" x 3-3/8" x 4-3/4".



POWER SUPPLY PP(XA-1282)/ALQ-7

1. This unit weighs 61 pounds. It is 8½ inches high, 12 inches wide, and 14 inches deep. (CONFID)

2. This is the high voltage supply for the beam voltage of the klystrons. It is capable of producing 10,000 volts at 400 MA. (CONFID)

3. The components are immersed in Silicone Oil. They consist of a three-phase transformer which has a delta primary plus a single phase secondary, a stepping switch which taps the primary of the transformer to allow correct output to the klystrons, and a three-phase full wave rectifier. (CONFID)

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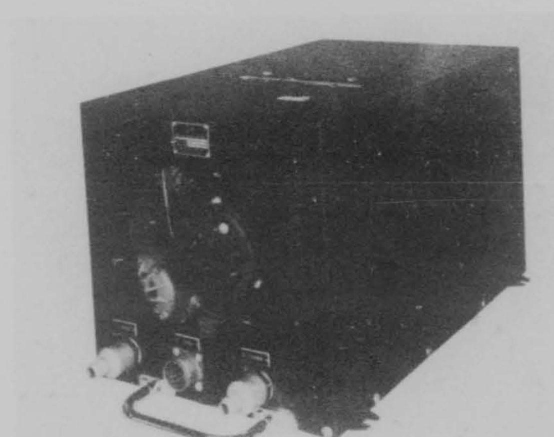

LIQUID COOLER HD(XA-220)/ALQ-7

1. The liquid cooler weighs 38 pounds. It is a full rack unit 11½ inches high, 11¼ inches wide, and 19 inches deep. (UNCL)

2. The liquid cooler is provided to dissipate the heat which is generated by the klystrons. The liquid cooler is composed of a gear type pump which is motor driven, a honeycomb radiator and fan, a liquid heater and the necessary plumbing and valves. (CONFID)

3. In operation, the pump circulater an ethylene glycol and water mixture through both klystrons and through the radiator. When the temperature reaches 80 degrees C. the radiator fan is energized and continues to operate until the temperature drops to 60 degrees C. The heater and radiator bypass valves allow for sub zero operation when the klystrons do not supply enough heat. (UNCL)

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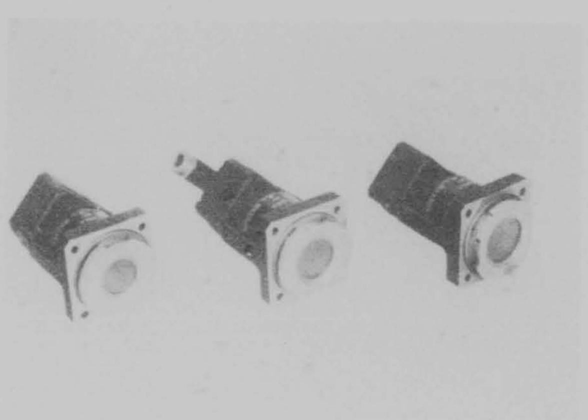

1. Antennas for the AN/ALQ-7 system. From left to right. (CONFID)

   a. AT(XA-583)/ALQ-7 High Band.
   b. AT(XA-585)/ALQ-7 Receiver.
   c. AT(XA-584)/ALQ-7 Low Band.

2. The antennas are adjustable for clock-wise or counterclock-wise polarization. (CONFID)

SECRET

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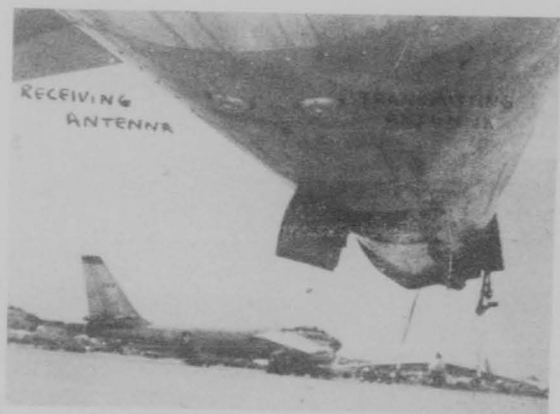
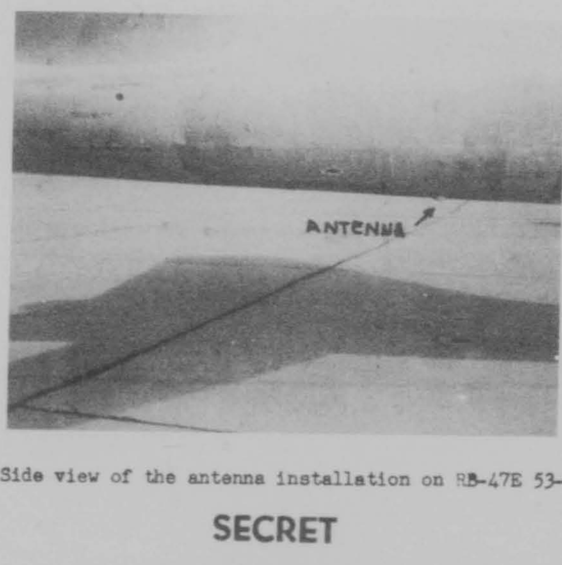


View of the antenna installations on RB-47E 53-4259



Side view of the antenna installation on RB-47E 53-4259

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APPENDIX B

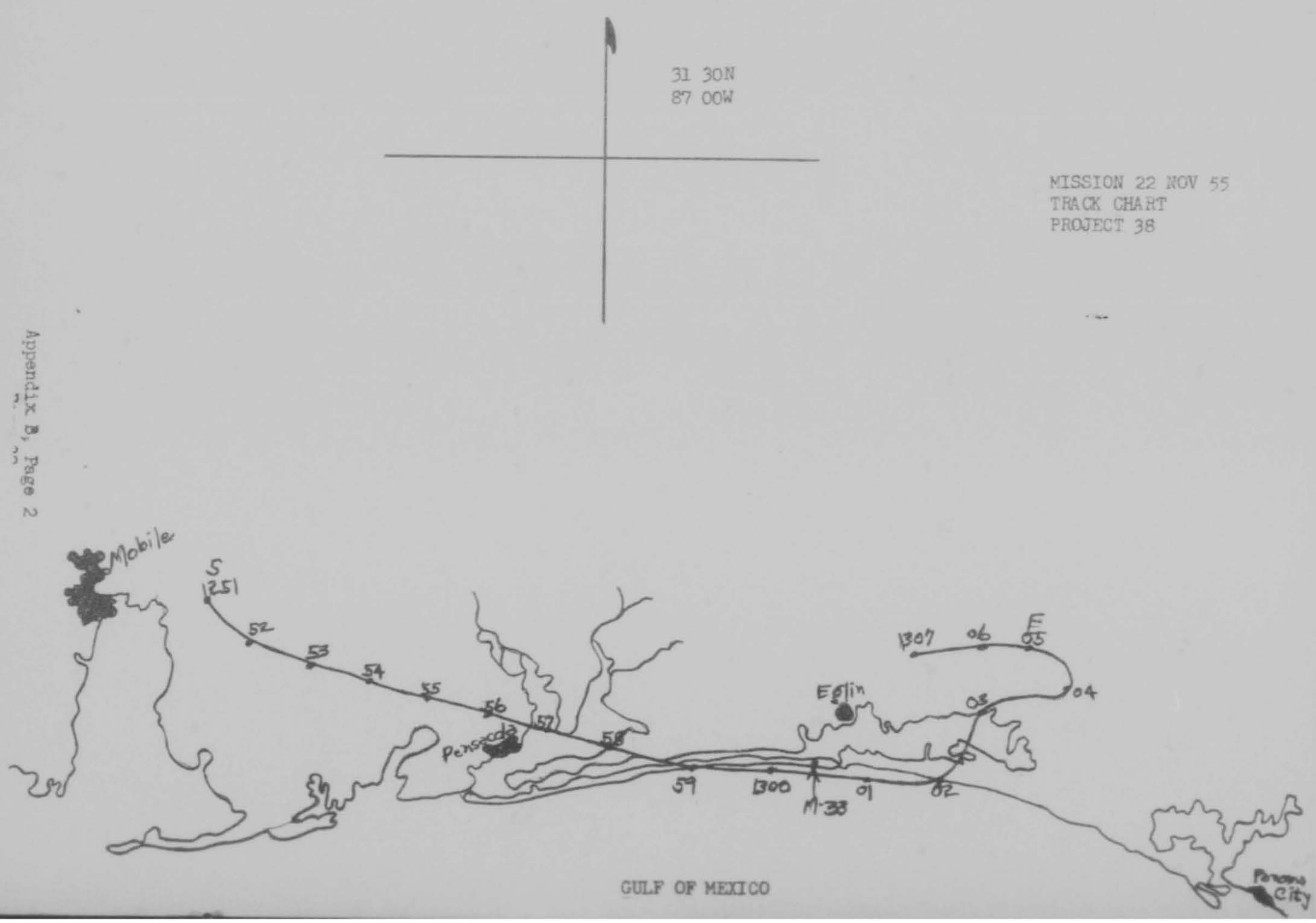
DETAILED MISSION INFORMATION

The information on the M-33 missions in this appendix consists of the 376DCTT observer's log which was taken from tape recordings which were made in the M-33 radar van while the mission was in progress. The track overlays were constructed from the polar charts made at the GCI radar (FPS-3) site at Eglin AFB, Fla. The pictures are representative of the jamming encountered. Whenever possible, they were taken in sequence from the exposed 35 mm film. Information on the interference missions included the airborne observer's logs and pictures of the K-4A bomb/nav system scope. (CONFID)

The information is combined by mission date. Results of the ground interference tests are included in this appendix in order to make comparison of airborne and ground interference easier. (UNCL)

1. Mission, 22 November 1955, Observer's Log.

1222-1232	Aircraft inbound on Run 1. No target.
1232	Run 1 completed. Target never picked up.
1234-1236	Locked on wrong aircraft.
1237	Locked on another target. Wrong aircraft.
1238-1248	Aircraft outbound on Run 2. No target.
1248	Run 2 completed. Target never picked up.
1252-1255	Aircraft inbound on Run 3. No target.
1255	Target picked up. Aided range tracking being used.
1256	ALQ-7 operator reports receiver locked-on. Asked him to turn jamming transmitter on.
1257-1258	Tracking target in full automatic. No jamming seen.
1258¼	Some interference appearing on A-scopes. Presumed to be from ALQ-7. Jamming only 1/8 to ¼ inch high and periodic in nature. Target pip plainly visible at all times.
1259	Target lost, but not due to jamming.
1259-3/4	Picked up target again. Jamming looks same as before.
1300½	Jamming still periodic but now stronger. Appears to be about height of target pip.
1301	Raised frequency of radar to about maximum (9600 mc). Jamming immediately came in strong and solid, causing loss of target. Jamming as high as main bang. Operators completely baffled. No targets visible.
1301½	Turned ALQ-7 transmitter off until target reacquired by radar.
1302	ALQ-7 transmitter turned on. Jamming immediately caused loss of target. Jamming high as main bang. Target not seen through jamming.
1303	Jamming disappeared. Operators trying to pick up target again.
1303¼	Jamming back again. Keeps operators from locking-on. When jamming appears, target blip is lost.
1303½	Target picked up again. Jamming now high as target blip but not as high as main bang. Radar lost target immediately.
1304-3/4	Jamming disappeared. Malfunction in ALQ-7. Target tracked later but ALQ-7 would not work due to malfunction. (SECRET)



MISSION 22 NOV 55
TRACK CHART
PROJECT 38

Appendix B, Page 2

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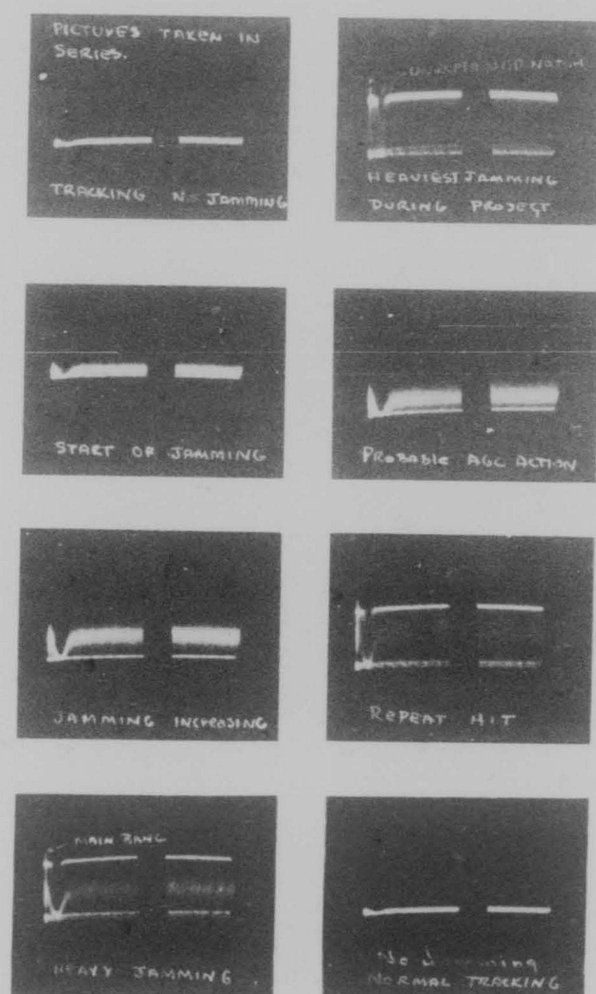
2. Mission, 5 December 1955, Observer's Log.

1244-1250	Aircraft coming in on Run 1. Not picked up. ALQ-7 transmitter off.
1250½-	Tracking target. ALQ-7 locking-on both M-33 and APS-23 radar.
1254-3/4	Asked operator to stay on M-33 frequency and turn on ALQ-7 transmitter.
1255	Very strong jamming appeared. Target lost immediately. Target blip cannot be seen through jamming.
1256	Still have jamming. Target still lost.
1257	Jamming disappeared. Target still lost. End of Run 1.
1259-1305½	ALQ-7 transmitter turned off. Target still lost.
1305-3/4	Target picked up. Auto tracking. Will turn ALQ-7 transmitter on in one minute. Start of Run 2.
1306½	Very strong jamming. Target lost immediately.
1307¼	Jamming disappeared. Target still lost.
1307½-1314	Target picked up and tracked in auto with no jamming. ALQ-7 was locked-on APS-23 in aircraft. End of Run 2.
1314-1324	Aircraft making turn and coming in. Not tracked by radar. ALQ-7 transmitter off.
1325	Target picked up. Auto track. Will turn on ALQ-7 transmitter. Start of Run 3.
1325-3/4	Very strong jamming. Target lost immediately. Jamming then disappeared. Target still lost.
1326-3/4	Target reacquired. No jamming seen.
1328	ALQ-7 transmitter turned off. End of Run 3.
1329-1334	Target lost. Aircraft in turn.
1334½	Target reacquired. Auto track. ALQ-7 off. Start of Run 4.
1336	Tracking target. Auto track. ALQ-7 still off.
1337½	Tracking target. ALQ-7 being turned on.
1338-1339½	Very strong jamming. Target lost.
1339-3/4	Jamming disappeared. Trying to lock-on target.
1340-1342	Target tracked. No jamming. Target near maximum range. End of Run 4.
1342-1400	Target not tracked. Making turn and starting Run 5.
1401-1403	Very strong jamming. Target lost during jamming. End of Run 5.
1403½-1407	Elevation operator has now learned "system" of causing ALQ-7 to lose radar. He moves off quickly in elevation about 100 mils and jamming disappears. He then reacquires target immediately and tracks target for about 10 seconds with no jamming. At instant jamming reappears, process is repeated. As result, target is tracked about 80% of time with no jamming. Aided range tracking.
1407-1414	No jamming. Target tracked 100% of time now. Start of Run 6.

1415-1417½	Jamming reappeared. Operators do not believe they can see target through jamming so are using "system" described above to track aircraft about 80% of time.
1418	Target lost. No jamming. Told ALQ-7 operator to turn transmitter off.
1419½	Target reacquired. Near maximum range. ALQ-7 transmitter will now be turned on.
1422	No jamming was seen. Aircraft out of range of radar. End of Run 6.
1422-1432	Aircraft making turn and coming in. Not tracked by radar. Start of Run 7.
1433	Target reacquired. Jamming appeared. Elevation operator again using "system" to track aircraft about 80% of time with no jamming.
1435	Jamming very strong. "System" does not work now. Jamming does not disappear with even great changes in elevation angle. Target completely lost. ALQ-7 transmitter turned off. End of Run 7.
1436-1443	Aircraft making turn for Run 8. Not tracked by radar.
1444-1451	Target reacquired. ALQ-7 transmitter turned on. Jamming reappeared. "System" of tracking being used to follow target with no jamming about 80% of time. Observers say they cannot see target through jamming at any time at any range. End of Run 8. Target out of radar range.
1452-1509	Aircraft making turn and coming in on Run 9. Not tracked by radar.
1509½-1518	Target reacquired. Using "system" to track target as before. Jamming appears stronger than before.
1518	Near maximum radar range. Turned ALQ-7 off. Ready to turn for Run 10.
1518½-1531	Aircraft making turn and coming in. Not tracked by radar. Start of Run 10.
1532-1544	Tracking aircraft. ALQ-7 turned on. ALQ-7 won't lock-on radar signal.
1545	End of Run 10. End of mission. (SECRET)

MISSION 5 DEC 55 AGAINST M-33 RADAR



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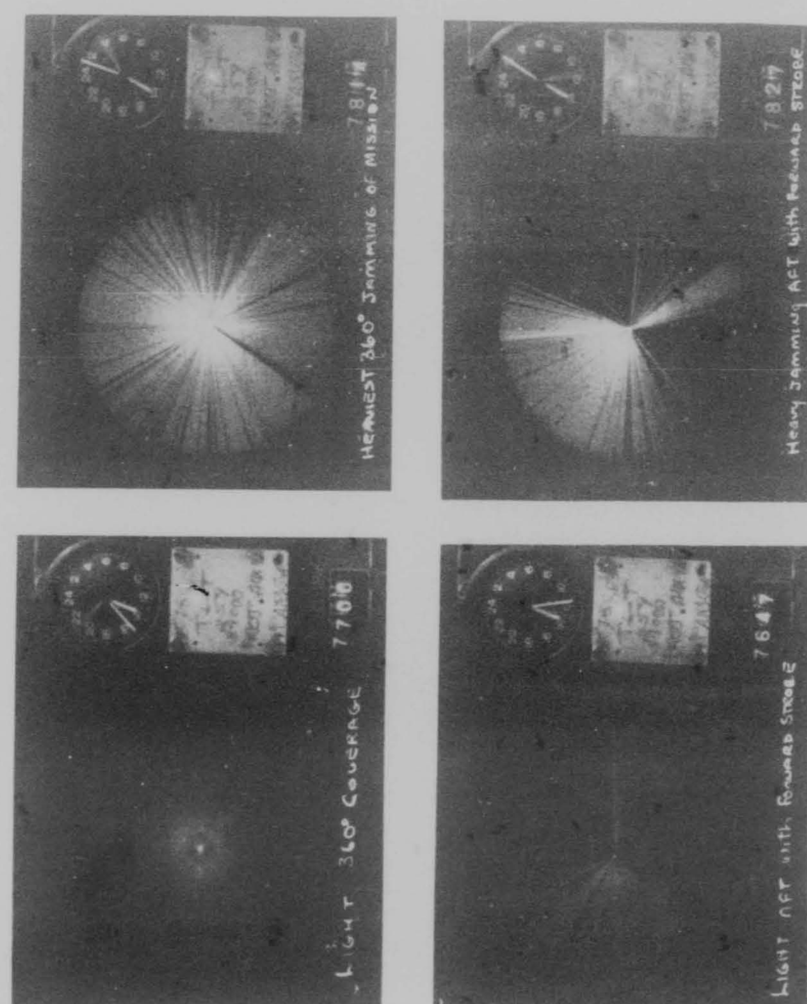
MISSION 5 DECEMBER 1955

INTERFERENCE TO K-4A BOMB/NAV SYSTEM BY AN/ALQ-7 IN SAME AIRCRAFT



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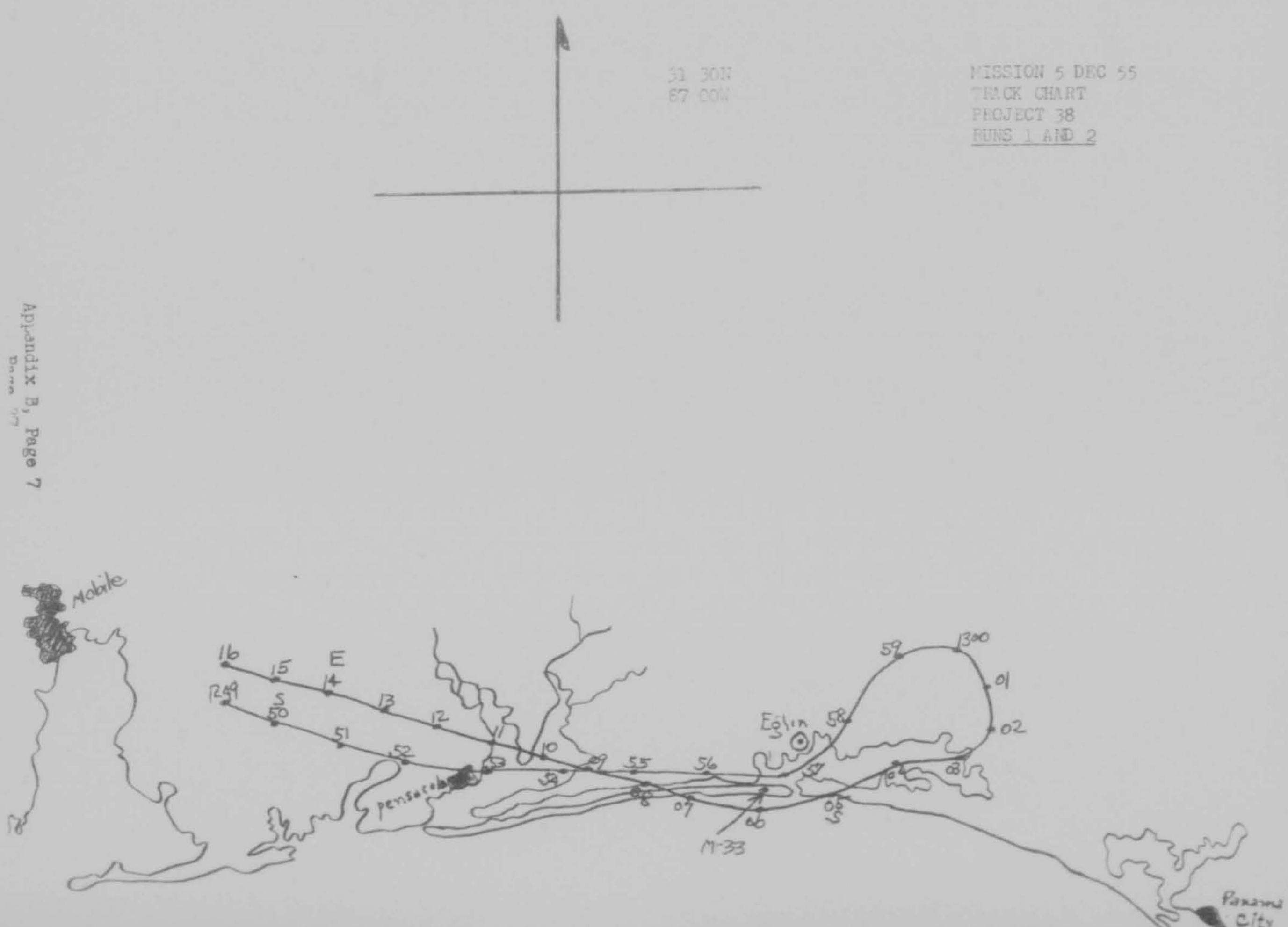

MISSION 5 DEC 55
TRACK CHART
PROJECT 38
RUNS 1 AND 2

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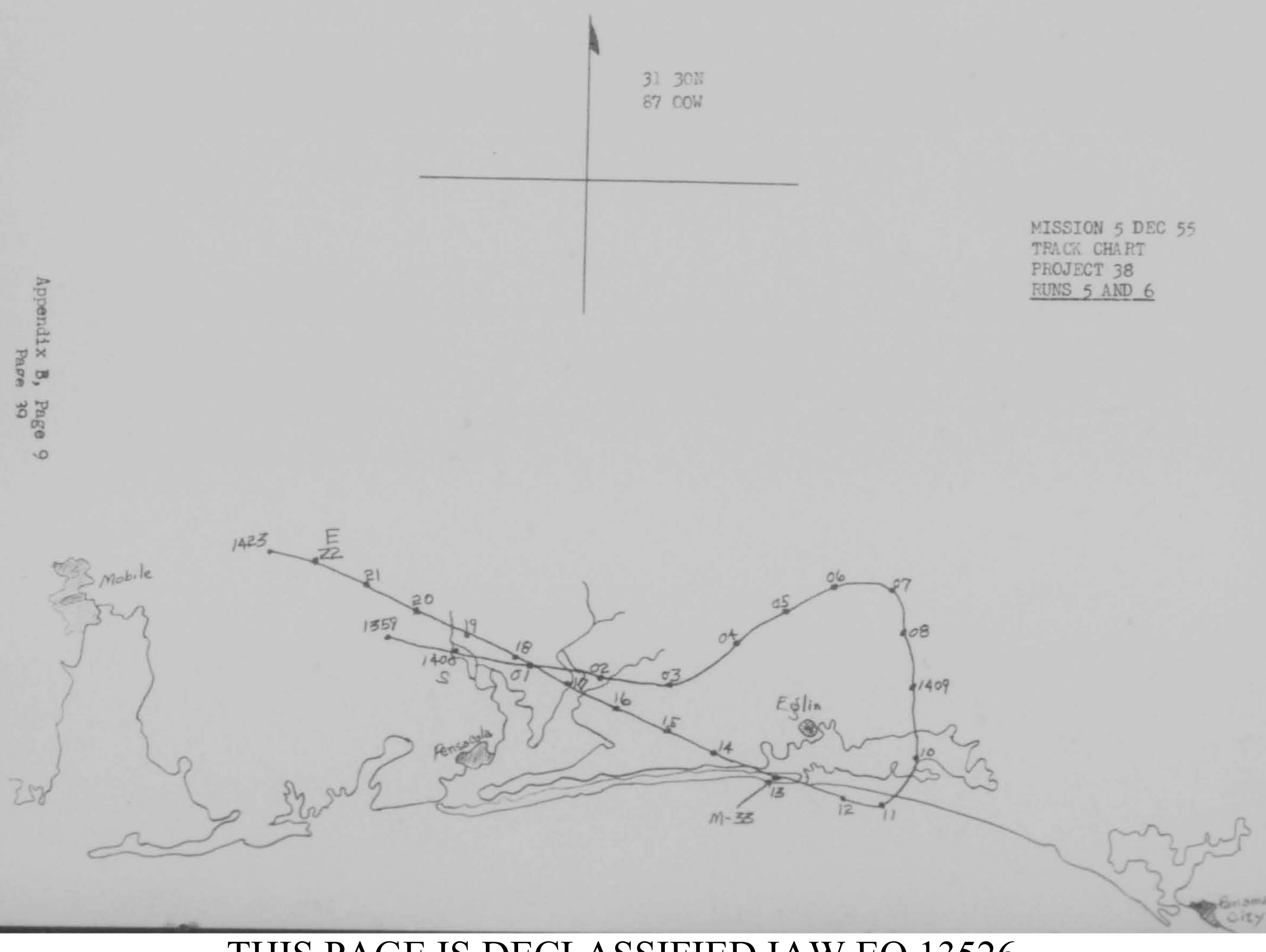
MISSION 5 DEC 55
TRACK CHART
PROJECT 38
RUNS 3 AND 4



MISSION 5 DEC 55
TRACK CHART
PROJECT 38
RUNS 5 AND 6

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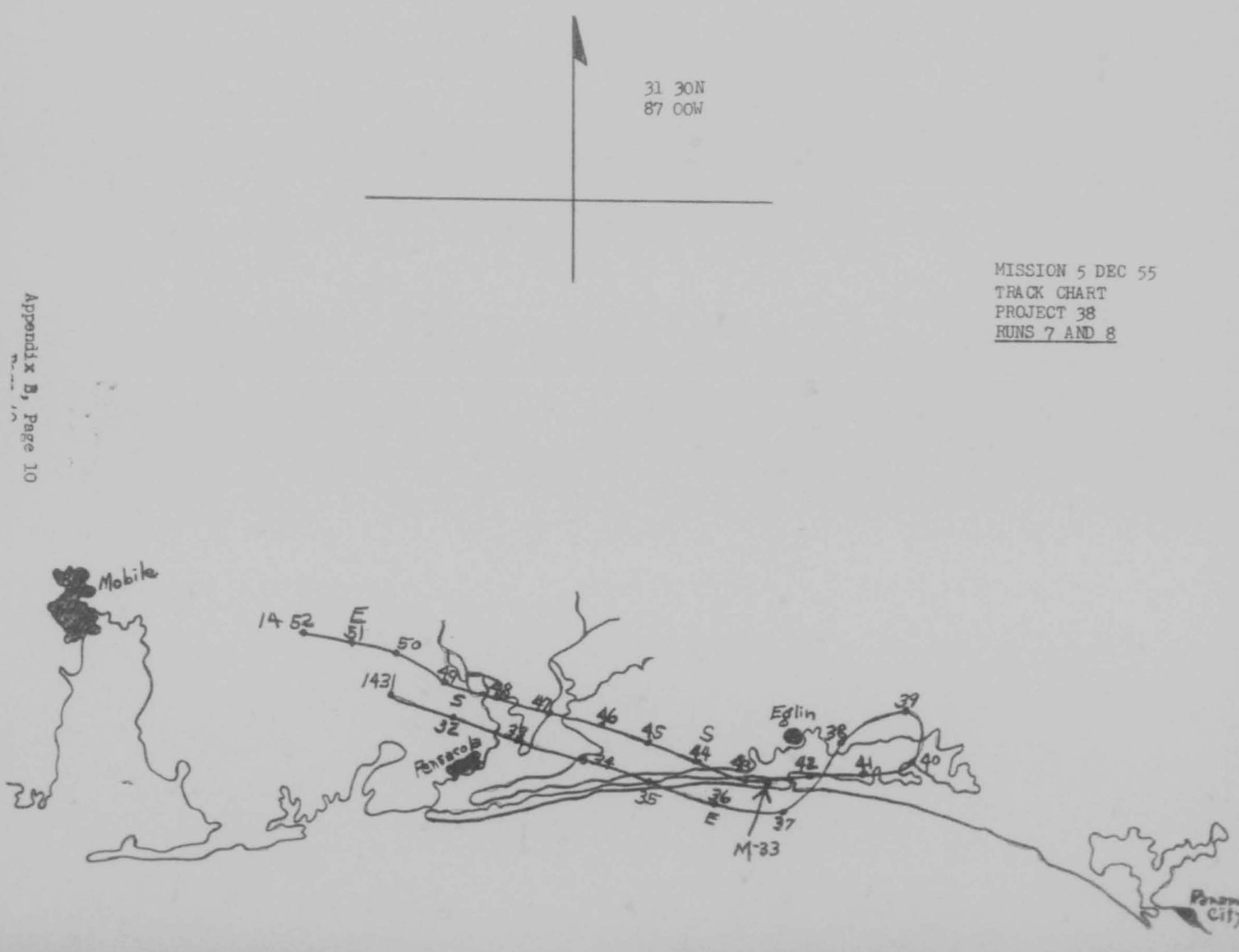

MISSION 5 DEC 55
TRACK CHART
PROJECT 38
RUNS 7 AND 8

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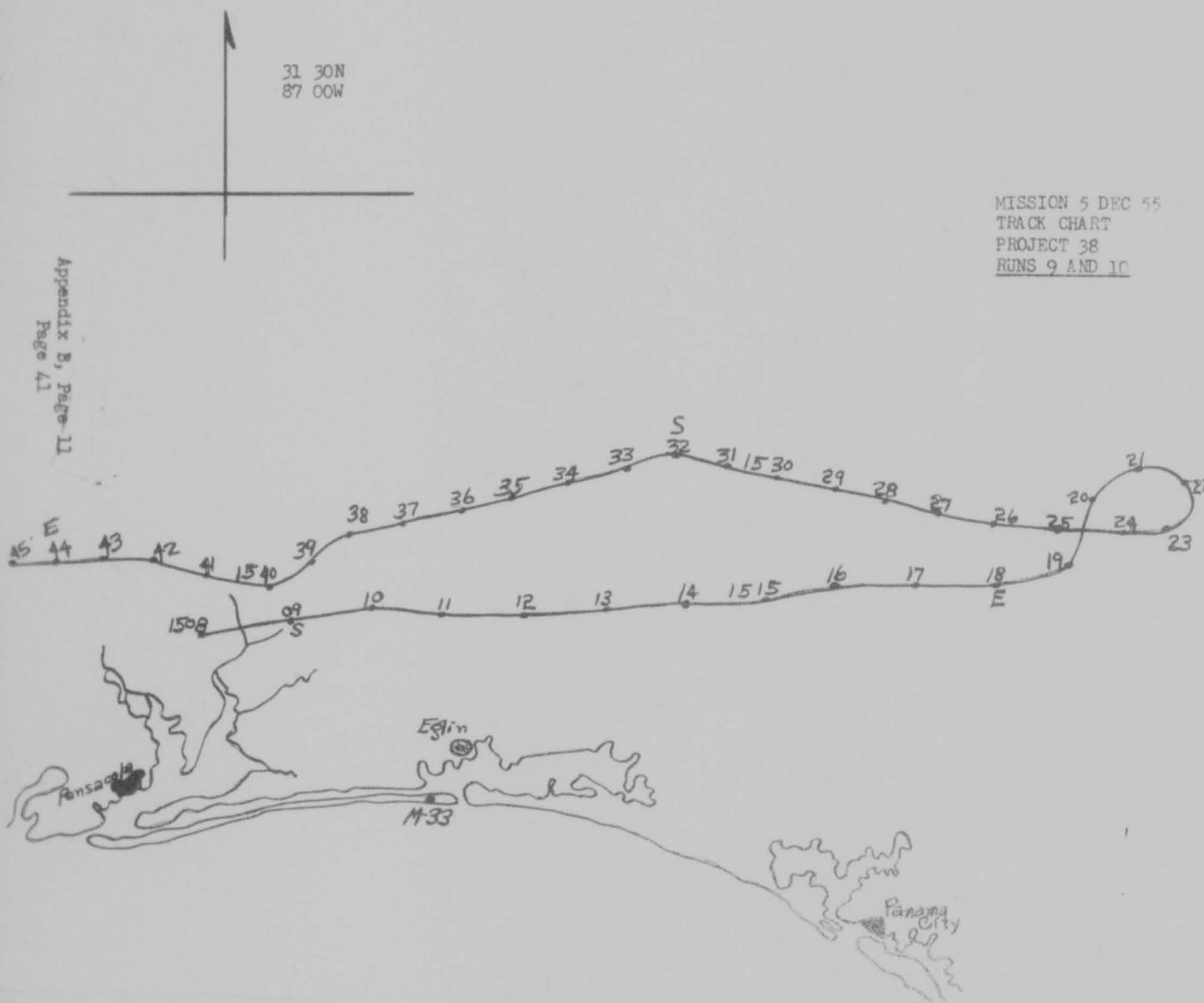
MISSION 5 DEC 55
TRACK CHART
PROJECT 38
RUNS 9 AND 10



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3. Mission, 21 December 1955, Operator's Log.

0816-0820	Aircraft coming in on Run 1. Not picked up. No jamming. ALQ-7 on. Frequency of radar near maximum (9600 mc).
0820¼	Target seen. Trying to lock-on. No jamming.
0820½	Target being tracked in aided-range. Getting flashes of jamming indicating ALQ-7 transmitter passing through radar frequency. Jamming does not affect tracking.
0822-0832	Lowering and raising frequency of radar. No jamming at all. Target tracked with ease. End of Run 1.
0832-0833	Jamming present. Effectiveness not recorded.
0834	Aircraft in turn. No jamming. Target being tracked.
0834½-	Very strong jamming. Target lost. Target blip not seen in jamming.
0835-3/4	Elevation operator trying to use "system" learned on mission of 5 December. System does not work. Jamming does not stop with large changes in elevation angle.
0836	Jamming disappeared. Target still lost. Start of Run 2.
0836½-0843	Operators using system now and it is working. Only time target is being tracked is when there is no jamming. Operators assume they cannot see target through jamming.
0843	Target tracked to maximum range of radar. End of Run 2.
0843-9847½	Aircraft in turn. Target not tracked. No jamming. Start of Run 3.
0848-0852-3/4	Target picked up and tracked part time with no jamming through use of system. Jamming appears to be inferior to what it was on previous runs. Operators still assume, however, that target cannot be tracked through jamming.
0853-0855½	System not being used now. Radar frequency being changed. Causes jamming to disappear until frequency change is over. Operators can keep ALQ-7 lost most of time by merely changing frequency. End of Run 3.
0855-3/4-0857	Operators have now discovered they can track target through jamming in full auto. Very small target blip appears on top of jamming periodically but is very hard to see.
0857	Target lost momentarily. Short flashes of jamming seen.
0858	Target reacquired. Auto track. Jamming flashes still being seen. Start of Run 4.
0858½-0905	Radar frequency lowered. Steady jamming appeared. Auto tracking. Jamming appears about ½ to 3/4 as high as main bang. Target blip not seen through jamming most of time. Jamming signal strength seems to be less than on previous runs.
0905	Changing radar frequency. Jamming flashes appeared again.
0906	Lowered radar frequency continuous jamming now. Target tracked through jamming.
0907-0918	Out of radar range. End of Run 4. Aircraft making turn.
0918½	Start of Run 5. Jamming present. Trying to get on target.
0919	Target reacquired. Manual track. Jamming appearing periodically as short flashes.
0919½	Raised radar frequency. Jamming now continuous. Tracking through jamming in aided range tracking.

SECRET

0920-0928	Tracking target full time. Changing radar frequency causes ALQ-7 to stop continuous jamming. During change jamming appears as periodic flashes of very short duration. When frequency is held constant, jamming is continuous, however, target can be tracked through it. Aided range tracking. End Run 5.
0928-0939	Target out of radar range. Jamming appearing, however, from time to time when radar is pointed in direction of target. Start of Run 6.
0939½-0951	Target acquired and tracked through jamming with aided range. ALQ-7 can be kept from jamming most of time (approximately 90%) by continuously changing frequency of radar. When frequency change is stopped, ALQ-7 lock-on and jams radar. Target can be seen from time to time through jamming and can be tracked in aided range. Jamming 3/4 to ½ as high as main bang. End of Run 6.
0951½-0957	Out of radar range. Jamming present from time to time when radar is pointed in direction of aircraft. Start of Run 7.
0958-1010	Same conditions as at 0939½-0951. Also noted that ALQ-7 will not lock-on radar frequency and jam continuously when radar frequency is at full maximum. End of Run 7.
1010-1021	Out of radar range. Jamming appearing from time to time. Start of Run 8.
1022-1038	Same conditions as at 0939½-0951. Also noted this aided range is not always accurate. Since target blip is not seen full time, proper range rate is hard to maintain and have noted that range notch not on target at all times but often only near target. Frequency change still causes ALQ-7 to cease jamming. End of Run 8.
1038½-1042½	Out of radar range. No jamming seen. Start of Run 9.
1043-1055	Same conditions as at 0939½-0951. Again noted that radar range only approximately correct. At full maximum frequency of radar, jamming not continuous but have periodic flashes of jamming. End of Run 9.
1055½-1101	Out of radar range. No jamming seen. Start of Run 10.
1101½-1115	Same jamming conditions as usual in that jamming could be tracked through in aided range. At long ranges it becomes very difficult for range operator to keep range correct. Changing frequency causes ALQ-7 to cease jamming. Jamming returns when frequency change is over. End of Run 10. End of mission.

(SECRET)

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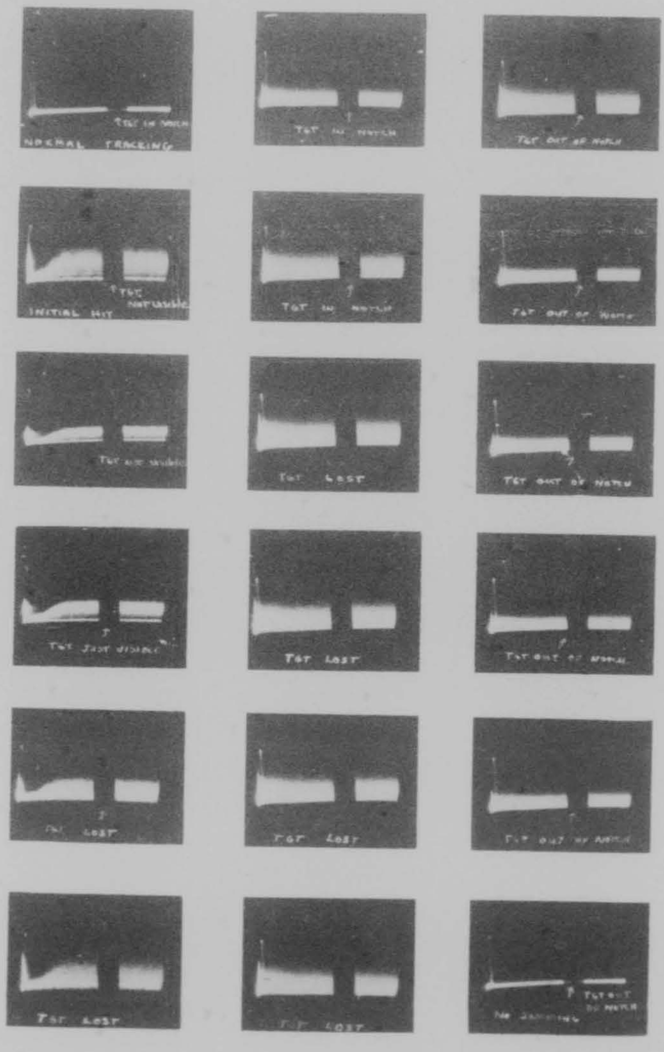
MISSION 23 BMC 55 AGAINST M-33 RADAR

THESE PICTURES WERE MADE CONSECUTIVELY AND COVER APPROXIMATELY TWO SECONDS OF OPERATION DURING THIS TIME THE TARGET MOVED OUT OF THE RANGE NOTCH OF THE RADAR.



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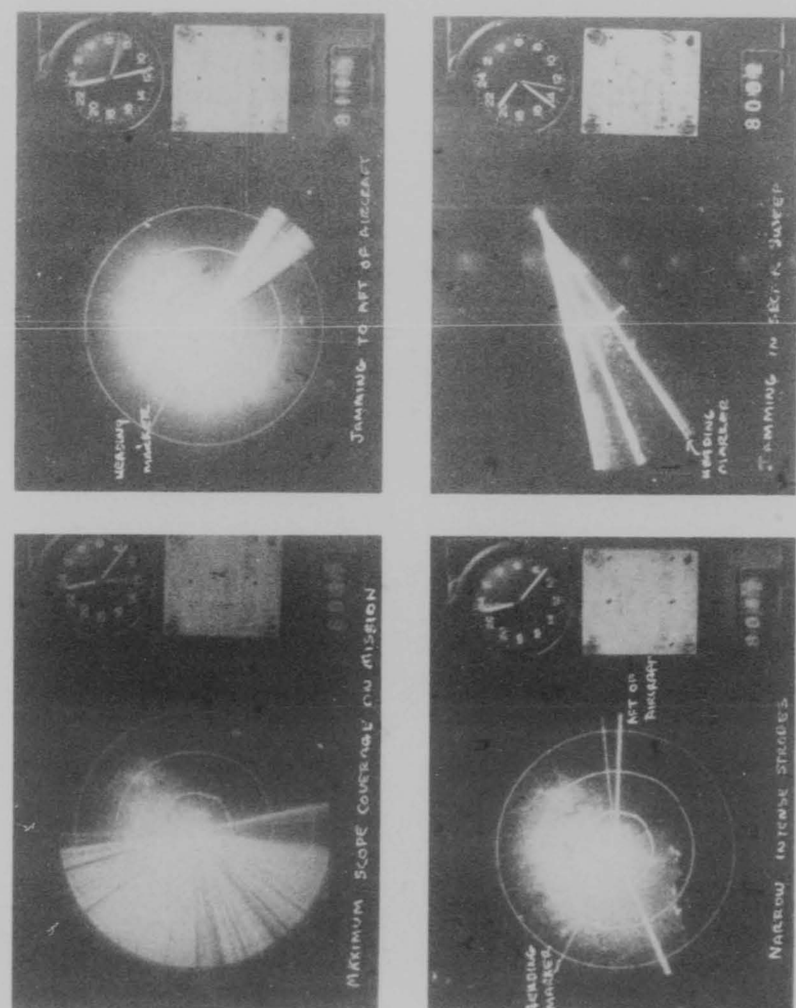
MISSION 21 DECEMBER 1955

INTERFERENCE TO K-4A BOMB/NAV SYSTEM BY AN/ALQ-7 IN SAME AIRCRAFT



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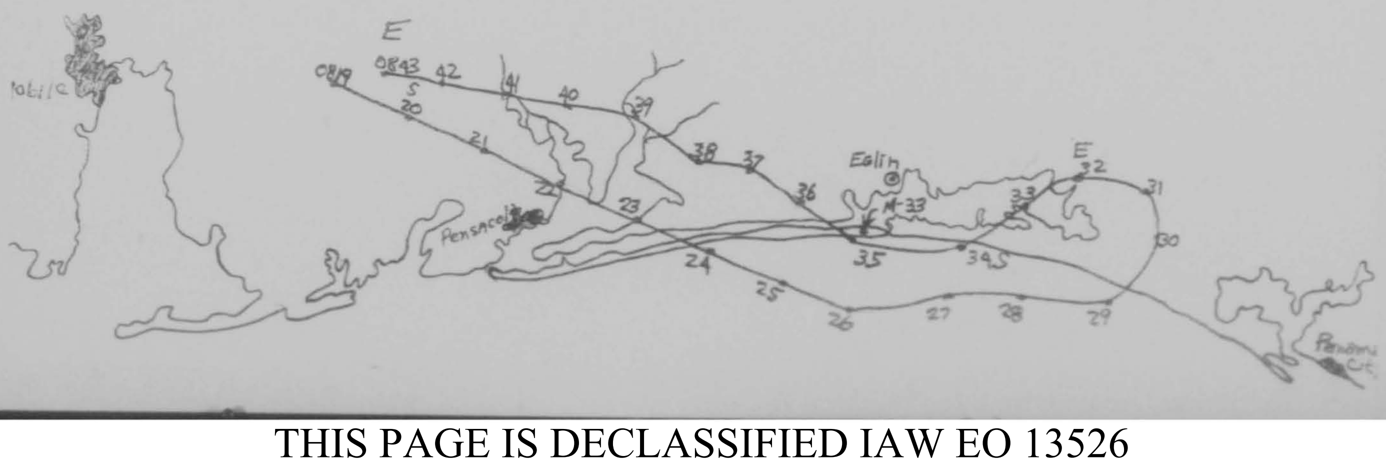
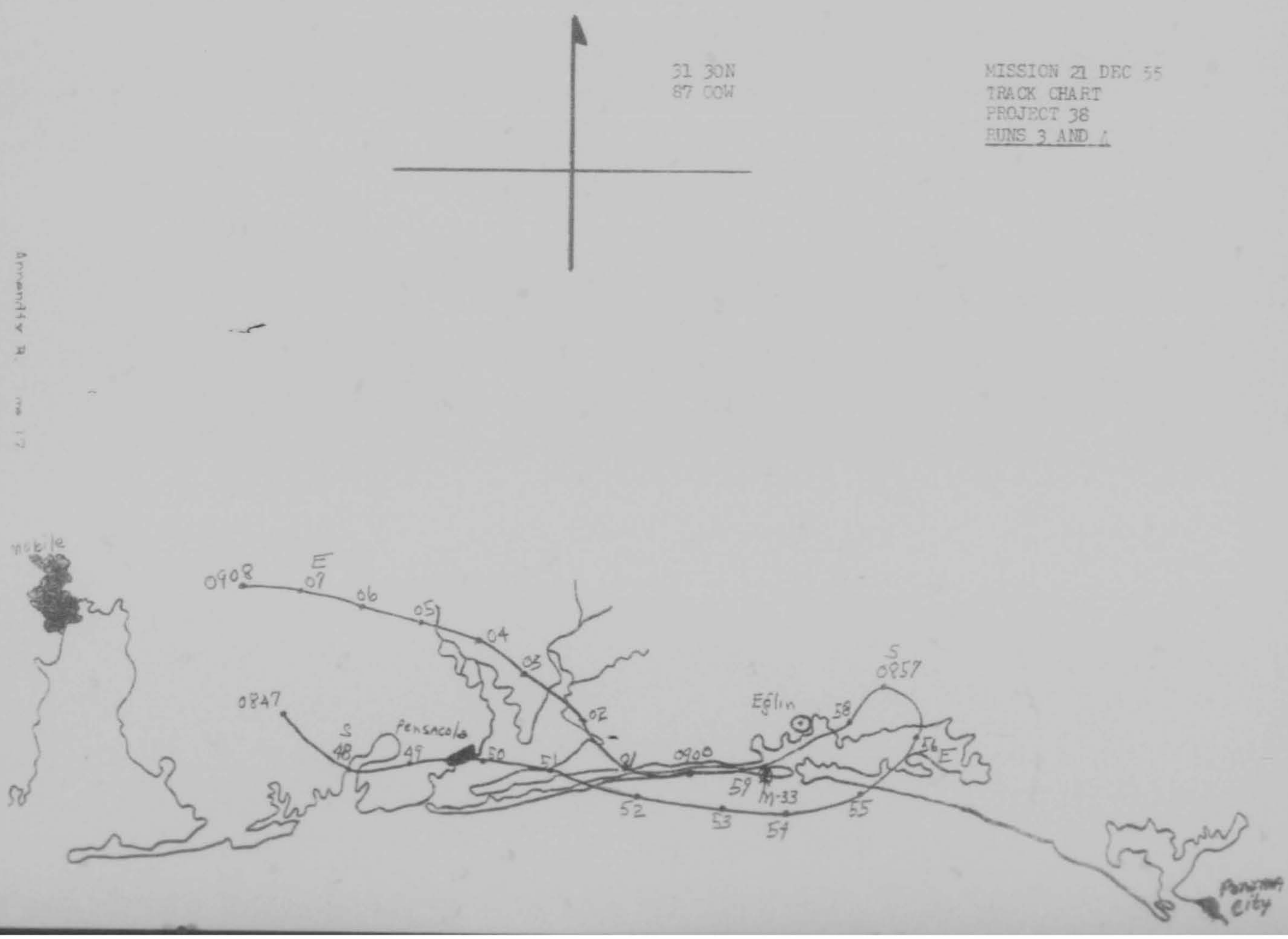
MISSION 21 DEC 55
TRACK CHART
PROJECT 38
RUNS 1 AND 2





MISSION 21 DEC 55
TRACK CHART
PROJECT 38
<u>RUNS 3 AND 4</u>

Appendix B

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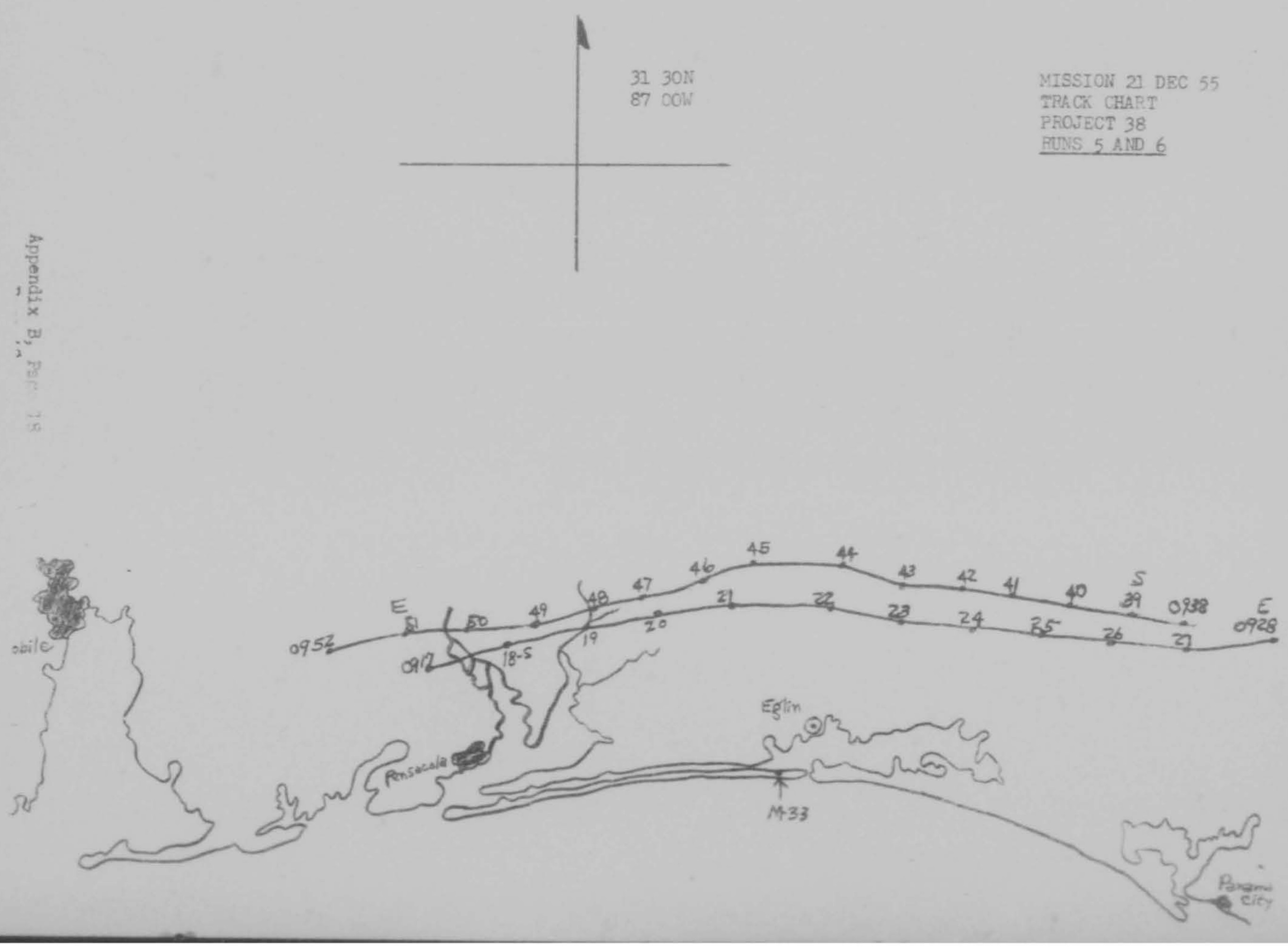

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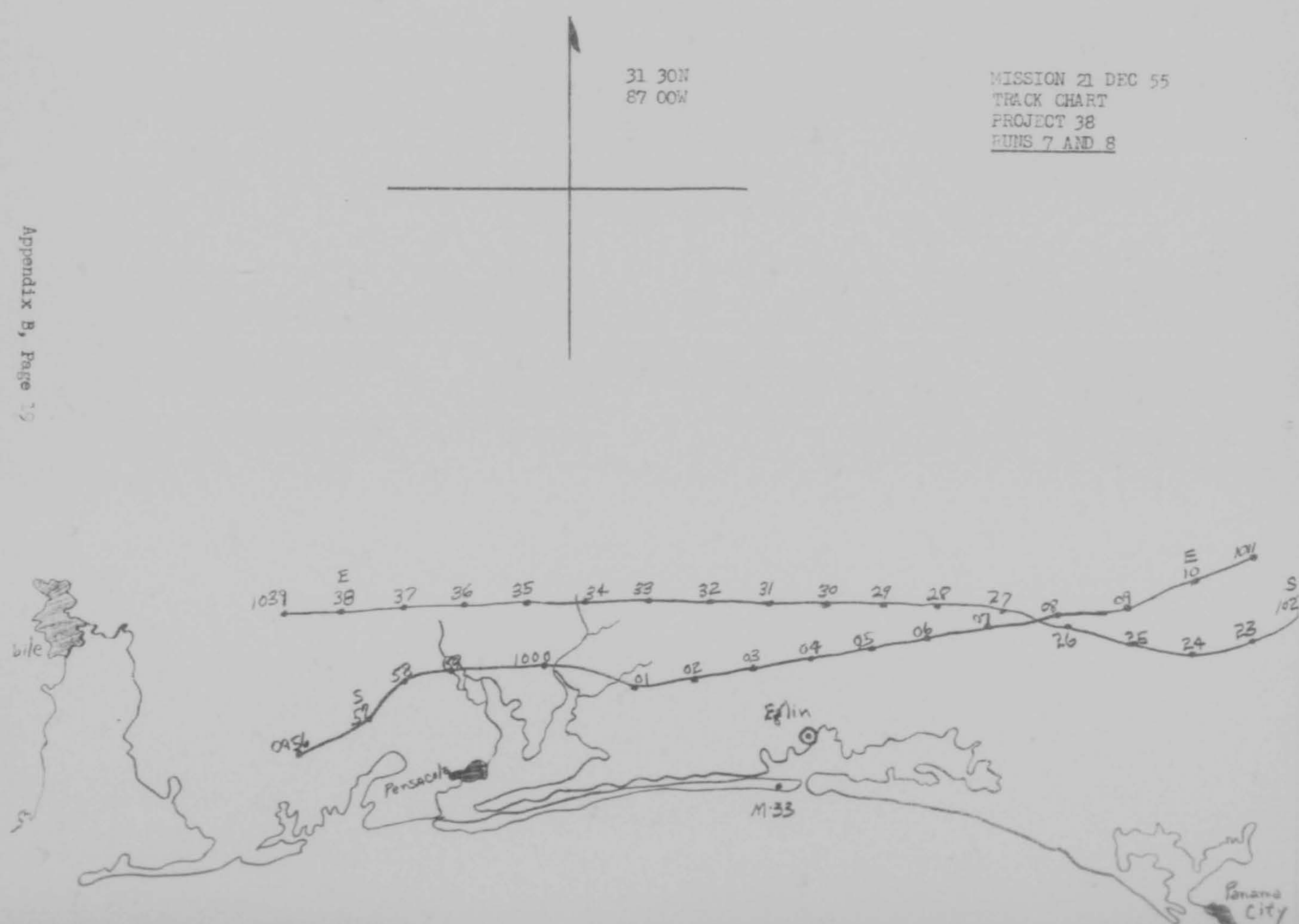
MISSION 21 DEC 55
TRACK CHART
PROJECT 38
RUNS 7 AND 8



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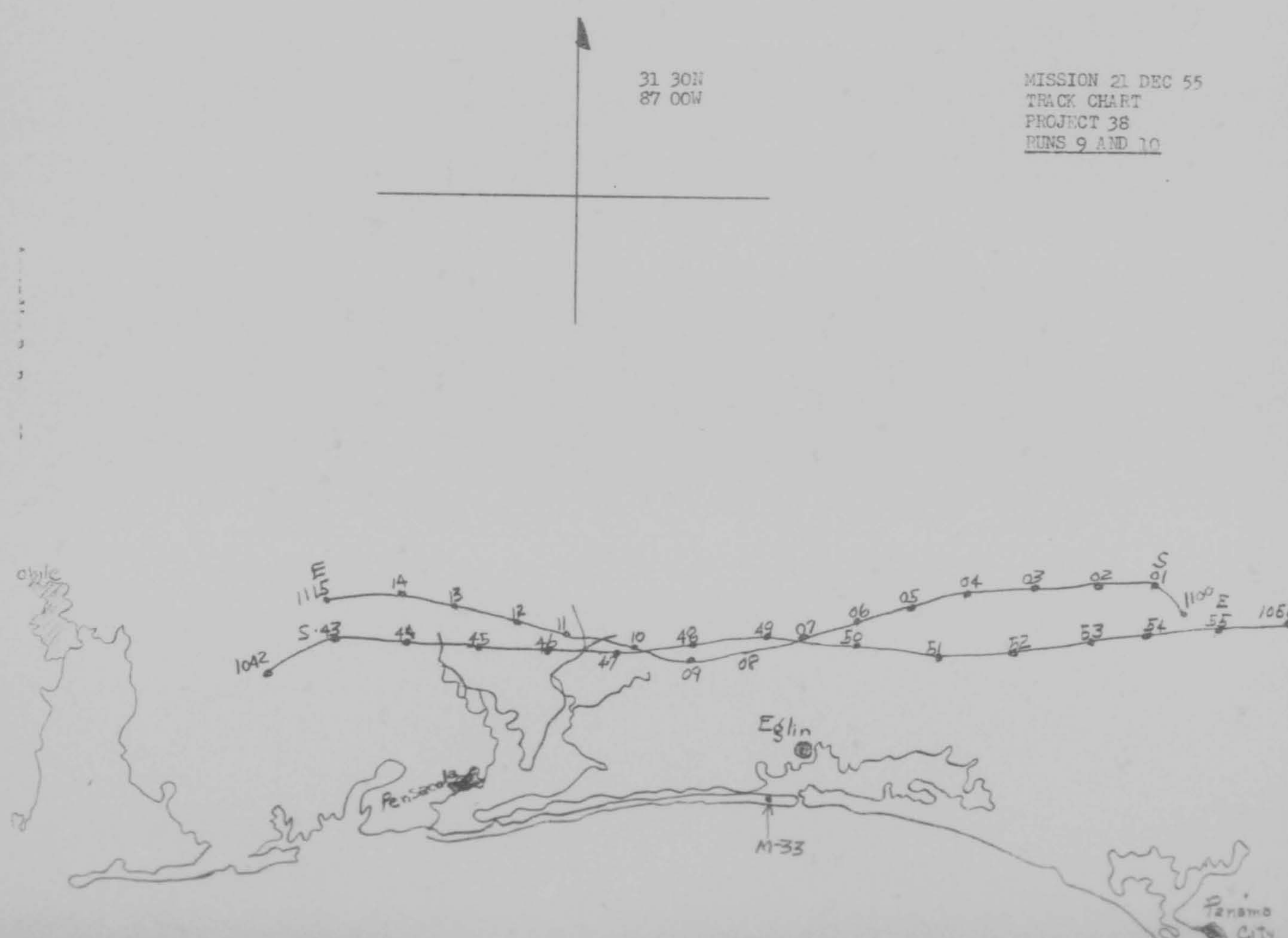

MISSION 21 DEC 55
TRACK CHART
PROJECT 38
RUNS 9 AND 10

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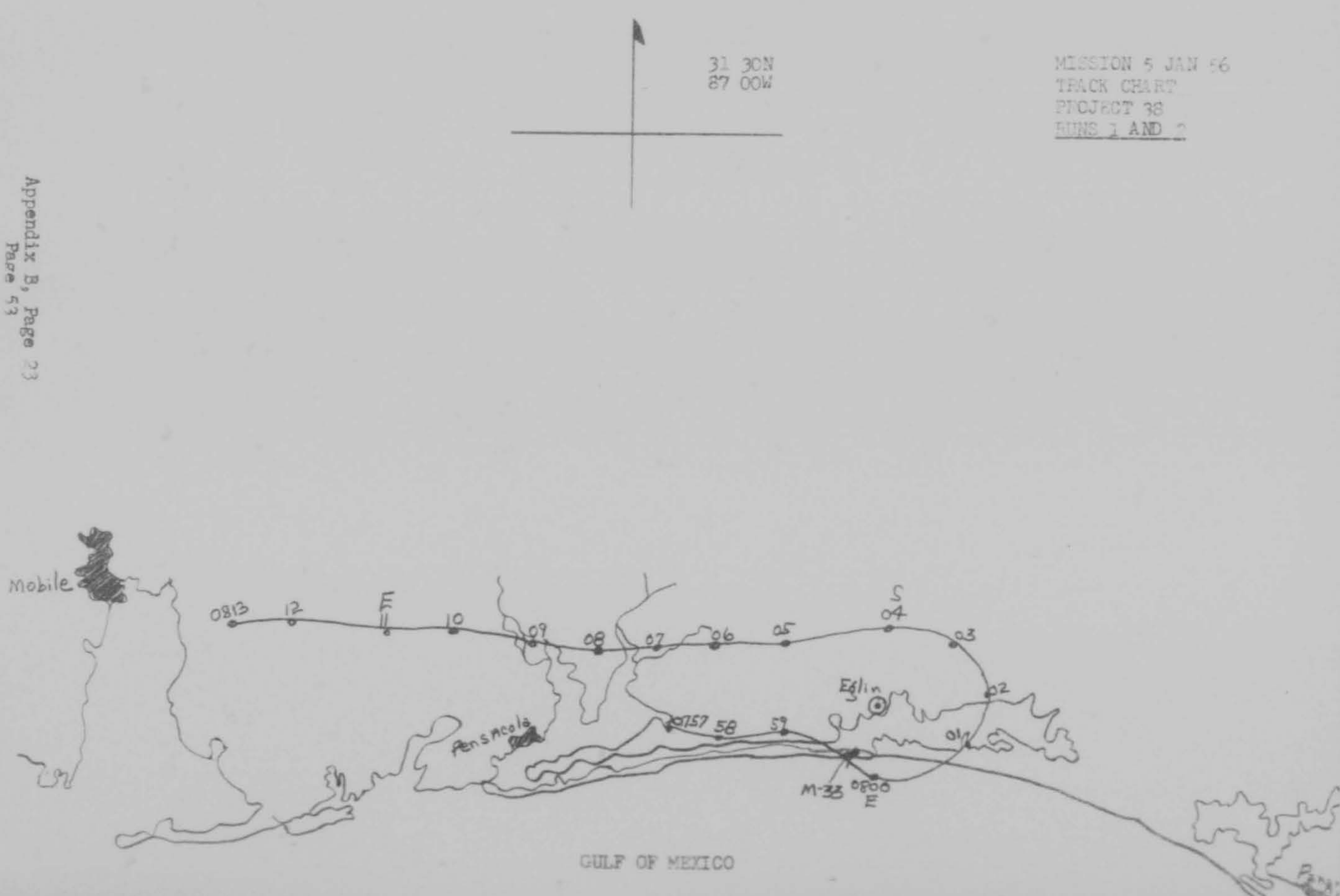
4. Mission, 5 January, Operator's Log.

0800	Target picked up. Run 1 already over.
0800-0804	Target turning for Run 2. Jamming present but operators tracking target through it in aided range.
0804-0811	Run 2. Operators using system of tracking target with no jamming. Elevation operators moved radar off, then back on target causing ALQ-7 to cease jamming. About 10 seconds later jamming appeared and process was repeated. System not necessary as radar can track target through jamming. End of Run 2.
0811-0819	Target not tracked. Target turning for Run 3.
0819½-0821	Start of Run 3. No jamming. ALQ-7 off. Aided range.
0821-0823	Operators experimenting with MGC and AGC. With AGC they can track through jamming. With MGC jamming looks entirely different. Lose target in MGC.
0823	AGC being used. System being used. Operators confident now with experience.
0823½-0824½	While tracking target, radar frequency being changed. ALQ-7, if previously locked-on, remains locked-on and operators lose target. If ALQ-7 not previously locked-on, it locks-on in a few seconds and cannot be kept lost by continuously changing frequency.
0824-3/4	Jamming very strong (about height of main bang). Aircraft at short range.
0825	Aircraft lost. No target. No jamming.
0826-0828/3/4	Target tracked. Aided range. Jamming magnitude lower now. Changing frequency of radar now but cannot lose ALQ-7. Also note that range usually somewhat in error when system is used to lose ALQ-7. Range operator has great difficulty keeping it correct. End Run 3.
0828-3/4-0832½	Target turning for Run 4. Target tracked. Aided range. Continuous but weak jamming (½ height of main bang). Range operator can keep on only approximate range as he is having difficulty seeing target blip.
0832-3/4-0841-3/4	Run 4. Target tracked. Aided range. Jamming 1/3 to 1/2 height of main bang. Range data questionable. Range is checked for accuracy by stopping jamming (moving off target in elevation). Target blip then shows up plain and is usually inaccurate (up to 250 yards off). Most of trouble believed to be operators fault. System works as usual allowing tracking of aircraft without jamming about 80% of time. End of Run 4.
0842-0850½	Target turning for Run 5. No target. No jamming.
0850-3/4-0854	Run 5. Target tracked. Aided range. System being used due to inability of range operator to keep on target through jamming. Noted that other personnel could see target through jamming much better than range operator. Fatigue may be a factor here. End of Run 5. (SECRET)

0854½-0857	Target lost. No jamming.
0857-0901	Target tracked. Aided range. Jamming 1/3 height of main bang. Still getting inferior range tracking.
0901-0902	Changed range operator. New operator doing much better. Target tracked. Aided range. Tracking through continuous jamming.
0902½-0908	Target lost. Out of range. No jamming.
0908½-0920	Run 6. Target tracked. Aided range. Continuous jamming 1/3 height of main bang. Optics show azimuth and elevation errors of about plus-minus 1 mil. At shorter ranges range operator tracked very accurately. At longer ranges error may occasionally go to plus-minus 100 yards. System used occasionally to check range. End of Run 6.
0920½-0930	Target lost. Out of range. No jamming. Turning for Run 7.
0930-0941	Run 7. Target tracked. Aided range. System used at times during run. Frequency of radar changed at times; however, ALQ-7 tracked change satisfactorily. At long ranges jamming ¼-1/3 height of main bang (weak). Jamming much stronger at close ranges and system does not work, or changing radar elevation angle does not lose ALQ-7. Range operator has increasing difficulty tracking through jamming with increasing range due to decreasing size of target return.
0941½-0949	Target lost. Out of range. No jamming. Turning for Run 8.
0949-0953½	Run 8. Target tracked. Aided range. Jamming 1/3 height of main bang. Range operator having difficulty staying exactly on target at times and complains of mechanical trouble with hand wheel. System being used at times but not necessary.
0954-0955	Target tracked, full automatic tracking. Target shows up fine through jamming.
0955-1001	Target tracked. Aided range. Jamming ¼ height of main bang (weak). System used at times for variety but not necessary.
1001-1010	Target lost. Out of range. End of Run 8. No jamming. Turning for Run 9.
1010-1020	Run 9. Target tracked. Aided range. Jamming still weak. System being used from time to time. Optics show excellent azimuth and elevation tracking. Tried changing frequency of radar to lose ALQ-7. ALQ-7 tracks frquency change satisfactorily. End of Run 9.
1020	Target lost. Out of range. End of mission. (SECRET)

MISSION 5 JAN 56
TRACK CHART
PROJECT 38
RUNS 1 AND 2



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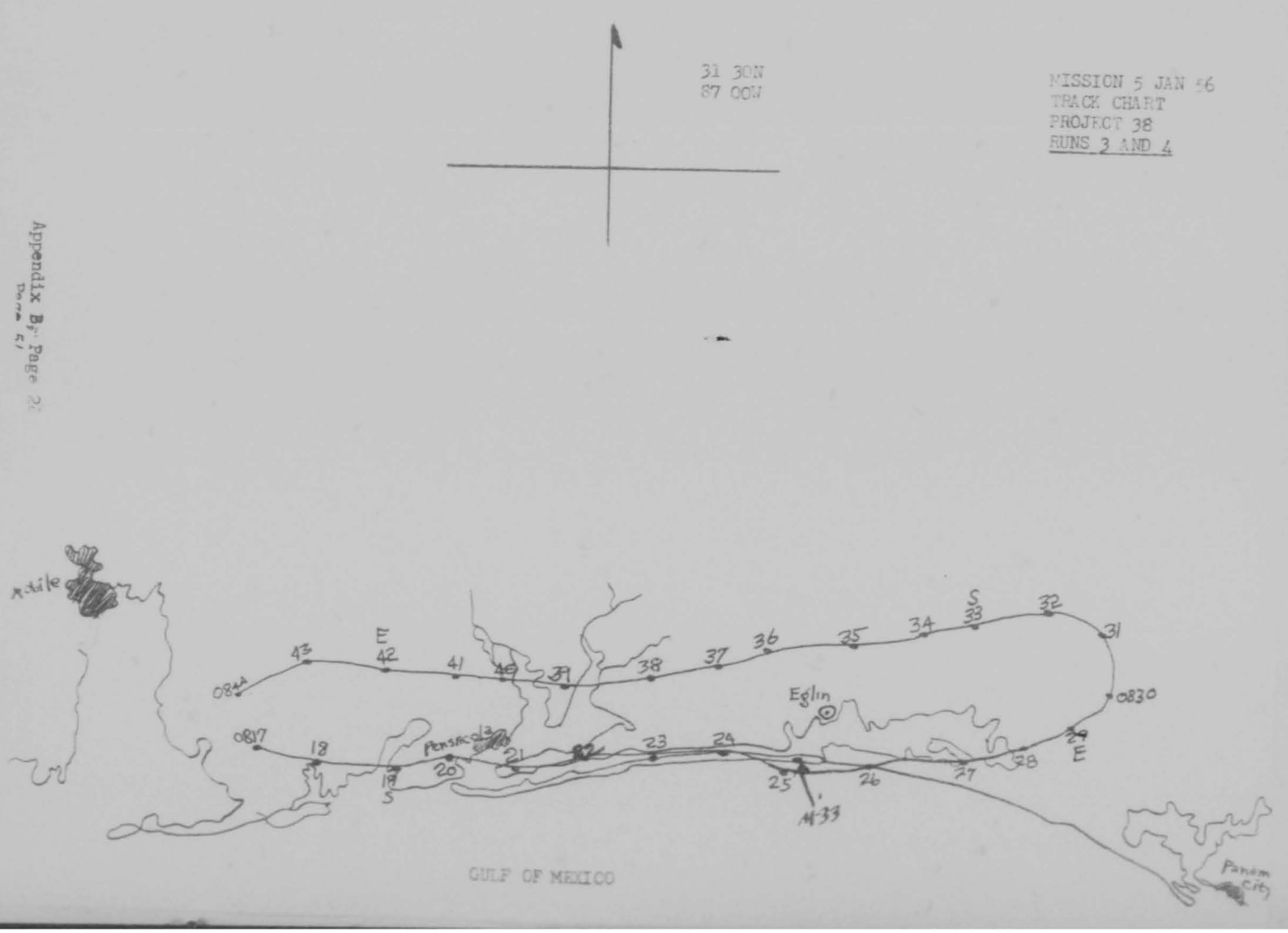

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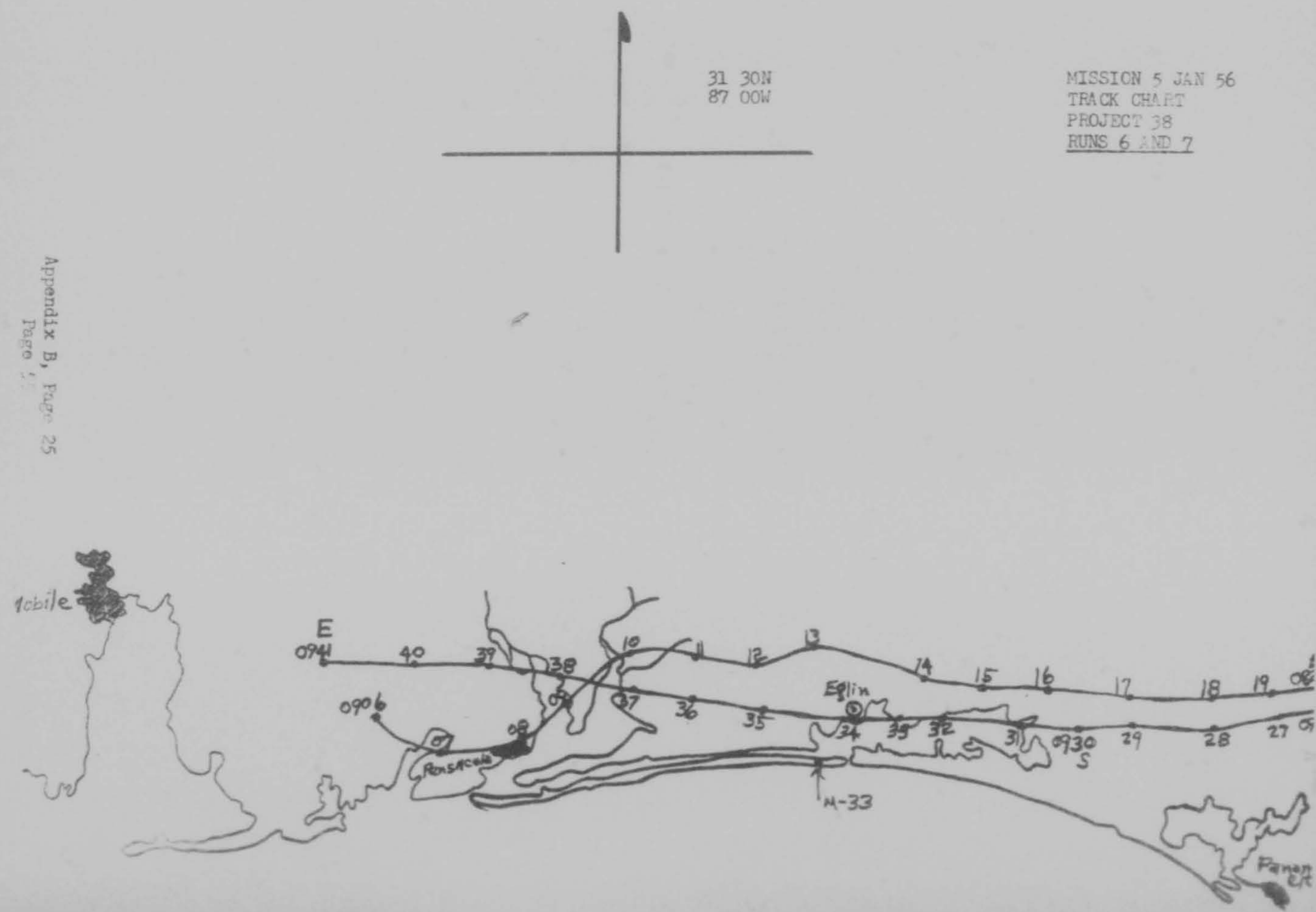
MISSION 5 JAN 56
TRACK CHART
PROJECT 38
RUNS 6 AND 7



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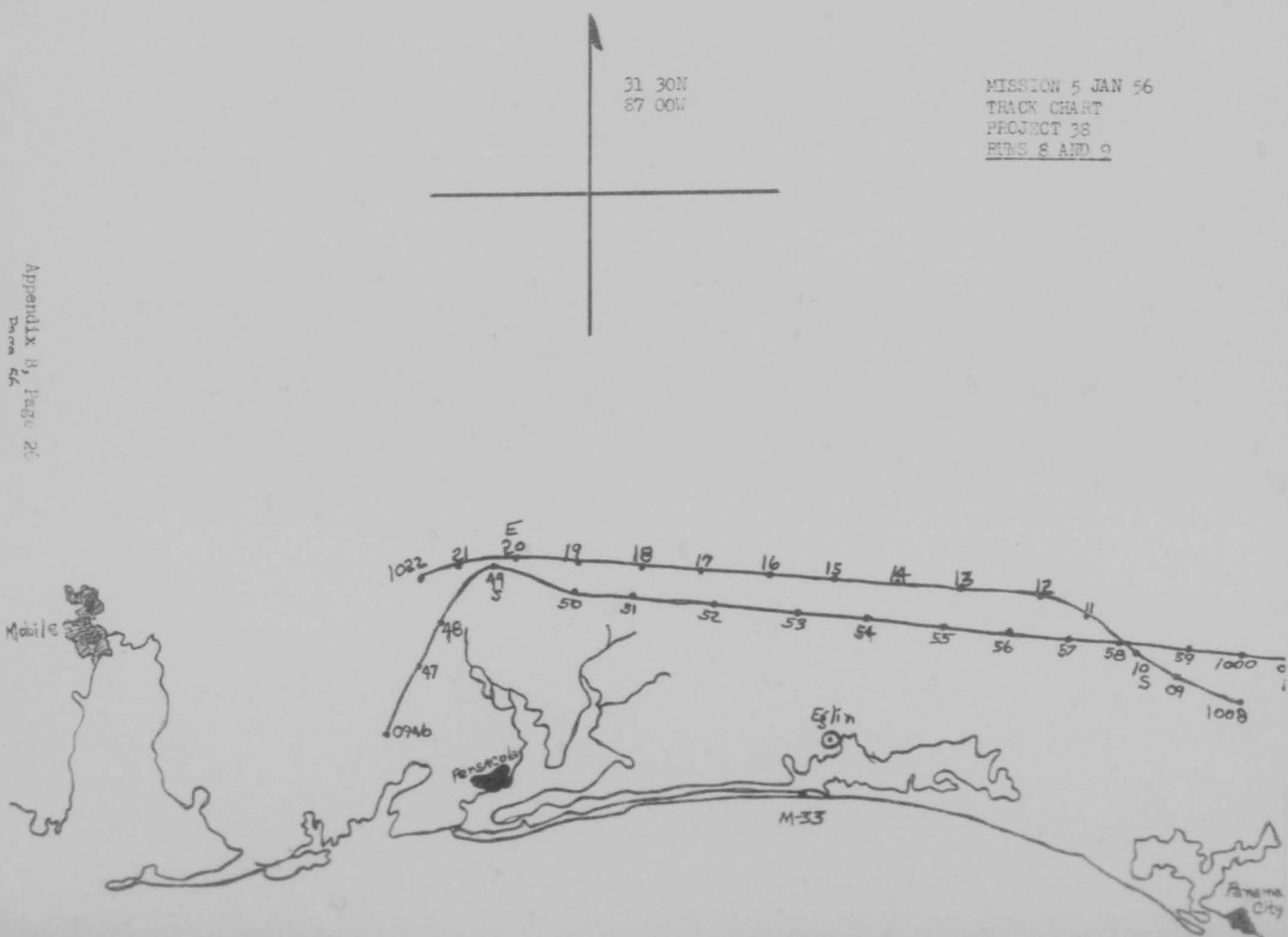

MISSION 5 JAN 56
TRACK CHART
PROJECT 38
RUNS 8 AND 9

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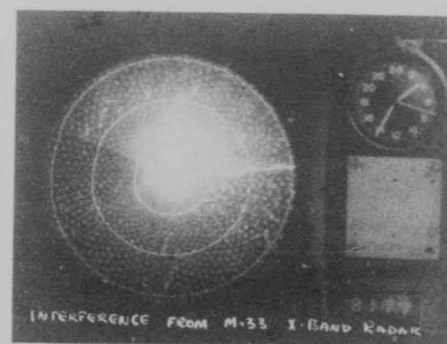
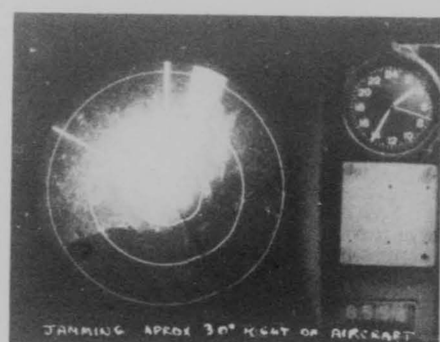
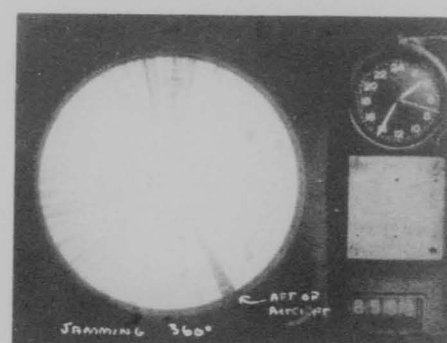
MISSION 5 JAN 56

INTERFERENCE TO K-4A BOMB/NAV
SYSTEM BY AN/ALQ-7 IN SAME ACFT

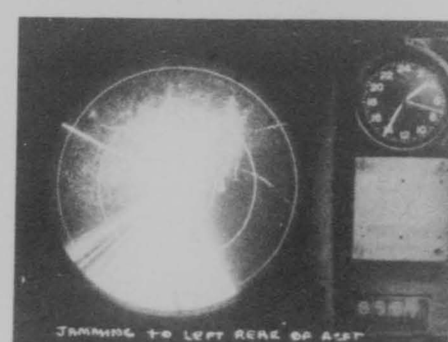

INTERFERENCE FROM M-33 X-BAND RADAR


JAMMING APROX 30° RIGHT OF AIRCRAFT



JAMMING 360°


JAMMING IN AFT QUADRANT


JAMMING TO LEFT REAR OF ACFT

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5. Mission, 6 March 1956, Operator's Log.

1127 Picked up jamming signal. Target not seen, only jamming. Base line not well defined at all on A-scopes. Magnitude of jamming in upward direction from base line is weak (barely above grass), however, magnitude of jamming downward from base line is much greater. Since target is not visible, operators have no indication of aircraft's position. 35mm camera taking pictures of A-scope.

1128 Jamming disappeared. Radar not illuminating aircraft. Aircraft close overhead.

1129½ No jamming, no target. Radar still not illuminating aircraft.

1131½ No jamming, no target. Radar still not illuminating aircraft.

1132 Asked Demon Control (FPS-3) for aircraft position. Still no jamming operation as radar is not illuminating aircraft.

1133 Located aircraft on S-band acquisition radar PPI scope. X-band tracking radar slewed to approximate range and azimuth of target. Jamming started immediately. Target not seen at all due to jamming interference.

1134 Jamming appearing now only part of the time due to elevation operator moving quickly off target in elevation in order to make ALQ-7 go into search phase. Elevation operator quickly reacquires target and radar tracks target with no jamming for about 7 to 10 seconds. Jamming then reappears. Target cannot be seen in range notch during jamming operations. Jamming magnitude upward is small, downward is much larger. Base line not sharply defined.

1135½ Same conditions as 1134.

1137 Starting Run 2. Jamming present. Operators are now seeing target through jamming. Jamming magnitude upward is still weak. Base line is separated so that there is a clear space free of jamming between lower base line and jamming above. Azimuth and elevation operators in automatic operation and range operator in aided range. Quality of data questionable as target not seen continuously through jamming and when seen is not always at correct range.

1138 Jamming still present. Target lost in jamming. Elevation operator cannot make ALQ-7 go into search phase by moving off target in elevation since aircraft is close to radar and is continuously illuminated.

1139 Jamming disappeared. Aircraft completely lost by radar.

1141 Still lost. Aircraft apparently passing overhead.

1142 Aircraft still lost. No target, no jamming.

1143 Located target on acquisition radar PPI. Trying to get track radar on it.

1144 Jamming present. Looks same as before. Target being seen periodically in 500-yd notch. Target being followed in aided range. Tracking data very poor as target moves back and forth throughout 500-yd notch without operator being able to keep target in center.

1145 Same conditions as at 1144. Elevation operator again causing ALQ-7 to go into search phase by moving off target, then reacquiring. Several seconds delay after reacquiring before jamming recurs.

1147 Jamming still present. Target no longer seen through it. Target at long range.

1148 ALQ-7 malfunctioned. End of test. (SECRET)

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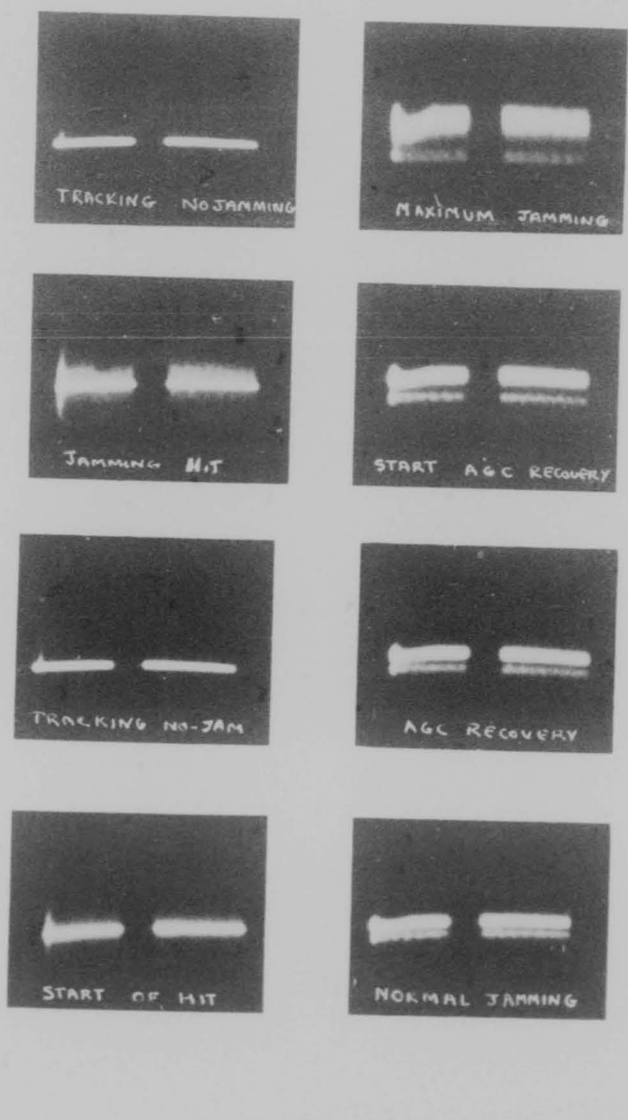
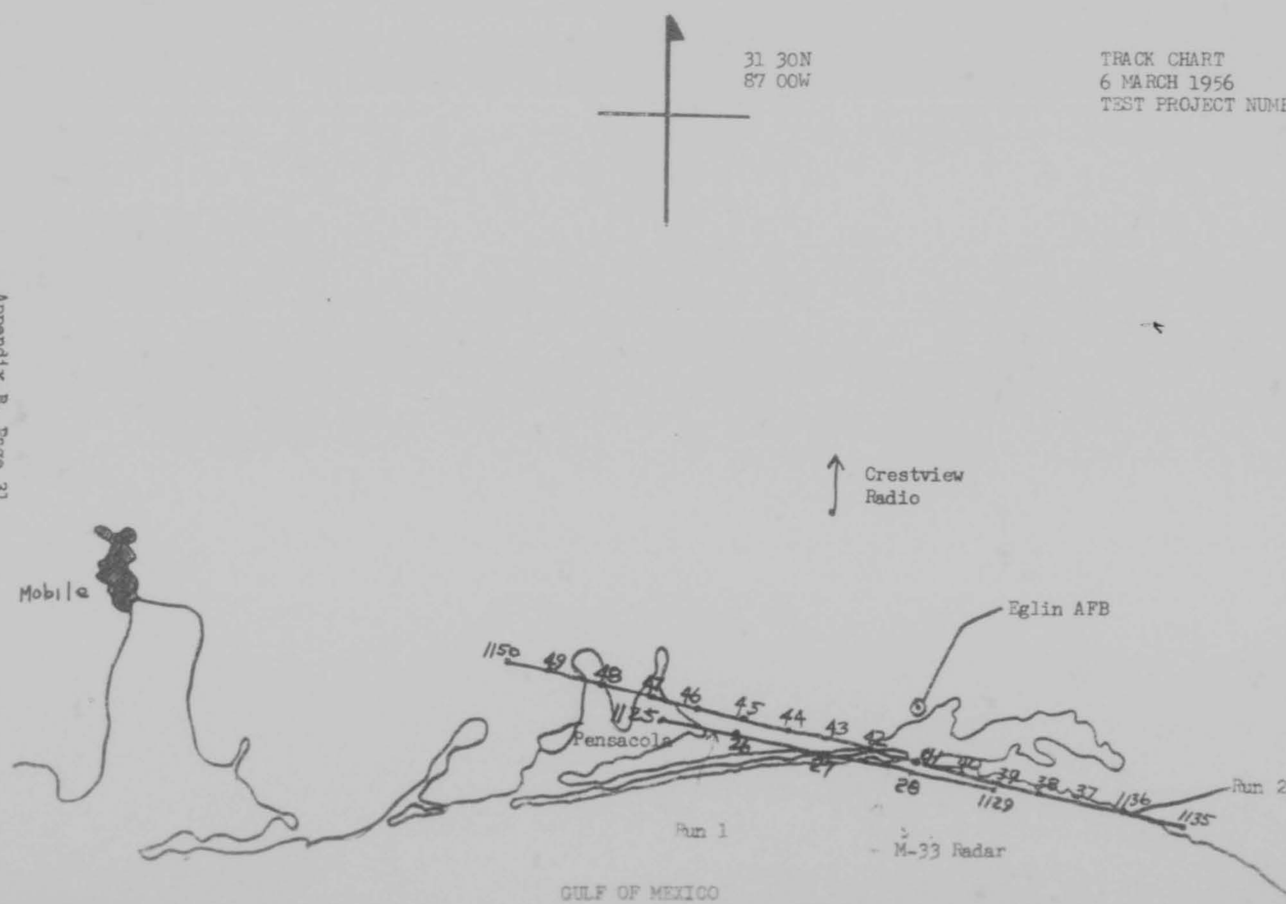
MISSION 6 MAR 56 AGAINST M-33 RADAR



SECRET

TRACK CHART
6 MARCH 1956
TEST PROJECT NUMBER 38



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6. Mission, 9 March 1956, Observer's Log.

1110	Demon Control (FPS-3) was called to find present position of aircraft. No jamming, no target.
1111	Jamming present. Did not see target prior to start of jamming. Magnitude and intensity of jamming is high. Base line completely obliterated on A-scopes with jamming going both directions from where base line should be. No chance at all of seeing a target through the jamming.
1111½	Jamming disappeared. Target has not yet been seen.
1112	No jamming, no target.
1112½	Jamming present again. Target not seen. Jamming is very strong. Base line gone. Jamming going both directions, up and down. No chance of seeing target through jamming. Elevation operator trying to cause ALQ-7 to start searching by changing elevation of radar, but cannot cause ALQ-7 to stop jamming by this method. Operators have no idea of position of target. 35mm pictures being taken.
1113	Jamming disappeared. No target.
1115	No jamming, no target.
1115½	Getting jamming from time to time. Looks same as before. Target never seen.
1116-1124	No jamming, no target. Operator in aircraft says that ALQ-7 has malfunctioned.
1124-1204	Tracking aircraft in full automatic operation. No jamming. ALQ-7 malfunctioned.
1205	End of test. (SECRET)

TEST PROJECT 58 MISSION, 9 MAR 58

ALQ-7 OPERATORS LOG

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	ALQ-7 RCVR LOCK YES	ALQ-7 RCVR LOCK NO	ALQ-7 XMTR JAM YES	ALQ-7 XMTR JAM NO	REMARKS CONCERNING ALQ-7
1 (Phase A rerun later)	A	1536	1538	OFF	ON	X		X		Jammed for 10-15 sec at end of run, freq. of 9200mc. Rcvr temporarily locked on several tim after that without staying on long enough for xmtr to tune to rcvr and jam.
	B	1539	1541	ON	OFF	X			X	Rcvr locked on temporarily several times. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
2	A	1550	1552	OFF	ON	X		X		Locked on and jammed several times at freq. of 9200 mc.
	B	1553	1555	ON	OFF	X		X		Locked on and jammed for three 10-sec periods.
3	A	1600	1602	OFF	ON	X		X		Locked on and jammed for a period of 10-sec.
	B	1603	1605	ON	OFF	X		X		Locked on and jammed for two 6 or 7 second periods.
4	A	1618	1620	OFF	ON		X		X	Receiver did not lock on.
	B	1622	1624	ON	OFF	X		X		Rcvr temporarily locked on once but did not stay locked on long enough for xmtr to tune to rcvr and jam.
5	A	1626	1628	OFF	ON	X			X	Rcvr temporarily locked on several times. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
	B	1628½	1630½	ON	OFF	X		X		Locked on and jammed for 20-sec. at start of pha
6	A	1633½	1635	OFF	ON		X		X	Rcvr did not lock on.
	B	1637	1639	ON	OFF	X			X	Rcvr temporarily locked on twice. Did not stay locked on long enough for xmtr to tune to rcvr and jam.
7	A	1642	1644	OFF	ON		X		X	Rcvr did not lock on.
	B	1645	1648	ON	OFF	X			X	Rcvr temporarily locked on several times but di not remain locked on long enough for xmtr to tun to rcvr and jam. Rcvr finally locked on and xm jammed for 5-sec. period.
1 (Rerun of Phase A)	A	1650	1653	OFF	ON	X		X		Locked on and jammed for 6-sec. period, two 15-sec. periods, and one 10-sec. period.
	B									

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TEST PROJECT 38 MISSION 9 MAR 56
TARGET AIRCRAFT -PILOTS LOG

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	REMARKS CONCERNING APG-32
1 (Phase A rerun later)	A	1536	1538	OFF	ON	APG-32 not working properly. Apparently not warmed up yet.
	B	1539	1541	ON	OFF	
2	A	1550	1552	OFF	ON	Locked on aircraft carrying ALQ-7 prior to start of phase. Whe[illegible] jamming started APG-32 lost target immediately and went into sear[illegible] Phase. Sweep or jizzle band saturated with vertical jamming str[illegible] in corkscrew-like pattern. Target blip completely disappears du[illegible] jamming. By pressing action switch on hand control (stopping ra[illegible] search), jamming disappears. Target then reacquired. After s[illegible]ral seconds, jamming reappears and process is repeated.
	B	1553	1555	ON	OFF	
3	A	1600	1602	OFF	ON	Same as Run 2 Phase A.
	B	1603	1605	ON	OFF	
4	A	1618	1620	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1622	1624	ON	OFF	
5	A	1626	1628	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1628½	1630½	ON	OFF	
6	A	1633½	1635	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1637	1639	ON	OFF	
7	A	1642	1644	OFF	ON	Target blip not seen. No jamming evidenced. Aircraft believed to be out of antenna pattern of APG-32.
	B	1645	1648	ON	OFF	
1 (Rerun of Phase A)	A	1650	1653	OFF	ON	Same as Run 2 Phase A.

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TEST PROJECT 38 MISSION, 9 MAR 56
TARGET AIRCRAFT OBSERVERS LOG

RUN	PHASE	START TIME	END TIME	APS-23	APG-32	O-15 FRAME NO. START	O-15 FRAME NO. END	REMARKS CONCERNING APS-23
1 (Phase A rerun later)	A	1536	1538	OFF	ON			
	B	1539	1541	ON	OFF	1116	1133	Weak interference aft of aircraft
2	A	1550	1552	OFF	ON			
	B	1553	1555	ON	OFF	1134	1153	Weak interference aft of aircraft and beyond target range of APS-23. Antijam circuit in operation frames 1150 and 1151.
3	A	1600	1602	OFF	ON			
	B	1603	1605	ON	OFF	1154	1179	Very little to no interference.
4	A	1618	1620	OFF	ON			
	B	1622	1624	ON	OFF	1180	1228	Very little to no interference.
5	A	1626	1628	OFF	ON			
	B	1628½	1630½	ON	OFF	1229	1252	Very little to no interference.
6	A	1633½	1635	OFF	ON			
	B	1637	1639	ON	OFF	1253	1270	Very little to no interference.
7	A	1642	1644	OFF	ON			
	B	1645	1648	ON	OFF	1271	1308	Very little to no interference.
1 (Return of Phase A)	A	1650	1653	OFF	ON			

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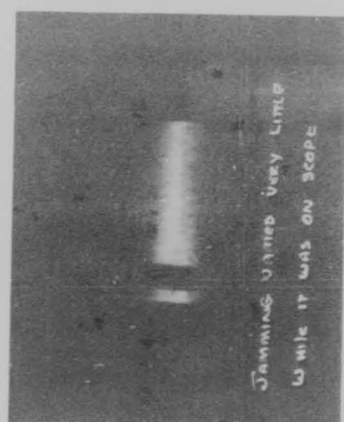
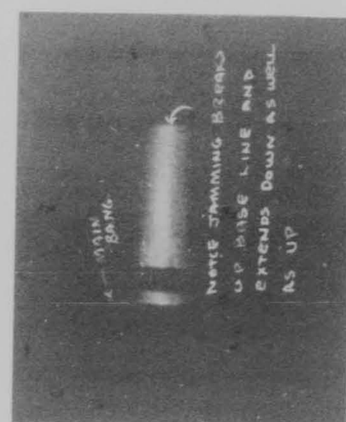
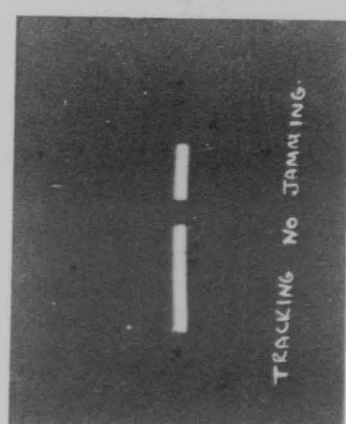
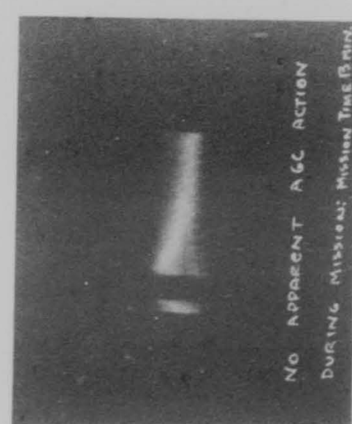
MISSION 9 MAR 56 AGAINST M-33 RADAR









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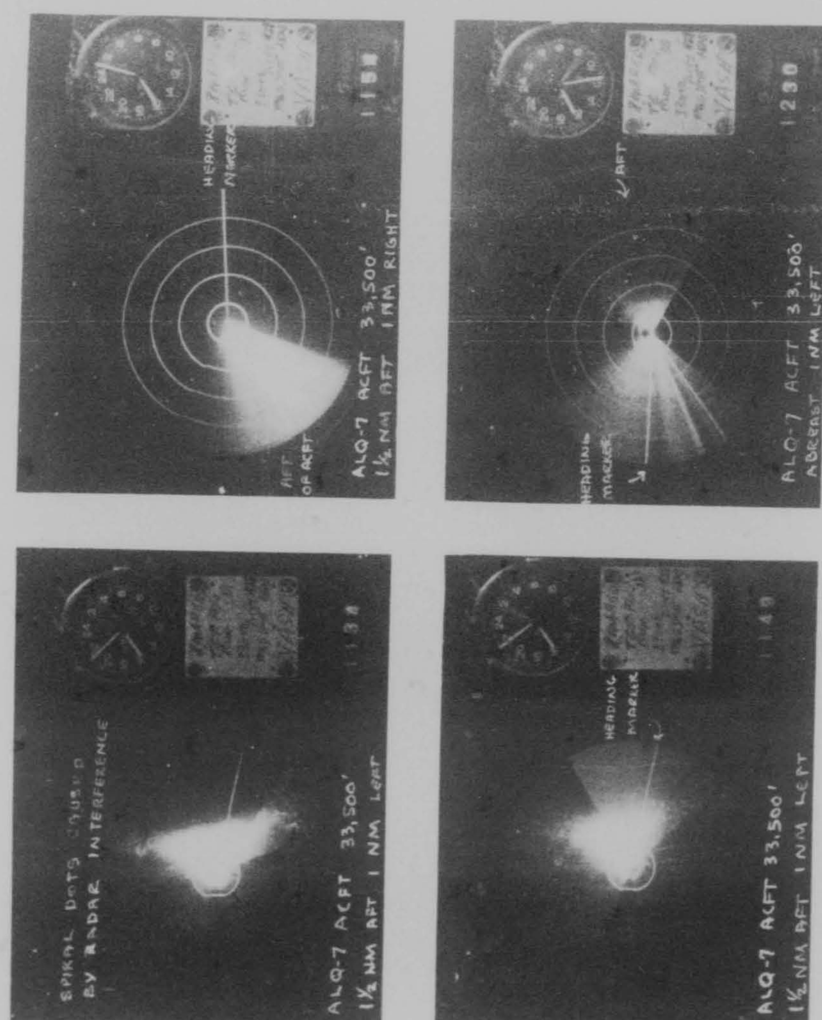
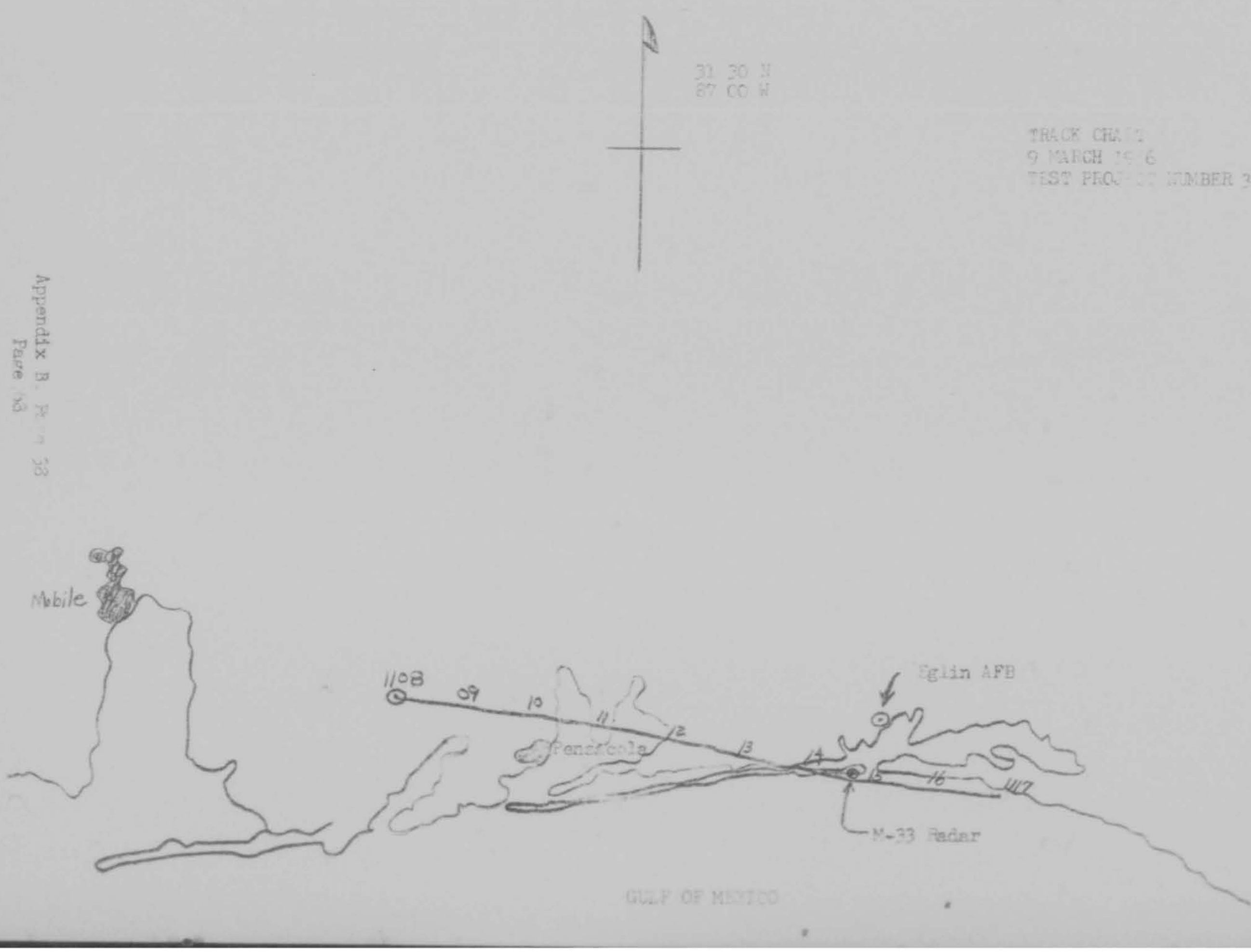
MISSION 9 MARCH 1956

INTERFERENCE TO K-4A BOMB/NAV
SYSTEM BY AN/ALQ-7 LOCATED IN ANOTHER
AIRCRAFT



TRACK CHART
9 MARCH 1956
TEST PROJECT NUMBER 38



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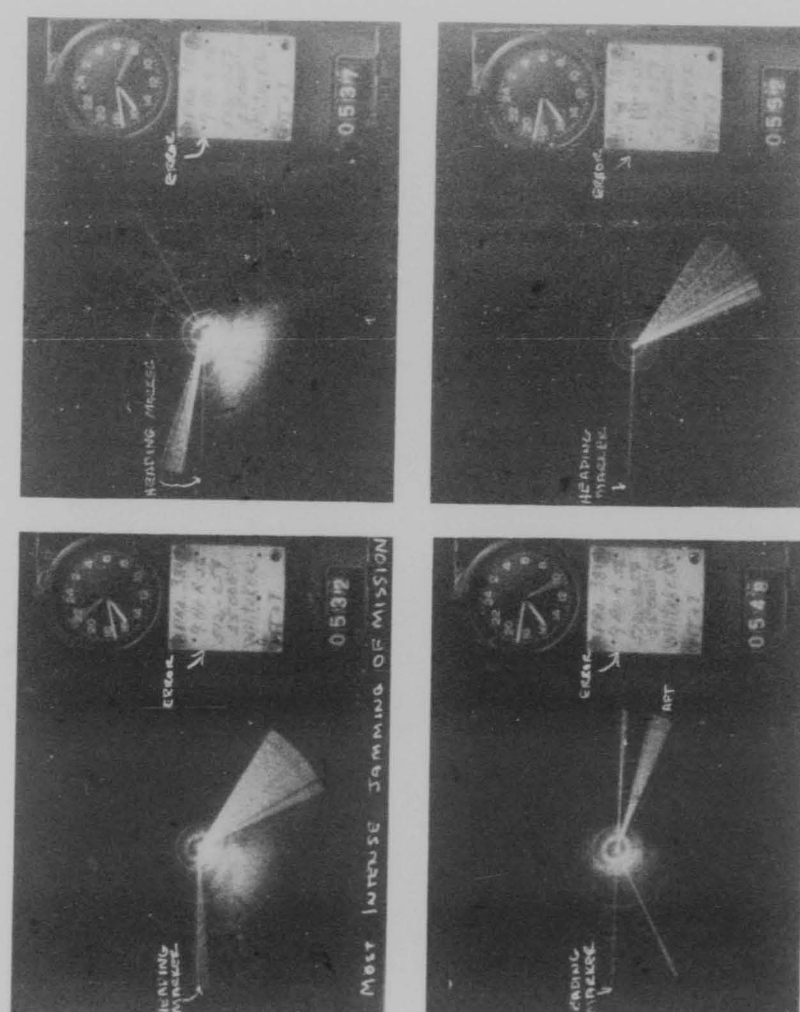
MISSION 6 APRIL 1956 SECRET

INTERFERENCE TO K-4A BOMB/NAV SYSTEM BY AN/ALQ-7 IN SAME AIRCRAFT



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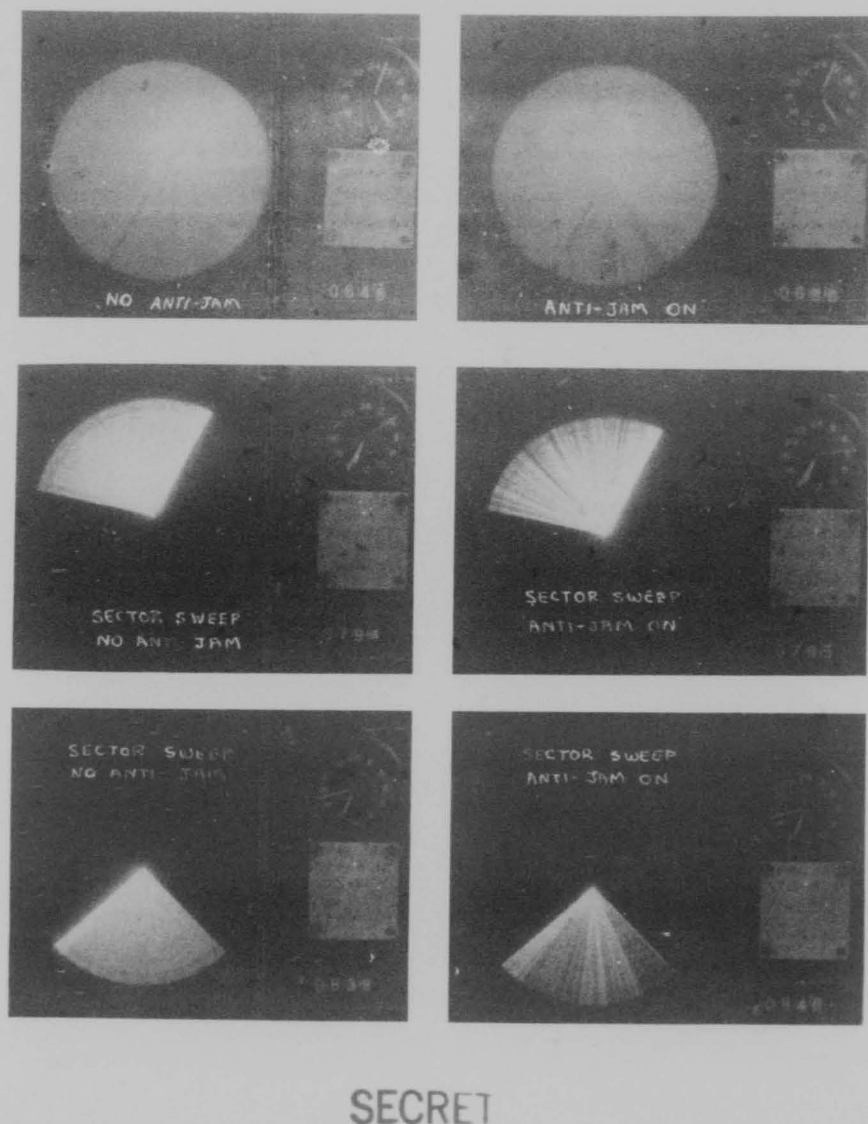
GROUND INTERFERENCE TEST
K-4A BOMB/NAV SYSTEM



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APPENDIX C

LABORATORY AND GROUND TEST

1. Laboratory Tests: These tests were performed in the 376DCTT Labratory. (SECRET) (UNCL)

a. This test was to determine the accuracy of the dial calibrations on the sector limit controls as well as the operation of the sector limits. A signal generator (TS-622U) Serial 754 was set up at 250 MC intervals, as shown, and first the lower and then the upper limit controls were adjusted until the receiver locked on the signal. The limit control readings were taken for both upper and lower limit adjustments. (SECRET)

SIGNAL GENERATOR FREQ (MC)	LOWER LIMIT (MC)	UPPER LIMIT (MC)	LOWER LIMIT ERROR (MC)	UPPER LIMIT ERROR (MC)
7500	7500	no rejection	0	-
7750	7850	7550	100	200
8000	8100	7825	100	175
8250	8350	8150	100	100
8500	8600	8500	100	0
8750	8850	8875	100	125
9000	9100	9175	100	175
9250	9350	9450	100	200
9500	9650	9800	150	300
9750	9900	10050	150	300
10000	10175	10300	175	300
10250	10450	10500	200	250
10500	10750	10700	250	200
10750	11050	10850	300	100
11000	SIGNAL GENERATOR LIMIT			

b. The minimum PRF control on the receiver was set at each of its positions and the PRF signal generator was varied until the receiver rejected the signal. The PRF was then recorded. Finally, the test was repeated using the maximum PRF control. (SECRET)

MINIMUM PRF CONTROL SETTING (CPS)	PRF REJECTED (CPS)	PRF ERROR (CPS)	MAXIMUM PRF CONTROL SETTING (CPS)	PRF REJECTED (CPS)	PRF ERROR (CPS)
[illegible]	94	6	-	-	-
[illegible]	345	45	300	-	-
1000	1000	0	1000	1000	0
2000	1850	150	2000	1860	140
3000	2900	100	3000	3100	100
4000	4000	0	4000	4100	100
6000	5100	900	6000	5000	1000

SECRET

c. This test was for the purpose of determining the accuracy of the minimum and maximum pulse width controls on the AIQ-7 receiver. The minimum pulse width control was set in each of its positions and the width of the pulse was varied until the receiver accepted the pulse. The width of the pulse was then recorded. The maximum PRF control doesn't work, so no record could be made. (SECRET)

MINIMUM PW SETTING (μSEC)	PW ACCEPTED (μSEC)	PW ERROR (μSEC)
.75	.75	0
1.25	1.2	0.05
1.75	1.85	0.10
3.25	3.5	0.25
4.75	4.8	0.05
6.25	5.0	1.25
50	NO TEST	-

d. The duration control indications were checked against a stop watch to determine accuracy of settings. Only the receiver was tested. The transmitter was turned off. (SECRET)

DURATION CONTROL SETTING (SEC)	TEST TIME No. 1 (SEC)	TEST TIME No. 2 (SEC)	TEST TIME No. 3 (SEC)
3	2.2	2.2	2.2
5	4.3	4.3	4.3
7	6.3	6.35	6.35
9	8.3	8.4	8.4
11	10.3	10.3	10.3
13	12.5	12.5	12.5
15	14.6	14.5	14.5
17	16.6	16.6	16.6
19	18.7	18.7	18.7
21	21	20.7	20.7

e. The sequence control settings on the receiver were checked against a stop watch for accuracy. (SECRET)

SEQUENCE CONTROL SETTING (SEC)	TEST TIME No. 1 (SEC)	TEST TIME No. 2 (SEC)	TEST TIME No. 3 (SEC)
10	11.6	11.7	11.5
20	23.3	23.3	23.2
30	35	35	34.5
40	46.6	46.6	46.4
50	58.2	58.3	58.3
60	69.9	70.1	68.8
70	81.8	82.0	81.0
80	90.3	93.5	93.5
90	101.7	103.4	105.5

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f. This test was run to determine the sweep speed of the receiver while searching and while slewing. The full band width of the equipment was used (7500 to 11,000 mc). Since the receiver will sweep at two different speeds (i.e. slower at a PRF of 100), both speeds were checked. The slew speeds are the same in both cases. (SECRET)

TYPE OPERATION	TEST TIME No. 1 (SEC)	TEST TIME No. 2 (SEC)	TEST TIME No. 3 (SEC)	AVERAGE TEST TIME (SEC)
Slew	2.5	2.5	2.6	2.53
Normal Search	6.4	6.5	6.5	6.47
Slow Search	15.7	15.9	15.6	15.73

g. The purpose of this test was to determine how far from the victim signal the center frequency of the jamming appeared. The ALQ-7 was operated normally with the victim signal being the output of a signal generator: TS-622U Signal Generator and TS-148UP Spectrum Analyzer were used. (SECRET)

SIGNAL GEN FREQUENCY (MC)	FREQUENCY ERROR (MC)
9200	0
9300	1
9400	0
9500	0.5
9600	0.5

h. The purpose of this test was to determine the power output of the ALQ-7 transmitter. The power output was measured with a cubic calorimeter. Power output variation on test was probably due to use of different Klystrons. Three tests were run on the dates indicated. Three test were run on the dates indicated. (SECRET)

	POWER IN WATTS		
FREQUENCY MCS	28 NOV	11 JAN	30 APR
9200	198	218	275
9250	225	-	-
9300	240	260	320
9350	253	-	-
9400	265	285	325
9450	183	-	-
9500	208	300	275
9550	243	-	-
9600	278	320	320
9650	295	-	-
9700	310	348	335
9750	260	-	-
9800	268	353	320
9850	295	-	-
9900	305	350	325
9950	315	-	-
10,000	255	350	290
10,100	-	318	315
10,200		330	340
10,300		333	345

FREQUENCY MCS	POWER IN WATTS		
	28 NOV	11 JAN	30 APR
10,400		328	325
10,500		300	345
10,600		298	310
10,700		285	335
10,800		260	305

1. The purpose of this test was to determine the accuracy of the frequency calibrations on the frequency meter located on the Control Indicator. (SECRET)

FREQUENCY MCS	INDICATOR	ERROR
9200	9050	150
9300	9150	150
9400	9250	150
9500	9300	200
9600	9400	200
9700	9500	200
9800	9650	150
9900	9750	150
10,000	9850	150
10,100	10,000	100
10,200	10,100	100
10,300	10,200	100
10,400	10,300	100
10,500	10,450	50
10,600	10,550	50
10,700	10,700	0
10,800	10,850	50

2. Ground Test: This test was performed to determine if the aircraft alternators and control circuits were operating within their limits, and the effects of loading the alternators with the ALQ-7. The voltages were measured with two model 433 Weston Voltmeters. There was no indications of voltage or frequency transients. The ALQ-7 performed satisfactorily during this test. The following test results were obtained. (CONFID)

NO LOAD CONDITIONS:

ENGINE # 1 ALT.			ENGINE # 2 ALT			BOTH ALT		
PHASE	VOLTAGE	FREQ	PHASE	VOLTAGE	FREQ	PHASE	VOLTAGE	FREQ
A	117½	409	A	119½	409	A	119	409
B	118	409	B	120	409	B	119½	409
C	117	409	C	115	409	C	119	409

LOAD CONDITION: Loaded with ALQ-7 - Both alternators on the line. The engines were checked with speed variations on both engines as well as synchronized. Readings were the same and are as follows: (SECRET)

PHASE	VOLTAGE
A	119
B	119½
C	119

APPENDIX D

AN/ALQ-7 TROUBLES AND SUGGESTED IMPROVEMENTS

The following major causes for malfunctions during this test project are submitted together with some recommended changes to the equipment. They do not represent a cure-all for system malfunctions, but it is felt that these are the major contributing factors to the unreliability of the AN/ALQ-7 system. (SECRET)

1. Transmitter: The beam current regulator for the klystrons is not capable of operating at line voltages of 121 volts. At voltages above 119 volts the beam current rises sharply to an overload condition, which may lead to klystron damage. It is believed that this caused some of the airborne malfunctions. The beam current regulator circuit should be modified to accommodate greater line voltage fluctuations. (SECRET)

2. Transmitter lock on: One of jamming deficiencies of the ALQ-7 system has been the time required for the transmitter to tune to the proper frequency after the receiver has located a signal. This can be reduced to zero seconds for a target on the same frequency, or a maximum of two seconds for a target at a different frequency. The transmitter search circuits should be designed so that the transmitter servo will slew to the proper frequency in the direction of the shortest distance to the target. Tuning the transmitter to the proper coarse frequency can be accomplished by the addition of a reference potentiometer to the transmitter servo drive assembly, the output of which can be compared to the output of the receiver potentiometer. After the transmitter is tuned to the coarse frequency, the tracking loop should cause the system to lock on. (SECRET)

3. Receiver: The search track relay is sometimes triggered by noise and because of improper width of the image gate. If the image gate is too short, it doesn't reject all signals which appear in the image band. This characteristic of the receiver allowed the radar operators to develop the "system" of tracking explained in this report. Future systems should have a noise AGC system to control the noise output of the receiver, and a wider image gate. Rewiring in the vicinity of critical circuits would reduce random triggering. It might also be advisable to use a balanced mixer to increase sensitivity and dynamic range. (SECRET)

4. PW Discrimination: Uncertain rejection of pulses which are wider than the setting of the pulse width controls upper limit is the result of distorted pulses appearing at the PW discriminator. The pulses are distorted because they are received at the edge of the IF band pass. This condition can be remedied by delaying the signal accept gate, which will assure that the signal is within the band before it is accepted. (SECRET)

5. Power Circuit: A power relay (Relay F, K1203, Allied Control MHY-12D) located in the primary circuit of the high voltage transformer, malfunctioned several times. It was necessary to replace this relay each time it malfunctioned. The reason for its failure may have been due to the highly

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inductive load present. It was rated for 10 amperes continuous. The relay was finally replaced by a Cutler-Hammer power contactor built to deal with loads of this nature. It is rated at 25 amperes continuous, with sufficient surge rating to handle the system overload condition. Since this contactor was much larger than the replaced relay, it could not be mounted in the same position inside the low voltage power supply and was therefore mounted on the front of the low voltage power supply. (UNCL)

6. Modulator: A number of malfunctions were encountered in which the tubes of the gating and final stages of the modulator had failed. Cause of the tube failures is unknown. It is suggested the unit be re-designed to achieve greater reliability. (CONFID)

7. Liquid Cooler Hoses: The liquid cooler hoses (MIL-H-5511A-8) supplied with the equipment, ruptured during the test program. Evidently these hoses do not have the capacity required by this unit. (UNCL)

8. Plugs: Several sub-miniature plugs are employed as connectors for the plug-in sub-chassis. Some of the plugs, with a large number of pins, tend to fragility and are a potential maintenance problem. It is suggested that a system using either large plugs, or more plugs with fewer pins per plug, be adopted. (UNCL)

9. Interference: In order to prevent the system from locking on the navigation radar, the ALQ-7 should include a frequency reject control which is tied into the frequency indication circuit of the receiver. Setting the control to the frequency of the radar to be protected would enable the receiver to tune past the radar frequency without locking on the signal and jamming. (SECRET)

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FINAL REPORT
TEST PROJECT NUMBER 39
FLIGHT TESTING OF QRC-18(T)

SECRET

6-8287

SECRET

CLASSIFICATION: SECRET
AUTHORITY: COMBOMWG 376
NAME:
DATE: 20 July 1956

HEADQUARTERS
376TH BOMBARDMENT WING MEDIUM
Barksdale Air Force Base
Louisiana

376DCTT

20 July 1956

SUBJECT: (Uncl) Final Report on Test Project Number 39, "Flight Testing of QRC-18(t)

TO: Commander in Chief
Strategic Air Command
Offutt Air Force Base
Nebraska

1. Transmitted herewith is final report on Test Project Number 39, the purpose of which was to determine jamming effectiveness of the AN/ALT-7 transmitter, modified with QRC-18(t), against VHF voice communications. (SECRET)

2. The transmitter, when used as a swept jammer, was found to be ineffective against communications. When used as a spot jammer, the transmitter is capable of jamming a single channel, but this capability is difficult to realize because of the poor setting-on accuracy of available ECM receiving systems. (SECRET)

1 Incl
a/s

for Robert J. Calhoun Col, USAF
STEPHEN D. McELROY
Colonel, USAF
Commander

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SYNOPSIS

This test project was conducted to determine jamming effectiveness of the AN/ALT-7 transmitter, modified by the QRC-18(t), against VHF voice communications. (SECRET)

Thirty-five sweep jamming and 19 spot jamming runs were made in an attempt to jam reception on an airborne R77B/ARC-3 receiver from a 50-watt VHF ground transmitter. (SECRET)

Sweep jamming, using from one to three AN/ALT-7 transmitters modified with QRC-18(t), was not effective against VHF voice communications. (SECRET)

Results of the spot jamming runs indicate the AN/ALT-7 transmitter is apparently capable of spot jamming communications, but the possibility of doing so is limited by narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of available ECM receivers. (SECRET)

SECRET

FINAL REPORT

ON

TEST PROJECT NUMBER 39

FLIGHT TESTING OF QRC-18(t)

SECRET

TABLE OF CONTENT

INTRODUCTION

GENERAL.

This test project was initiated and conducted in accordance with Headquarters ARDC letter RDTDRE-141, dated 1 June 1955, subject: "Flight Testing of QRC-18(t)", subsequent Headquarters WADC, ARDC, SAC and Second Air Force indorsements thereto, and Attachment 8 to Headquarters SAC letter DOPLT, dated 20 February 1956, subject: "Clarification of Operational Procedures of 376th Bomb Wing Test and Tactics Section". Purpose of the test project was to determine jamming effectiveness of the AN/ALT-7 transmitter, modified by the QRC-18(t), against VHF communications. (SECRET)

DESCRIPTION.

The T-464/ALT-7 jamming transmitter is designed as airborne ECM equipment for jamming enemy signals in the frequency range of 24 to 170 megacycles. The transmitter may be used as a spot jammer or swept in frequency over a bandwidth approximately ten percent of the center frequency at a selectable rate between eight and 400 cycles per second. Radio frequency output of the transmitter may be unmodulated, or modulated by narrow band noise or wide band noise, as desired. Minimum power output is 70 watts. (CONFID)

Effectiveness tests of the AN/ALT-7 have shown that the transmitter can be used as a spot jammer against VHF communications but is ineffective when used as a sweep jammer. An effort has been made by WADC and the equipment manufacturer to improve communications jamming effectiveness of the AN/ALT-7 by modification of the transmitter. The modification consists of narrowing the swept bandwidth and increasing the selectable sweep rate. The modified jammer is designed to sweep over a bandwidth of one, two or four percent of the center frequency at a selectable rate from 36 to 2000 cycles per second. The transmitter modification is accomplished by means of a field installation kit designated QRC-18(t). Each kit consists of three sweep units and a Sweep Rate control knob. (SECRET)

TERMINOLOGY.

Conditions of jamming referred to in this report are described as follows:

Condition 0 - No jamming.

Condition 1 - All transmissions can be received with only a little background annoyance.

Condition 2 - Can understand practically all messages but an occasional word is blocked out.

Condition 3 - Can understand words and phrases but not complete continuity (a good operator can copy a repeated message).

Condition 4 - Can tell that a transmission is being made by cannot receive the message.

Condition 5 - Cannot tell that a transmission is being made.

The recurrence rate of the jamming signal in a given receiver channel is referred to as the "Jamming Rate" and is expressed in "Hits Per Second".

The GCI or ground station referred to is a standard BC-640 VHF transmitter with a power output of 40 to 50 watts into an omni-directional antenna.

The airborne or fighter receiver is a standard R-77B/ARC-3 VHF receiver.

Distance from the ground station for a particular condition of jamming is the distance of the fighter from the ground station. The separation distance for a particular jamming condition is the distance between the bomber and the fighter at a known distance from the ground station. (CONFID)

Jamming is considered "effective" when a condition four or better is produced in the victim receiver. From a study of typical interceptor tactics and radars it has been arbitrarily determined that for adequate bomber protection the jammer should have a minimum capability of producing a condition four or better for a separation of 25 miles at a distance of 80 miles. (SECRET)

OPERATIONAL ASPECTS

LABORATORY TESTS.

One, two and four percent QRC-18(t) sweep units were installed in production models of the T-464/ALT-7 transmitter and actual sweep widths measured. At a center frequency of 142.38 megacycles the one percent units gave an average sweep width of 7.5 megacycles, or 5.2 percent of center frequency. The single two percent unit tested gave a sweep width of 13.34 megacycles, or 9.4 percent. The four percent unit tested gave a sweep width of 19.04 megacycles, or 13.4 percent. (CONFID)

Jamming rate versus "Sweep Rate" dial reading was measured on four transmitters modified with one percent units. Actual measured rates differed very widely from the dial readings. On the highest dial setting the jamming rate varied from 2300 to 2500 hits per second, depending on the particular set. On all four sets the sweep motor stalled for dial settings of 600 or below. (CONFID)

Further details of the laboratory tests and method of measurement are contained in Appendix I of this report. (UNCL)

FLIGHT TESTS.

Sixteen flight tests totaling 94 hours were flown. Two of these used C-47 aircraft flying at 9000 feet altitude and the remainder used KC-97 aircraft at 19,000 feet or B-47 aircraft at 34,000 feet. A total of 54 jamming runs were made. On each of these runs two aircraft were used, one simulating the bombing aircraft carrying the jamming transmitters and the other simulating the fighter aircraft. The aircraft maintained a constant separation while flying nose-to-tail over a course extending away from the ground station. A standard BC-640 VHF transmitter and RC-81 antenna were used as a ground station for all tests. Transmissions to the fighter were a tape recorded sequence of towns and populations repeated once with a short interval between transmissions. An AN/ARC-3 VHF receiver was used in the fighter aircraft. (SECRET)

Spot jamming and sweep jamming runs were made with various jamming rates and modulation. A single transmitter was used for spot jamming and from one to three transmitters for sweep jamming. With one transmitter, spot jamming, conditions one to three were obtained on the majority of runs at distances of 40 to 150 miles with separations of 13 to 25 miles. On two spot jamming runs, condition five was obtained at distances of 30 to 250 miles with separations of 15 to 30 miles. On other spot jamming runs, conditions four to five could be obtained for various distances and separations if the ECM operator was "talked on" frequency from the ground station. With from one to three transmitters sweep jamming with one per-cent units, conditions one to three were obtained for all distances and separations except for occasional condition fours at distances beyond 100 miles. Jamming rates of 800 to 1000 hits per second were more effective than slower rates. Modulation by wide or narrow noise had little or no effect on sweep jamming. (SECRET)

Details of flight tests and results obtained are contained in Appendix I of this report. (UNCL)

CONCLUSIONS

It is concluded:

1. When used as a sweep jammer, the AN/ALT-7 transmitter modified with the QRC-18(t) is not effective against VHF voice communications. (SECRET)

2. The AN/ALT-7 transmitter when used as a spot jammer with narrow noise modulation is capable of spot jamming communications, but the possibility of accomplishing this is limited by narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of available ECM receivers. (SECRET)

3. Frequency drift of the AN/ALT-7, though good for a set of this type, is too great to allow its use as a pre-set spot jammer for VHF communications. (SECRET)

4. Sweep jamming rates of 800 to 1000 hits per second are most effective against voice communications. (SECRET)

5. Narrow noise modulation is most effective for spot jamming of voice communications. (SECRET)

RECOMMENDATIONS

It is recommended:

1. The AN/ALT-7 transmitter, with or without QRC-18(t) modification, not be considered for sweep jamming of VHF voice communications. (SECRET)

2. Consideration be given to methods to improve spot jamming capability of the AN/ALT-7 transmitter. These include: (SECRET)

a. Improvement of selectivity or setting-on accuracy of present ECM receiving systems.

b. Increase of amplitude modulation of the AN/ALT-7.

c. Possible use of a very narrow sweep unit for spot jamming.

Some suggested methods for improvement are discussed on page 34.

APPENDIX I

Method of Conducting Tests and Results Obtained

LABORATORY TESTS.

Sweep Width. Sweep width of the AN/ALT-7 transmitters with QRC-18(t) sweep units installed was measured with an AN/APR-4 receiver, AN/ALA-2 panoramic adapter, and a TS-323/UR frequency meter. Upper and lower frequency limits of the sweeping signal from the transmitter were tuned in on the receiver and panoramic adapter and the frequency measured using the TS-323/UR frequency meter. Transmitter center frequency for all measurements was 142.38 megacycles. Six of the one percent units, one each of the two percent and four percent units were measured; results are as follows: (CONFID)

	MEASURED SWEEP WIDTH	
TYPE UNIT	MEGACYCLES	PERCENT OF CENTER FREQUENCY
1%	4.80	3.75
1%	5.90	4.15
1%	6.40	4.5
1%	6.52	4.6
1%	10.30	7.2
1%	10.68	7.5
Average 1%	7.43	5.2
2%	13.34	9.4
4%	19.04	13.4

Jamming Rate. Jamming rate in hits per second was measured for various settings of the SWEEP RATE control. The QRC-18(t) modification kit includes a dial for this control to be used in place of the normal AN/ALT-7 SWEEP RATE dial. The QRC-18(t) dial is calibrated in CPS and looks like this: (CONFID)

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Jamming rate measurements were made using an AN/APR-4 receiver and a TS-382A/U Audio Signal Generator. The sweeping signal from the transmitter was tuned in on the receiver and the audio output mixed with audio output from the signal generator. The signal generator was then tuned for an aural beat with the receiver output and the jamming rate read off the signal generator dial. (CONFID)

Results of jamming rate measurements on four sets using different QRC-18(t) sweep units are shown in the table below. The dial setting shown as "top" was the highest speed setting and is a dial setting between the CPS and OFF markings. All sweep units stalled at dial settings of 600 or below. (CONFID)

DIAL READING CPS	MEASURED JAMMING RATE - HITS PER SECOND			
	TX 1476	TX 928	TX 811	TX 138
"Top"	2440	2540	2300	2500
2000	1240	1600	1310	1410
1800	830	990	515	950
1600	430	415	310	430
1400	250	210	95	225
1200	76	61	49	78
1000	43	32	33	53
800	31	27	below 20	32
600	stall	stall	stall	stall

The AN/ALT-7 transmitter has a thyratron speed control and a reference tachometer coupled to the sweep motor to control the sweep motor speed. A screw driver adjustment potentiometer (R-236) is provided to adjust the bias of the thyratron circuit. Adjustment of this control has little or no effect on high sweep speeds but does vary the low sweep speeds. All jamming rate measurements shown above were made with this control set as received from the factory for normal AN/ALT-7 operation. To observe the effect of this control, transmitter 138 was measured with the control set for high sweep speeds and for lowest speeds. The table below shows the measured jamming rates for high and low settings of the bias control compared to the "as received" setting: (CONFID)

DIAL READING CPS	MEASURED JAMMING RATE - HITS/SECOND BIAS CONTROL SETTING		
	HIGH	LOW	AS RECEIVED
"Top"	2500	2500	2500
2000	1540	1180	1410
1800	990	830	950
1600	605	390	430
1400	340	170	225
1200	82	stall	78
1000	61		53
800	42		32
600	stall		stall

Normal AN/ALT-7. Measurements were made of the sweep width and jamming rate of the normal T-464/ALT-7 transmitters (with the normal 10% sweep unit installed), in the same manner as described for the QRC-18(t) units. On five sets tested at a center frequency of 142.38 megacycles, sweep widths varied from a minimum of 24.2 megacycles to a maximum of 29.7 megacycles, for an average of 26.6 megacycles, or 18.7 percent of center frequency. Jamming rate in hits per second for various settings of the SWEEP RATE dial are shown in the table below. All sweep units stalled at a setting slightly below 50. (CONFID)

DIAL READING CPS	MEASURED JAMMING RATE - HITS/SECOND TX 138	TX 121	TX 116	TX 144	TX 94
600	330	240	310	280	310
500	240	240	270	245	260
400	190	195	190	195	190
300	155	150	142	142	135
200	120	95	112	108	110
100	57	below50	below50	below50	57
50	approximately 20 to 30 for all sets				

At dial settings of 100 and below, the rate wavers because the rotation of the sweep motor is not uniform. (CONFID)

Frequency Drift. Frequency drift of the AN/ALT-7 was measured during May 1955 to determine the feasibility of using these transmitters as pre-set spot jammers for VHF communications or radar. These tests were conducted by carrying the transmitters on B-47 aircraft during normal training missions. Measurements were made at 68, 108, and 148 megacycles. Transmitters were set to these frequencies in aircraft on the ground after allowing a 30 minute or longer warm-up period. The exact frequency of each transmitter was measured with a TS-323/UR frequency meter and recorded. Tuning dials of the transmitters were locked and the sets turned off. The aircraft then flew on missions of six to eight hours' duration at altitudes in excess of 30,000 feet. Thirty minutes to an hour before return to Barksdale AFB, and while still at high altitude, all sets were turned to stand-by for warm-up. When the aircraft were over Barksdale AFB at altitude, each transmitter was operated and the signal frequency accurately measured at a ground site for comparison with the recorded take-off frequencies. (SECRET)

In five tests at the highest frequency, 148 megacycles, two transmitters had drifted up in frequency 1.0 and 2.0 megacycles respectively. Three transmitters had drifted down in frequency 0.72, 1.0, and 3.0 megacycles. (CONFID)

In two tests at 108 megacycles, one transmitter drifted up 0.2 megacycles and one drifted down 3.89 megacycles. (CONFID)

In one test at 68 megacycles, the transmitter drifted up 1.17 megacycles. (CONFID)

FLIGHT TESTS.

Sixteen flight tests of the QRC-18(t) and AN/ALT-7 transmitters totalling approximately 94 hours were conducted. Thirty-five sweep jamming runs were made using from one to three transmitters, and 19 spot jamming runs, using a single transmitter. (SECRET)

Test Conditions. All tests were flown against a BC-640 VHF transmitter and RC-81 antenna located at Barksdale AFB, La. The BC-640 is a standard transmitter used by many AACS and ADC facilities. Nominal power output is 50 watts. Transmissions to the fighter aircraft were a tape recorded sequence of towns and populations repeated once with short intervals between transmissions. The receiver in the fighter aircraft was an R77B/ARC-3 VHF receiver. The frequency for all tests was 142.38 megacycles. (SECRET)

Aircraft used for the tests were C-47, KC-97 and B-47 types which simulated either the fighter or the bomber. C-47 and KC-97 aircraft were used on some tests in order that operators and instrumentation could be carried to closely observe the test and gather data. (CONFID)

Two aircraft were used on each flight test, one simulated the bomber carrying the jamming transmitters and the other, the fighter aircraft. A constant separation was maintained between aircraft while flying a course extending away from the ground station. For tests on which C-47 aircraft were used, the bomber flew at 9000 feet altitude and the fighter at 8000 feet over a course extending approximately 70 miles from the ground station. For tests on which two KC-97 aircraft were used, the bomber flew at 19000 feet altitude and the fighter at 18000 feet over a course extending approximately 175 miles from the ground station. For tests on which two B-47 aircraft were used, the bomber flew at 34000 feet altitude and the fighter at 33000 feet over a course extending approximately 250 miles from the ground station. By maintaining constant separation between aircraft during the flights, the only test variable was the distance from the ground station. Although rendezvous equipment, radar, VOR, and time over navigation lines were used to maintain constant separation, the flight conditions at the different altitudes used made the separation difficult to maintain at times. To take into account the small variations in separation, the navigator of each aircraft kept an expanded log and track chart for each jamming run. The track chart for the two aircraft were plotted after the missions and the exact separation and distance from the ground station taken from the plots. (SECRET)

On each flight (except the B-47 sweep jamming flights) an ECM operator in the bomber continually monitored the jamming transmitters to insure proper operation and maintain the swept band centered on the ground station frequency. An observer in the fighter aircraft monitored the AN/ARC-3 receiver and recorded jamming on a tape recorder and in an observer's log. (SECRET)

A receiving site located about a mile from the ground station continually monitored both the ground station and the signals from the airborne jammers.

An AN/ARR-8 or AN/APR-4 receiver with AN/ALA-2 panoramic adapter, and AN/ARC-3 receiver, and a TS-323/UR frequency meter was used at the receiving site to measure frequencies. The sweep widths of the one percent QRC-18(t) units, listed in a preceding section, were measured at the receiving site while the units were being flown on the flight tests. The receiving site was also used to "talk-on" the jamming frequency during some of the spot jamming runs. See Inclosure 5. (CONFID)

AT-191/AP antennas installed in AB-109 antenna mounts on the aircraft were used with the jamming transmitters for all flight tests. (CONFID)

Sweep Jamming Results. Test results as extracted from condition logs of 35 sweep jamming runs are shown in the following tables. For each run the number of transmitters and type of sweep unit are shown. The jamming rate shown is in hits per second. Separation and distance from the ground station are in nautical miles as corrected from the navigator's expanded log for each flight. (SECRET)

8 September 1955 C-47 Aircraft 8000 and 9000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One 1% QRC-18(t) Transmitter. 800 hits/second - Wide Noise Modulation. Power output 180 watts.		
	2	10½	14½
	3	14½	14½
	4	16	14
	5	17	14½
	condition 5 beyond 17 miles		
2	Same equipment as for Run 1		
	2	11½	9½
	3	15	9½
	4	16½	9½
	5	17½	10
	condition 5 beyond 17½ miles		
3	Same equipment as for Run 1		
	2	9½	14½
	3	11	15
	4	13	15
	5	17½	15

4 Same equipment as for Run 1		
2	11	10
3	13	10
4	17½	10
5	22	11
condition 5 beyond 22 miles		

Results for the first flight test given above are invalid since it was noted during the test that the ground station field strength was only one-third to one-fourth normal. The observer in the fighter also reported the ground station signal was very weak. A check of the ground station after the mission showed that the antenna used was shorted and only a fraction of the transmitter power was being radiated. From the field strength measurements taken during the test it is estimated the actual radiated ground station power was one-ninth to one-sixteenth normal power, or in the neighborhood of five watts. The results are interesting only in that they agree with similar results obtained on a WADC test of the QRC-18(t) against an eight to ten watt ground station at Rome Air Force Base, N.Y. This WADC test is described in WADC Technical Note 55-243, "Interim Report on Effectiveness of AN/ALT-7 Modification, QRC-18(t)", dated June 1955. (SECRET)

A second flight test was run on 26 September 1955 under the same conditions as the first test, except that a properly operating ground station antenna was used. On this test two runs were made with the transmitter designed for SAC Test Project Number 1A. This is a 150 watt VHF transmitter which sweeps over a five megacycle band and is described in 376th Bomb Wing Final Report on Test Project 1A, "Sweep Jamming of VHF Communications", dated 2 March 1955. The two runs with the 1A transmitter were made for comparison because the effect of this transmitter has been determined from several hundred hours of flight tests. (SECRET)

Results of the second test are shown in the following table:

26 September 1955 C-47 Aircraft 8000 and 9000 Feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One 2% QRC-18(t) Transmitter. 800 Hits/Second. Narrow Noise Modulation. Power output 150 Watts		
	0	4	14
	0	20	14
	1	26	13½
	0	26-57	13
	1	57-62	13
	0	62-65	13
	1	65-66	13

2	One 1A Transmitter. 800 Hits/Second. CW. Power Output 148 Watts.		
	1	66-62	11
	0	62-20	12
	1	20-18	12
	0	18-4	12
3	One 1A Transmitter. 800 Hits/Second CW. Power output 148 Watts		
	0	4-14	15
	1	14-66	14
4	One 2% QRC-18(t) Transmitter. 800 Hits/Second. Wide Noise Modulation. Power Output 143 Watts.		
	0	entire run	12½
5	One 1% QRC-18(t) Transmitter. 800 Hits/Second. Wide Noise Modulation. Power Output 180 Watts.		
	0	4-20	13
	1	20-22	13
	2	22-24	13
	1	24-30	13
	0	30-33	13
	1	33-34	13
	0	34-49	13
	1	49-66	13
6	Same equipment as for Run 5		
	1	66-64	12
	0	64-4	10-12

The following flight tests were flown using two KC-97 aircraft with the bomber at 19000 feet altitude and the fighter at 18000 feet. Results of the sweep jamming runs of these tests are show in the tables below. Spot jamming results appear in a following section. (SECRET)

4 October 1955		KC-97 Aircraft	18000 and 19000 Ft
RUN	JAMMING CONDITIONS	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BOMBR MILES
1	One 1% QRC-18(t) Transmitter. 1000 Hits/Second. Wide Noise Modulation. Power out 138 Watts.		
	1	27-37	17-19
	1	42-53	19-21
	1	108-124	29-32

2	Spot jamming run. Described in Spot Jamming Section.		
3	Two 1% QRC-18(t) Transmitters. 1000 Hits/Second. Wide Noise Modulation. Power Out 160 and 140 Watts.		
	1	44-48	14½
	2	48-51	14½
	4	51-57	14½
	2	57-61	14½
	1	61-117	15
	2	117-123	15
	3	123-131	15
	4	131- ?	15
4	Two 1% QRC-18(t) Transmitters. 1000Hits/Second. Wide Noise Modulation. Power Out 165 and 140 Watts.		
	5	123-141	18-20
	4	114-123	18½
	3	105-114	18-19
	2	93-105	19-20
	1	78-93	19-20
	1	65-72	20-21
	1	48-55	23
	2	? -48	23

22 November 1955 KC-97 Aircraft 18000 and 19000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One 1% QRC-18(t) Transmitter. 800-1000 H/S Narrow Noise Modulation. Power Out 125 W.		
	0	15	21
	2	30	22
	2	42	19
	2-3	56	18
	3	78	16
	3	100	15
	3	142	19
2	Spot Jamming. Described in Spot Jamming Section.		

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
3	Two 1% QRC-18(t) Transmitters. 800-1000 H/S Narrow Noise Modulation. Power Out 125 and 130 W.		
	0	35	28
	1	58	33
	1	64	32
	0	85	35
	0	100	34
	0	140	28
4	Same Equipment as on Run 3		
	0	130	32
	0-1	126	31
	1	100	22
	1	84	20
	0	70	20
	0-1	66	21
	1	40	22
	1	39	30

14 December 1955 KC-97 Aircraft 18000 and 19000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One 1% QRC-18(t) Transmitter. 800-1000 H/S Narrow Noise Modulation. Power Out 120 Watts.		
	0	42	7
	0	58	16
	0	72	32
	0	110	30
2	Two 1% QRC-18(t) Transmitters. 800-1000 H/S Narrow Noise Modulation. Power Out 140 and 115 W.		
	0	117	20
	0	86	14
	3	79	16
	3	58	15
	3-2	30	15
	2	24	14
3	Three 1% QRC-18(t) Transmitters. 800-1000 H/S Narrow Noise Modulation. Power 140, 115 and 145 W.		
	2	32	21
	2	40	35

	2	60	33
	3	78	34
	3	84	38
	4	94	33
	4	125	22
	4	142	14
4	Spot Jamming. Described in Spot Jamming Section.		

11 January 1956 KC-97 Aircraft 18000 and 19000 Feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	Three 1% QRC-18(t) Transmitters. 1000 H/S Wide Noise Modulation. Power 130, 150 and 160 W.		
	0	10	21
	0-1	21	22
	1-2	30	22
	2	48	29
	2-1	56	30
	1	65	30
	2	75	27
	2-0	90	31
	0	96	32
	0	108	34
	0-1	125	27
	0	140	18
2	Three 1% QRC-18(t) Transmitters. 400 H/S Narrow Noise Modulation. Power 155, 160, 150 W.		
	0	137	27
	0	110	40
	0	96	40
	0	87	34
	0	78	25
	0	65	25
	0	51	20
	0	32	11

3	Three 1% QRC-18(t) Transmitters. 400 H/S Wide Noise Modulation. Power 170, 160, 160 W.		
	0	18-50	22
	0-1	52	25
	1-0	67	26
	0	81	24
	0	103	30
	0	138	29
4	Three 1% QRC-18(t) TX. Two-1000 H/S, One-500 H/S Narrow Noise Modulation. Power 170, 180, 150 W.		
	0	119-97	23-24
	0	97-81	24-26
	0	81-52	26-29
	1	31	26
	1	22	25

17 January 1956 KC-97 Aircraft 18000 and 19000 Feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BOMBR MILES
1	Three 1% QRC-18(t) Transmitters. 800-1000 H/S CW. Power outputs 200, 150 and 140 watts.		
	0	15	25
	1	15-24	32
	2	51	27
	3	87	12
	3	110	11
	3	120	12
	2	140	10
2	Three 1% QRC-18(t) Transmitters. 800-1000 H/S CW. Power outputs 200, 150 and 140 Watts.		
	3	142	32
	3	122	29
	3	100	30
	3-2	92	29
	2	85	23
	2	79	21
	2-3	71	20
	2-3	52	17
	2	47	16
	2-1	31	16

3 Three 1% QRC-18(t) Transmitters. 800-1000 H/S Wide Noise Modulation. Power 200, 160, and 150 W.		
1	23	27
1	47	25
1	73	21½
1	104	17
1	131	11
1	141	12
4 Three 1% QRC-18(t) Transmitters. Two 1000 H/S, one 400 H/S. Narrow Noise Modulation. Power 200, 140 and 165 W.		
2	137	28
2	123	27
2	110	25
2	96	26
2	80	22
2	71	19
Rest of run aborted for fuel leak.		

The flight for which results are shown in the following table was made using two B-47 aircraft. One had an AN/ARC-3 VHF installation and flew at an altitude of 33,000 feet to simulate the attacking fighter. The other aircraft, acting as the bomber, flew at 34,000 feet and had three AN/ALT-7 transmitters modified with one percent QRC-18(t) sweep units installed in a bomb bay cradle. All transmitters were set to sweep at a jamming rate of 800 to 1000 hits per second. Four runs were made over a course which extended from the ground station at Barksdale AFB, La., to Meridian, Miss., a distance of approximately 300 miles. The aircraft flew with a constant 25-mile separation by maintaining times over VOR radials from the VOR stations at Shreveport and Monroe, La., Jackson and Meridian, Miss. Aid in maintaining separation was also given on the western half of the course by the AN/MPS-7 radar station at Texarkana, Ark. (SECRET)

It was intended that all four runs be made with three sweeping jammers; however, on the first run only one transmitter would come on, on the second run all three operated. On the third run, only one transmitter would come on during the first half of the run. On the second half of the run an additional transmitter came on without sweep. This second transmitter stopped sweeping on the ground station frequency so good spot jamming was obtained. On the fourth run one transmitter came on with sweeping operation and one with spot jamming on the ground station frequency. This unexpectedly good spot jamming from an unattended transmitter can be attributed to the fact that the transmitter center frequencies (frequency of the transmitter when the sweep unit is stopped) were set on the ground with a frequency meter before take off. At the monitoring receiver on the ground, the difference in frequency between the spot jamming transmitter and the VHF voice transmitter during the third and fourth runs was too small to be measured. (SECRET)

10 April 1956	B-47 Aircraft	33,000 and 34,000 Feet	
RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BOMBER MILES
1	One 1% QRC-18(t) Transmitter. 800-1000 H/S Narrow Noise Modulation.		
	1	24	24
	1	40	22
	1	60	24
	1	82	24
	1	100	26
	1	140	28
	1	170	28
	5	214	31
	5	230	33
	5	250	in turn
2	Three 1% QRC-18(t) Transmitters. 800-1000 H/S Narrow Noise Modulation.		
	5	242	20
	5	218	18
	4	210	19
	3	200	20
	2	190	22
	2	132	25
	2	100	24
	2	90	24
	2	70	23
	2	50	24
	2	30	20
3	One 1% QRC-18(t) Transmitter. 800-1000 H/S Narrow Noise Modulation.		
	1	25	25
	1-2	35	20
	1	50	20
	1	96	16
	2	118	18
	1	124	19
	1	152	21

At this point a second transmitter came on with spot jamming (narrow noise modulation).

5	172	20
5	180	20
3	185	20
3	194	22
4	200	24
5	205	24
3	210	24
2	220	24
1	232	24
1	240	24

4 One 1% QRC-18(t) transmitter. 800-1000 H/S narrow noise modulation - and one transmitter spot jamming. narrow noise modulation.

5	240	20
4	212	21
3	190	24
3	174	25
3	156	24
3	118	25
3	90	27
3	72	25
2	50	25
2	25	25

The observer in the fighter aircraft, who rode as the fourth man and monitored reception on the AN/ARC-3 receiver, reported the characteristic tone of the sweep jamming on the first two runs and early part of the third run as quite ineffective except at distances beyond 200 miles where the ground station voice signals became very weak. On the last portion of the third run and on the fourth run, jamming was mainly caused by the spot jamming of the second transmitter. It was noted that jamming was best immediately after the spot jamming transmitter came on and decreased somewhat after that. This was probably due to some drift in the frequency of the transmitter and is particularly evident from the data for the third run where the jamming condition deteriorated even though the aircraft were flying away from the ground station and the voice signals were getting weaker. (SECRET)

In the examination of transmitters after the flight it was found that the capacitor plates of the QRC-18(t) sweep unit in one transmitter had melted, evidently from sustained arcing. In a second transmitter, the QRC-18(t) sweep unit drive motor had failed. The third transmitter operated normally. (CONFID)

The flight for which results are shown in the following table was flown on 1 May 1956 using two B-47 aircraft with flight procedure the same as for the 10 April flight described above. It was intended that three transmitters would be used on runs where two normal one percent QRC-18(t) sweep units were used and runs where a single transmitter having a unit modified to sweep 1.2 megacycles was used. However, the two transmitters with normal sweep units failed to operate at high altitude so four runs were made with a single transmitter sweeping over a bandwidth of 1.2 megacycles. The modified sweep unit used on these runs was made up in the 376th Bomb Wing by opening up one of the normal QRC-18(t) sweep units and removing all but two of the sweep capacitor plates. (SECRET)

1 May 1956 B-47 Aircraft 34,000 and 33,000 feet

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA. MILES	SEPARATION FTR TO BMBR MILES
1	One AN/ALT-7 transmitter - narrow noise modulation - sweep jamming with special sweep unit designed to sweep over 1.2 megacycle width - 800-1000 hits/second.		
	3	30	18
	5	54	18
	2	80	20
	4	88	20
	5	100	20
	4	122	19
	5	130	19
	5	150	18
	5	175	19
	5	200	19
	5	225	19
	5	250	19
2	Same equipment as for Run 1.		
	5	250	12
	5	200	14
	5	150	16
	5	100	20
	4	88	24
	3	70	24
	2	46	24
	1	42	24
3	Same equipment as for Run 1.		
	0	24	12
	1	36	15

3	50	24
4	62	24
5	76	25
5	100	26
5	150	25
5	200	25
5	250	26
4 Same equipment as for Run 1.		
5	250	25
5	200	27
4	176	26
1	152	24
1	118	26
2	110	26
5	100	26
1	80	25
5	62	25
1	55	25

Jamming results on this test were somewhat better than on previous sweep jamming tests, considering that only one transmitter was being used, and this was probably due to the narrow sweep width used (the narrowest normal QRC-18(t) sweep units cover five to ten megacycles, depending on the particular unit). However, as can be seen from the chart, effective jamming was obtained only at distances of approximately 100 miles or beyond and on the last run jamming conditions varied widely even at far distances. This might possibly have been due to drift of the transmitter frequency during the last run. The two transmitters which failed to operate during the flight were checked after the mission and found to operate normally. The sweep units were carefully inspected and small amounts of moisture could be seen condensed on the inner surface of the glass envelope. The sweep units are not evacuated but are sealed with dry air when manufactured. The condensation observed indicates that either the seal is imperfect or that moisture or other vapor may be released from motor windings or other parts during operation. (SECRET)

Spot Jamming Results. Spot jamming runs were made in the same manner described for sweep jamming except that the ECM operator in the bomber used an AN/APR-4 receiver and AN/ALA-2 panoramic adapter to set the jammer on the ground station frequency. Narrow noise modulation was used on all spot jamming runs. On two of the jamming runs the ground receiving station aided the airborne ECM operator by "talking" him on frequency while listening to the AN/ARC-3 receiver on the ground station frequency. Results of the spot jamming runs are shown in the following tables. (SECRET)

4 October 1955 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
2	One transmitter - spot jamming - power out 138 W Narrow noise modulation		
	3	133-138	10-11
	2	126-133	11-11½
	1	72-126	11½
	1	4-36	12

22 November 1955 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
2	One transmitter - spot jamming - power out 145 W Narrow noise modulation		
	1	142	31
	1	125	31
	1-2	100	25
	1-2	81	20
	2	63	18
	2-3	33	21
	3	17	15

14 December 1955 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
4	One transmitter - spot jamming - power out 140 W This run "talked on" frequency from the ground		
	4	126	25
	4	115	12
	4	80	14
	4	49	13
	4	40	13

The spot jamming runs shown above for 4 October and 22 November were set on frequency by the airborne ECM operator using an AN/

APR-4 receiver, TN-17 tuning unit, and AN/ALA-2 panoramic adapter. The run shown for 14 December was made in the same manner except that the operator received aid in setting-on from the ground receiving station. The operator at the ground receiver monitored the signals from the ground transmitter and the airborne jammer and gave the airborne ECM operator tuning instructions until the jamming signal could be heard in the AN/ARC-3 receiver on the ground. The setting-on from the ground is a tedious procedure and makes the jamming run unrealistic; however, the run shows that the jamming transmitter is capable of jamming if it can be set on the communications frequency. (SECRET)

On the flight test for which results are shown in the following table, six spot jamming runs were made. Run 5 was "talked" on from the ground in the manner described above. On the rest of the runs, setting-on frequency was done by the airborne operator without help from the ground. (SECRET)

16 February 1956 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
2	One transmitter - spot jamming - power out 150 W Narrow noise modulation.		
	0	163	24
	0-1	135	26
	1	130	25
	1	119	24
	1-0	104	25
	0	93	24
	0	42	20
3	Same equipment as for Run 2		
	1	41	25
	1	55	25
	1	90	27
	1	115	27
	1-0	128	27
	0	148	27
4	Same equipment as for Run 2		
	0	164	27
	0	115	25
	0-1	78	25
	0	55	26
	0	34	25

5 Same equipment as for Run 2 This run "talked on" frequency from ground			
	2	153	26
	4	141	25
	4	132	25
	4	125	26
	4	100	25
	3	80	25
	3	72	26
	2	67	27
	1	60	25
	1	45	25
	0	40	25
6 Same equipment as for Run 2			
	0	47	25
	1	63	25
	1	95	27
	1	120	26
	1	140	25
	0	162	26

16 February 1956 KC-97 Aircraft 19,000 and 18,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
7 Same equipment as for Run 2			
	0	25	25
	1	38	25
	1	50	25
	1	65	25
	0	75	25
	0	80	25
	1	90	25
	1	115	25
	0	135	25

On the flight for which results are shown in the following table, four spot jamming runs were made, two with narrow noise modulation and two with wide noise modulation. Procedure was the same as on previous tests except that the ECM operator used a CV-253/ALR tuning unit with the AN/APR-4 instead of the TN-17. None of the following runs were "talked on" from the ground. (SECRET)

6 April 1956 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One transmitter - spot jamming - power out 150 W Narrow noise modulation		
	0	30	22
	0	40	25
	1	50	26
	0	60	23
	0	70	23
	0	82	23
	0	97	18
	0	117	15
	0	141	19
2	One transmitter - spot jamming - power out 150 W Wide noise modulation		
	0	140	25
	2	125	25
	2	110	27
	2	97	28
	2	79	27
	2	66	23
	1	41	18
	1	30	10
3	Same equipment as for Run 1 - power out 140 W		
	1	33	25
	1	50	25
	1	66	25
	1	81	26
	1	105	26
	1	122	26
	1	138	26
4	Same equipment as for Run 2 - power out 145 W		
	1	141	25
	1	106	25
	1	96	23
	1	79	23
	1	53	24
	0	30	20

The spot jamming test for which results are shown below was flown using B-47 aircraft with the same flight procedure as used on B-47 sweep jamming flights. A Phase V B-47 with ECM capsule was used as the bomber on this test. The ECM capsule is carried in the bomb bay of the B-47 aircraft and is designed to carry two ECM operators, various configurations of ECM equipment, and is equipped with heating, pressurization, and liquid oxygen systems. Four spot jamming runs were made using an AN/ALT-7 with narrow noise modulation. An AN/APR-14 receiver was used to set the jamming transmitter on frequency. On the first two runs no signals could be heard on the receiver. This was found to be caused by improper switching of the receiver antenna in the aircraft. On the last two runs the switch was set to connect an antenna to the receiver and excellent results were obtained. (SECRET)

14 May 1956 B-47 Aircraft 34,000 and 33,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMBR MILES
1	One AN/ALT-7 transmitter - narrow noise modulation spot jamming. AN/APR-14 receiver inoperative		
	1	40	29
	1	72	25
	1	100	23
	1	130	22
	1	170	20
	2	180	19
	2	200	18
	2	224	20
	5	235	22
	5	240	23
2	Same as for Run 1 - receiver not working		
	3	230	26
	1	215	26
	1	180	24
	1	170	20
	1	110	22
	1	90	25
	1	50	29
	1	30	30
3	Same as for Run 1 - receiver operating normally		
	1	30	35
	2	40	30
	3	55	28

	5	65	26
	5	85	23
	5	100	23
	5	125	21
	5	147	23
	5	180	25
	5	200	27
	5	230	28
4	Same as for Run 1 - receiver operating normally		
	5	240	15
	5	228	15
	5	213	14
	5	195	19
	5	180	24
	0	147	27
	5	135	27
	5	102	28
	0	94	30
	5	87	30
	5	60	30
	5	45	30
	5	31	30

The observer in the fighter aircraft reported that Runs 3 and 4 were the best jamming he had heard. Jamming was continually effective with no trace of the voice signal. On the last run, the two conditions zero shown coincided with times when the jamming operator turned off his transmitter to look-through for the voice signal. (SECRET)

Two jamming runs were made on 18 June using KC-97 aircraft in the same manner as for previous flights to test jamming effectiveness of a special narrow sweep unit and random speed control regulator. The sweep unit used was designed to sweep a narrow bandwidth less than one megacycle wide and the speed control unit caused the sweep speed to vary at a random rate. Photograph 2, following Appendix II, shows the special sweep unit and regulator compared to a normal sweep unit and regulator. Note that the special sweep unit has only two small capacitor plates and that these are widely spaced to give only a narrow sweep width. (SECRET)

On both runs the ECM operator used an AN/APR-4 receiver and CV-253/ALR tuning unit to set the jamming transmitter on the ground station frequency. Narrow band noise modulation was used on the first run and wide band noise modulation on the second. Results are tabulated below. (SECRET)

18 June 1956 KC-97 Aircraft 18,000 and 19,000 Ft

RUN	JAMMING CONDITION	DISTANCE FTR TO GND STA MILES	SEPARATION FTR TO BMR MILES
1	One transmitter - special narrow sweep unit and random speed regulator - narrow noise modulation		
	0	30	25
	0	50	26
	2	62	26
	2	83	25
	2	92	26
	1	100	27
	1	120	27
	1	140	27
2	Same as for Run 1 except wide noise modulation		
	1	140	26
	1	110	24
	1	84	23
	1	55	21
	1	31	21

DISCUSSION OF TEST RESULTS.

Sweep Jamming of AN/ARC-3. The AN/ARC-3 VHF receiver used on these tests has long been in standard use in the Air Force and in many commercial airlines. The set is of excellent design and has several circuit features which make jamming difficult, although these were probably not specifically designed as anti-jamming devices. (UNCL)

T.O. 12R2-2ARC3-2 specifies that the bandwidth of the R77B/ARC-3 receiver will be between 100 and 150 kilocycles. From measurements of several receivers it has been found that the bandwidth of these receivers as normally used is about 70 kilocycles at the half power point. The audio bandwidth of the receiver is within 2DB from 300 cycles to 4000 cycles and is down 6DB at 165 cycles and 5000 cycles. A series type noise limiter is used between the second detector and first audio stage. The limiter greatly reduces the amplitude of pulses shorter than about 75 milliseconds. The audio amplifier stage uses a rather large amount of inverse feedback which tends to equalize amplitude response of the receiver. (UNCL)

As an example of how the receiver features might effect jamming effectiveness, consider the QRC-18(t) with the 1% sweep unit operating at the rate found most effective, 800 hits per second. The average speed width for these units was found to be 7.43 megacycles. The jammer is swept over this width 800 times a second, or at a rate of:

7.43 x 800 = 5944 megacycles/second. If the receiver bandwidth is taken as 100 kilocycles, the jamming is in the receiver bandwidth for:

$$\frac{0.1 \text{ mc}}{5944 \text{ mc/sec}} = 16.8 \text{ microseconds}$$

(SECRET)

The jamming then produces in the receiver a series of 16.8 microsecond pulses at a rate of 800 per second. The pulses are considerably shorter than the time constant of the noise limiter so they will be severely clipped in this circuit. (SECRET)

The one percent unit having the narrowest sweep width was found to be 4.8 megacycles. If we consider this instead of the average found, the sweep speed is 4.8 x 800 = 3840 megacycles/second and the jamming is in the receiver bandwidth for:

$$\frac{0.1 \text{ mc}}{3840 \text{ mc/sec}} = 41 \text{ microseconds}$$

which is still a short time compared to the noise limiter time constant. (SECRET)

Suppose the manufacturer had met specifications and the one percent unit did sweep only one percent. At our test frequency of 142.38 megacycles, this would be a sweep width of 1.42 megacycles. At 800 hits per second, sweep speed would be: 1.42 x 800 = 1136 megacycles/second. At this speed each hit would be in the receiver bandwidth for:

$$\frac{0.1 \text{ mc}}{1136 \text{ mc/sec}} = 88 \text{ microseconds}$$

This would be a bit closer to the 75 millisecond time constant of the noise limiter and thus might be expected to do somewhat better. The test described for 1 May used a modified unit sweeping over 1.2 megacycles and better results were obtained. The difficulty with such a unit is that the sweep width then becomes of the same order, or less, than the drift to be expected in the transmitter frequency. It is doubtful whether a pre-set transmitter would remain on frequency during a flight. (SECRET)

Spot Jamming of AN/ARC-3. Results of the spot jamming runs indicate the AN/ALT-7 transmitter is apparently capable of spot jamming communications but the possibility of accomplishing this is low due to narrowness of the communications channel, coarse tuning of the transmitter, and poor selectivity of the ECM receiver. (SECRET)

For the range of interest in VHF communications jamming from 100 to 150 megacycles there are only four markings on the transmitter frequency dial. These are at 95, 110, 140, and 170 megacycles and are closely spaced, the space between the markings for 140 and 170 megacycles being only about 1/8". Thus, the transmitter dial marks can be used only as a gross indication of frequency and fine tuning must be done with a receiver or frequency meter. Gearing from the transmitter dial to the control knob is good and it requires about ten turns of the knob to tune from 95 to 170 megacycles. This gives an average of 7.5 megacycles per turn of the tuning knob. If the communications channel is taken as 70 kilocycles, then slightly more than 100 channels are covered in one turn. The ECM operator must tune carefully to set-on a particular channel. (CONFID)

The ECM receiver in general use at VHF frequencies is the AN/APR-4 with the TN-17 tuning unit. This receiver has a selectivity of four megacycles in the WIDE position and 0.6 megacycles in the NARROW position. If a communications channel is taken as 70 kilocycles, then for a single setting of the receiver, over 50 channels would be received on the WIDE position and from eight to nine channels on the NARROW position. It is not uncommon to hear several voice signals at the same setting of this receiver. The AN/APR-14 receiver now coming into use would be no help. The preliminary maintenance manual for the AN/APR-14 gives selectivity of this receiver as six megacycles on the WIDE position and 0.6 megacycles on the NARROW position. (CONFID)

The broad selectivity of the receiver has been described; however, this is not the final selectivity of a jamming system. The ECM operator generally uses a panoramic adapter, such as the AN/ALA-2, with the intercept receiver. Even if several signals are received on the same receiver setting, they are spread out on the panoramic adapter presentation. The AN/ALA-2 technical order does not specify the intermediate frequency bandwidth nor resolution of the oscilloscope presentation. The AN/ALA-2 has only one stage of five megacycle IF amplification, which probably is not too sharp, but this is still not the limit of selectivity for the jamming system. A CW signal of normal amplitude of ¼" to ½" height on the panoramic adapter scope covers about a half megacycle at the scope base line, but position of the signal center or peak can be visually determined considerably closer than this. How closely the ECM operator can determine the signal position or frequency and how closely he can adjust his jammer to the same frequency determines the accuracy of setting-on. At the ranges from the ground station where jamming is desirable, the possible setting-on accuracy is degraded because the ground signal is weak and may be masked to some extent by noise. In contrast, the jamming signal is very strong, and even with look-through devices, the victim and jammer signals cannot be viewed at the same time, at least not with relative amplitudes desirable for accurate jamming. (CONFID)

It was noted during the spot jamming runs, by observing the jamming and ground station signals on an AN/APR-4 and AN/ALA-2 at the remote receiving site, that even on runs when the jamming was not effective, the two signals were so close in frequency that they appeared to merge as one on the panoramic adapter. Difference in frequency was too small to measure from the AN/APR-4 and AN/ALA-2. (SECRET)

An experiment was attempted in the laboratory to gain some knowledge of how closely the AN/ALA-2 could be used to set-on signals. Two TS-413A/U signal generators were arranged to feed into an AN/ALA-2 panoramic adapter. One signal generator was used to simulate a receiver on which the victim signal was being tuned. The other was used to simulate a jamming transmitter. Operators were instructed to tune in the signal with the "receiver" and adjust for their favorite presentation on the AN/ALA-2. The "receiver" signal was then turned off and the "transmitter" signal turned on. The operators then tuned the "transmitter" to spot jam the "receiver". When this had been done the difference in frequency of the two signal generators was measured with a TS-323/UR frequency meter. For the seven different ECM officers or operators of various degrees of experience who performed these jamming runs, difference in frequency of victim and jammer signals varied from slightly over 20 to 140 kilocycles, with most values between 50 to 100 kilocycles. These results were obtained under laboratory conditions with no receiver noise or other signals on the panoramic adapter to interfere with setting-on, and the operators were given all the time they desired to make adjustments. It should be pointed out that if the bandwidth of the victim receiver is 70 kilocycles, a difference between the victim and jamming carrier signals of more than 35 kilocycles would place the jamming signal carrier outside the victim receiver bandpass. (CONFID)

The noise modulation provided in the AN/ALT-7 has little effect in communications jamming because the modulation percentage of the transmitter is low. When a modulated signal is detected in a receiver, the detector eliminates the carrier and passes only the modulation. Obviously then it is desirable that the modulation percentage be as high as possible. The AN/ALT-7 transmitter is a self-excited oscillator so cannot be modulated 100%. Also, grid modulation is employed and no means are provided to adjust the transmitter for proper modulated output. The output of the transmitter actually decreases when modulation is turned on. For a modulated signal, the portion of the total power contained in the modulated sidebands is $\frac{m^2}{4}$ where "m" is the modulation percentage expressed as a decimal. Thus, for a 100% modulated signal, one-fourth the total power is contained in each sideband and a half in the carrier. For a 50% modulated signal, the power in each sideband would be only:

$$\frac{(0.5)^2}{4} = 0.0625, \text{ or } 1/16 \text{ of the total power}$$

For example, in a 160 watt signal there would be ten watts in each of the modulated sidebands and 140 watts in the carrier. Measurements were made by observing the unmodulated and modulated AN/ALT-7 output on an oscilloscope and on an AN/UPM-17 spectrum analyzer to determine the modulation percentage. This percentage appeared to be between ten to 20 percent. When the transmitter signal is heard on a receiver, the modulation appears to be high but this is caused by frequency modulation of the transmitter oscillator. The oscillator carrier is frequency modulated by small variations in power supply voltage, 800 cycle ripple, and, when modulated, by the noise modulation voltage applied to the oscillator grids. This effect has been noted many times by ECM mechanics when measuring transmitter frequency with a frequency meter. Instead of hearing a distinct beat note as expected, only a very rough or raspy signal is heard, even if the transmitter is unmodulated. The frequency modulation is characteristic of self-excited oscillators of this type and since the percentage of amplitude modulation is so low, is probably more of an advantage than a disadvantage. (CONFID)

On early spot jamming tests the TN-17 tuning unit was used with the AN/APR-4 as a setting-on receiver. The TN-17 was found to be unsatisfactory and on later tests was replaced with the CV-253/ALR tuning unit (or the AN/APR-14 receiver on some tests). But what difference should the tuning unit make? This is the very "front end" of the receiver so can add nothing to the selectivity. The explanation of why CV-253/ALR tuning units (or AN/APR-14 receivers) should be used is best made by comparing the AN/ARC-3 and AN/APR-4 receivers. The AN/ARC-3 receiver is specially designed for communications. It has three relatively narrow high-gain IF stages and, more important, it has a stage of RF amplification to give gain where most needed to amplify weak signals and improve the signal-to-noise ratio. The set is well designed and quite sensitive. At high altitudes reception range is limited only by line-of-sight and voice signals can be heard from a distance of several hundred miles. (CONFID)

In comparison, the AN/APR-4 with the TN-17 was not designed as a communications receiver. It has five relatively broad IF stages in which selectivity and sensitivity have been sacrificed in favor of other characteristics desirable mainly for reception of radar signals. The receiver has no RF gain - in fact there is a signal loss in the TN-17. This is particularly undesirable because most receiver noise originates in early stages; the weak signal is inseparably mixed with noise and the signal-to-noise ratio is reduced. The AN/APR-4 with TN-17 is not capable of receiving voice signals over the same range as the AN/ARC-3 and the signals generally disappear before line-of-sight distance is reached. Also, and this is particularly unsatisfactory, the frequency of the TN-17 may be "pulled" by high level signals such as would be received when the ECM operator attempts to set-on his jamming transmitter. This would give inaccurately tuned jamming signals. In tests made at the Air Proving Ground, errors as great as seven megacycles were observed when the TN-17 was used. This has been reported in Air Proving Ground Command's Final Report on Project Number APG/SAS/142-A, "Operational Suitability Test of Countermeasures Transmitting Set AN/ALT-7", dated 19 March 1956. This report also describes the difficulty of setting the jamming transmitter on the receiver frequency and notes that on several tests the ECM operator required "frequent coaching from the ground monitor station." (CONFID)

The CV-253/ALR tuning unit (or AN/APR-14 receiver) has a stage of RF amplification to give a much higher receiver gain and enable the ECM operator to hear the ground station earlier. This would allow him more time to intercept the signal, adjust it on his panoramic adapter, and attempt to set-on his jamming transmitter. Also the RF stage isolates the tuning unit oscillator from incoming high level signals and prevents "pulling" of the receiver frequency. (CONFID)

SUGGESTIONS FOR IMPROVEMENT.

The problems and difficulties of spot jamming VHF communications have been described and some suggestions for improvement will be discussed. These are offered only as possible means to improve communications jamming effectiveness and in most cases no extensive investigation has been made to determine either the feasibility of the suggestion or degradation which might be caused other uses of the equipment. (UNCL)

Setting-On Accuracy. Improvement in setting-on accuracy would necessarily involve improvement of some part of the ECM receiving system. One possible means to effect improvement might be to increase the intermediate frequency selectivity of the AN/ALA-2 panoramic adapter. The AN/ALA-2 contains one stage of IF amplification which mainly determines how sharply signals are presented on the panoramic scope. The power transformer in the AN/ALA-2 is operated near its maximum filament current capacity so additional IF stages, which might be needed if a filter is used, could not be added unless some other tubes were either eliminated or replaced with lower filament current types. Considerable improvement might be realized if the present single IF stage were modified to operate with positive or regenerative feedback. This type of operation, sometimes called Q multiplication, increases both selectivity and gain. Such modification might possibly be applicable to the AN/APR-14 also, but no data on this receiver was available for analysis. (SECRET)

Sharpening of the tuned circuits of the panoramic adapter to the degree required may produce undesirable ringing or oscillation as the signals are swept across the IF frequency, in which case sharpening would have to be done in the associated receiver. Here the main difficulty is that panoramic output is taken from the receiver after the IF stages so that any sharpening in the receiver also reduces the spectrum width which can be seen on the panoramic adapter. Thus for reasonable selectivity, the panoramic spectrum would be correspondingly narrow and tuning would be difficult. (SECRET)

Transmitter Improvement. Probably the greatest improvement to increase the transmitter communications jamming effectiveness would be to increase the percentage of amplitude modulation. High modulation percentage, approaching 100%, would not be possible due to the difficulty of modulating a self-excited oscillator; however, even a small or moderate increase in modulation percentage would probably give noticeable improvement if it could be effected without increase in the frequency modulation of the transmitter. Some frequency modulation is normally present in the AN/ALT-7 but the amount is not excessive for this type transmitter. (CONFID)

A transmitter free from frequency drift would be ideal but it appears that to realize this would require extensive modification of the AN/ALT-7 or considerable auxiliary equipment. Actually, the frequency stability may be regarded as good when the type transmitter is considered along with its wide tuning range and sometimes severe operating conditions.

A type of instability is sometimes noted with the AN/ALT-7 wherein the frequency suddenly jumps several megacycles. Thus, an operator tuning toward a desired frequency may notice that the transmitter jumps over the desired frequency. When he attempts to tune back to the right frequency, the transmitter again jumps over in the other direction. This is an inherent characteristic of self-excited oscillators when fed into reactive loads and is similar to the long lines effect, or double moding, encountered in magnetron transmitters. The trouble is usually caused by an improper antenna system and may be remedied by use of the proper antenna, short antenna cables, and properly installed cable connectors. In some cases adjustment of the antenna coupling control will help. The jumping can occur during sweeping operation and cause holes in the swept band so each set-up for this type operation should be carefully checked. (CONFID)

Sweep Unit for Spot Jamming. The flight test of 1 May used a sweep unit modified to sweep over approximately 1.2 megacycles and somewhat better results were obtained than on tests where the normal QRC-18(t) units were used. This suggests that effectiveness might be increased if a very narrow sweep unit were used for spot jamming. The sweep width in this case should be only wide enough to make up for inherent setting-on errors of the receiving system, perhaps a few hundred kilocycles at the most. Use of such a unit would require monitoring by the ECM operator because normal drift of the transmitter may be greater than the sweep width. This technique would be a mitigation rather than a cure of the problem of communications jamming but would have the virtue of simplicity. (SECRET)

APPENDIX II

Equipment Details and Operation

TRANSMITTER T-464/ALT-7.

This transmitter is designed as airborne electronic countermeasure equipment for jamming enemy signals in the frequency range of 24 to 170 megacycles. The transmitter may be used as a spot jammer or may be swept in frequency over a bandwidth approximately ten percent of the center frequency at a selective rate between eight and 400 cycles per second. The radio frequency output of the transmitter may be unmodulated or modulated by noise as desired. Minimum power output is 70 watts. (CONFID)

The transmitter unit is contained in a 1½ ATR rack and the transmitter power supply, PP-506/ALT-6, is contained in a separate ATR rack. Photograph 3 shows the transmitter and power supply. Photograph 4 is an internal view of the transmitter, with the oscillator compartment open, showing the motor driven sweep capacitor and sweep motor speed regulator. (CONFID)

MODIFICATION KIT QRC-18(t).

Photograph 1 shows parts contained in the QRC-18(t) modification kit. The speed regulator and adjustment potentiometer, on the right in the photograph, are normally installed in the T-464/ALT-7 transmitter so essentially the modification parts consist of the three sweep units and a SWEEP RATE control knob. The small wrench is used to change knobs. A new SWEEP RATE control knob must be used because sweep rate of the QRC-18(t) sweep units is from 36 to 2000 CPS as compared to eight to 400 CPS for normal T-464/ALT-7 sweep units. (CONFID)

The three sweep units provide sweep widths of 1%, 2%, or 4% of the transmitter center frequency. The sweep width of a particular unit is identified by means of a colored band near the base: red for 1%, blue for 2%, and green for 4%. (CONFID)

To change sweep units for QRC-18(t) operation, remove the transmitter from the dust cover and open the oscillator housing by removing the lid screws. Remove the three screws which hold the sweep unit socket to the side of the oscillator housing. Withdraw the installed sweep unit and replace with a QRC-18(t) unit of the desired sweep width. Replace the three sweep unit socket screws, the oscillator housing lid screws, and replace the transmitter in the dust cover. Remove the normally used SWEEP RATE control knob and replace with the QRC-18(t) SWEEP RATE control knob. (CONFID)

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Photograph 1. GRC-12(T) Modification Kit

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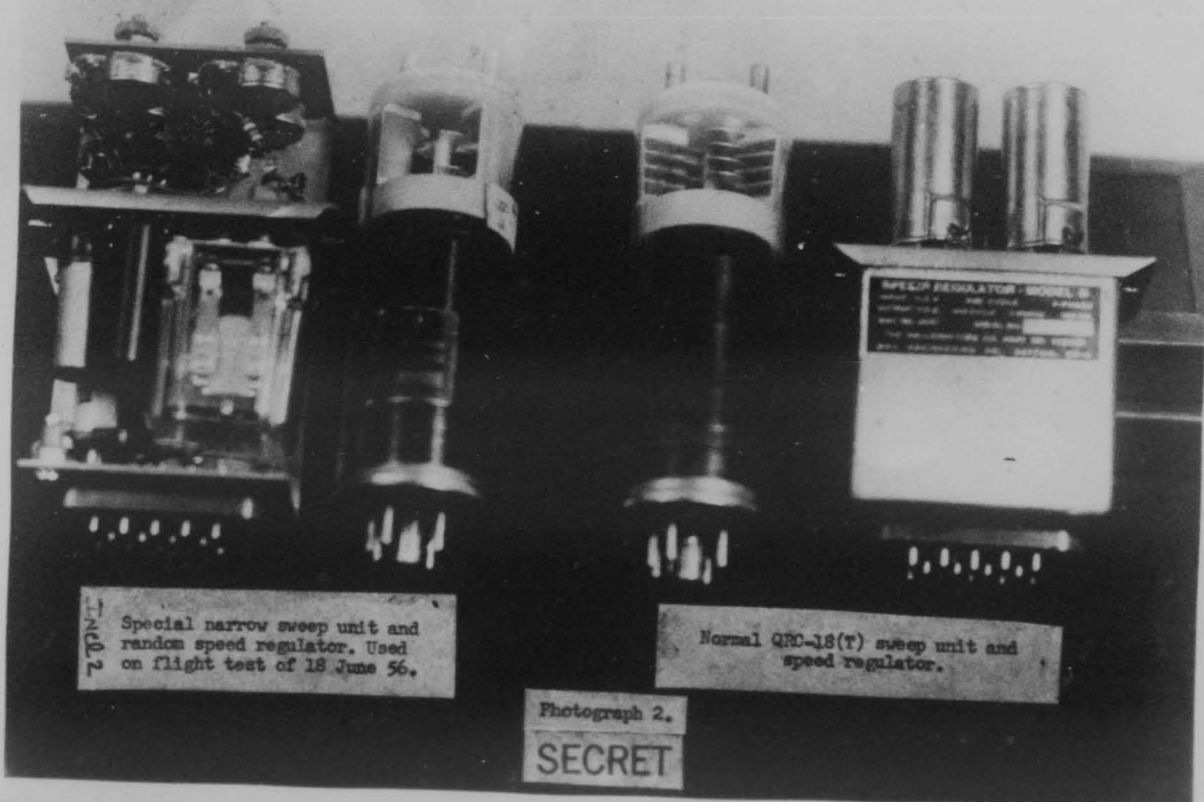

Photograph 2.

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Photograph 3. Transmitter T-464/ALT-7 and Power Supply PP-506/APT-6 with Antenna AT-191/AP

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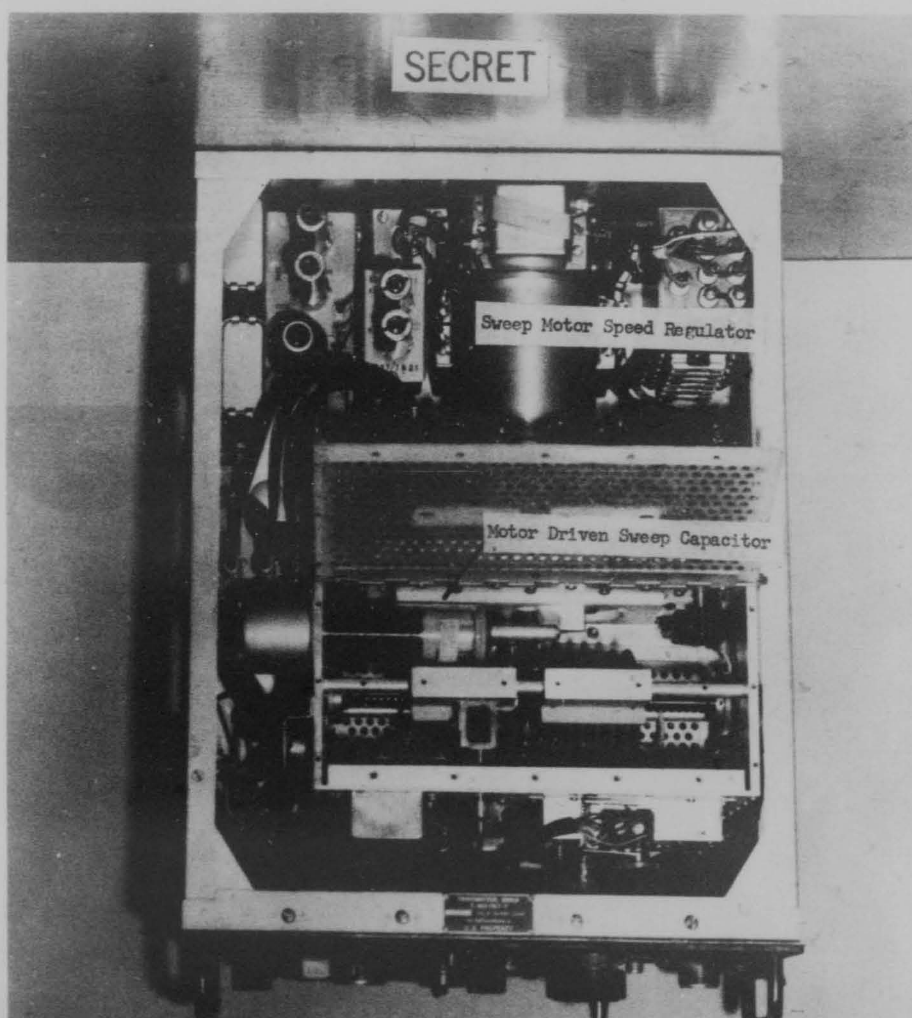

Photograph 4. Internal view of Transmitter showing sweep capacitor and motor speed regulator.

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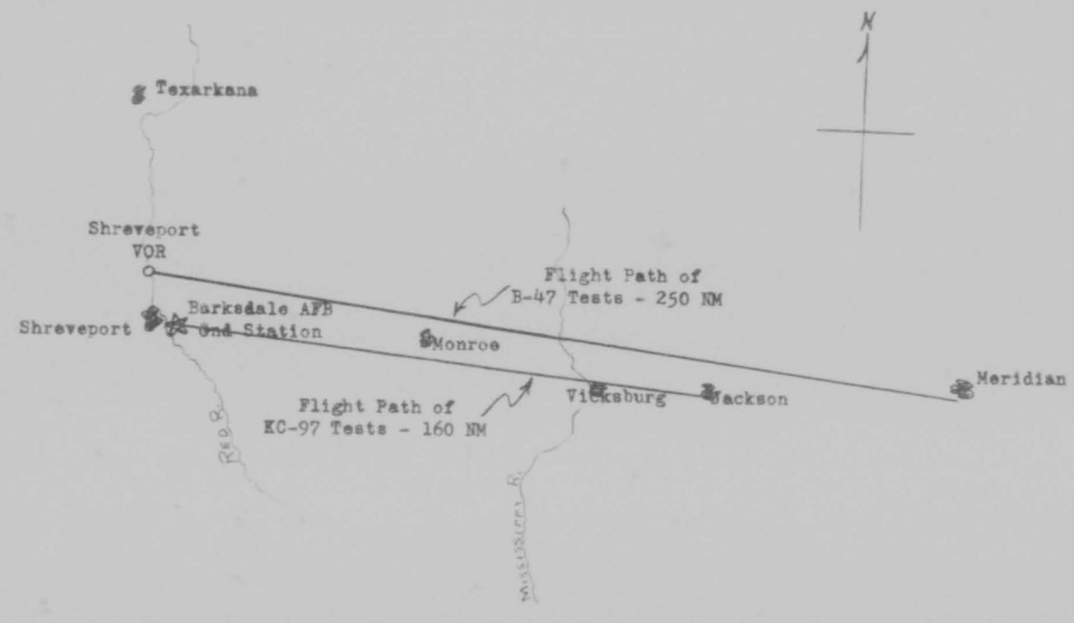

Test Project Number 39
Flight Paths

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HISTORICAL REPORT FOR THE MONTH OF APRIL 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

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1. The Wing had assigned seventy-three (73) aircraft for the month of April. The Wing possessed an average of sixty (60) aircraft for the month. The average in-commission rate was 86.02%, a total of 1,537:15 hours were flown for an average of 25:37 hours per possessed aircraft. The Wing AOCP rate was 2.78% for the month of April.

2. The following is a breakdown of paragraph one (1), for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had fifty-one (51) B-47 aircraft assigned with an average of forty-one (41) aircraft possessed for the month. The average in-commission rate 87.25% for April, compared to 89.49% for March. There was a total of 991:05 hours flown for an average of 24:10 hours per possessed aircraft.

b. KC-97 Aircraft: The Wing had twenty-two (22) KC-97 aircraft assigned with an average of nineteen (19) aircraft possessed for the month of April. The average in-commission rate was 83.30% for the month as compared to 87.78% for the previous month. There was a total of 546:10 hours flown for an average of 28:45 hours per possessed aircraft.

3. In April there were 211,121.7 manhours assigned with 151,319.5 manhours available for work. There were 4,364.4 manhours expended during the month on overtime and 2.9% of the available manhours. Of the total manhours available there were 68,595.7 hours expended on direct time or 45.3%. There were 80,132.9 manhours spent on productive indirect codes or 53.0% of the available manhours. There was also 2,591.1 manhours or 1.7% of the available time expended on non-productive work. Of the total manhours assigned there were 63,690.3 hours or 30.2% spent on absent codes.

a. The above figures are based upon a forty-four (44) hour week of which four (4) hours per airman is normally absent time for parades, squadron duty or excused from duty codes.

4. The malfunction figures are taken from the U-15 report which was completed from 1 April thru 31 April. During this period there were 9 aborts and 13 malfunctions for B-47 aircraft and 7 aborts and 0 malfunctions for KC-97 aircraft.

5. A total of 10 B-47 engines were changed during the month of April as compared to 9 for the previous month. There were 4 KC-97 engines changed during the month of april. The average engine time at change was 420:00 hours for B-47 and 397:00 hours for KC-97 aircraft.

TOC & RECORDS

1. During the month of April there were four (4) engine changes on KC-97 aircraft and ten (10) engine changes on B-47 aircraft.

2. There were 397 average hours per KC-97 engine change and 420 average hours per B-47 engine change.

3. During the month there were 42 Technical Orders complied with on KC-97 aircraft and 416 Technical Orders complied with on B-47 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of April was 36. There were 16 cannibalizations for B-47 aircraft and 20 for KC-97 aircraft.

2. There were ten (10) major line items that were AOCP during the month of April.

3. Following are the five (5) recurring line items that were causing most AOCP's.

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
02H2	0235-97918	Box	KC-97
03B	4103-147635 MSTI	Brake	KC-97
02A	2PTF-R4360-59B	Engine	KC-97
05D	6119-8DJ43BAH	Indicator	KC-97
01F	1AFE-7-3657-209	Fairing	B-47

4. The AOC rate was 1.92% for B-47 aircraft and 6.84% for KC-97 aircraft during the month.

5. The ANFE rate was 10.49% for B-47 aircraft and 18.03 for KC-97 aircraft during the month.

STANDARDIZATION TEAM

1. General Electric and Boeing Tech Reps conducted lecture on water alcohol on 16 - 17 April 1956.

2. M/Sgt James L. Campbell re-enlisted to fill his own vacancy.

3. M/Sgt John W. Mitchell was placed on OJT for 43171E on 17 April 1956.

QUALITY CONTROL UNIT

1. During the month of April 1956, the Quality Control Unit conducted quality inspections on seven (7) B-47 type aircraft, three (3) KC-97 type aircraft processed through 376th Periodic Maintenance Docks, and two (2) C-124 type aircraft processed through 3rd Strategic Support Squadron Periodic Maintenance Docks.

2. This unit conducted Flight Line (In-commission) Inspections on thirteen (13) B-47 type aircraft, five (5) KC-97 type aircraft and three (3) C-124 type aircraft.

3. There were eight (8) jet engine installations and two (2) reciprocating engine installations inspected by this unit.

4. Nine (9) B-47, ten (10) KC-97 and three (3) C-124 type aircraft Test Flights were supervised by this Unit.

5. Technical Publications were requisitioned, processed and distributed in accordance with SAC Manual 66-12 and SAC Regulation 5-4.

6. A total of 866 Failure Reports, 18 Unsatisfactory Reports and 15 Teardown Deficiency Reports were submitted through the UIP Control Section of this Unit.

Averill F Holman
AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

HISTORICAL REPORT FOR THE MONTH OF MAY 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing had seventy-two (72) aircraft assigned for the month of May. The wing possessed an average of fifty-seven (57) aircraft for the month. The average in-commission rate was 80.78%, a total of 1,689:10 hours were flown for an average of 29:38 hours per possessed aircraft. The wing AOCP rate was 5.82% for the month of May, computed on an hourly basis.

2. The following is a breakdown of paragraph one (1), for B-47 and KC-97 aircraft:

a. B-47 aircraft: The Wing had fifty (50) B-47 aircraft assigned with an average of forty-one (41) aircraft possessed for the month. The average in-commission rate was 83.45% for May, compared to 87.25% for April. There was a total of 1224:50 hours flown for an average of 29:52 hours per possessed aircraft.

b. KC-97 aircraft: The Wing had twenty-two (22) KC-97 aircraft assigned with an average of sixteen (16) aircraft possessed for the month of May. The average in-commission rate was 74.67% for the month of May, as compared to 83.30% for April. There was a total of 464:20 hours flown for an average of 29:01 hours per possessed aircraft.

3. In May there were 208,709.7 manhours assigned with 157,322.5 manhours available for work. There were 7,307.7 manhours expended during the month on overtime or 4.65% of the available manhours. Of the total manhours available there were 67,754.1 hours expended on direct time or 43.07%. There were 86,693.2 manhours spent on productive indirect codes or 55.11% of the available manhours. There was also 2,875.7 manhours or 1.83% of the available time expended on non-productive work. Of the total manhours assigned there were 57,665.1 hours or 27.63% of the assigned on non-available codes. These figures are based on a forty (40) hour week in accordance with Interim Change #2 to SAC Manual 66-14 effective 1 May 1956.

4. The malfunction figures are taken from the U-15 report which was completed from 1 May thru 31 May. During this period there were 19 aborts and 29 malfunctions for B-47 aircraft and 7 aborts and 3 malfunctions for KC-97 aircraft.

5. A total of 6 B-47 engines were changed during the month of May as compared to 10 for the previous month. There were 3 KC-97 engines changed during the month of May as compared to 4 for the previous month. The average time at change was 389 hours for B-47 and 334 hours for KC-97 aircraft.

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6. S/Sgt Edward R. Scott, NCOIC of Production Analysis Section of the Analysis Records and Reports Branch, is attending the Maintenance Engineering Production Analysis School at Chanute Air Force Base Illinois.

TOC & RECORDS

1. During the month of May there were three (3) engine changes on KC-97 aircraft and six (6) engine changes on B-47 Aircraft.

2. There were 334 average hours per KC-97 engine change and 379 average hours per B-47 engine change.

3. During the month there were 58 Technical Orders complied with on KC-97 aircraft and 387 Technical Orders complied with on B-47 aircraft.

SUPPLY LIAISON

1. Total cannibalizations for the month of May was 56. There were 23 cannibalizations for B-47 aircraft, 32 for KC-97 aircraft and 1 for C-124 aircraft.

2. There were fifty-seven (57) major line items that were AOCP during the month of May.

3. Following are the seventeen (17) recurring line items that were causing most AOCP's.

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
05D	6119-988868303	Harness EGT	B-47
03F	4577-18401-11	Refrigeration Unit	B-47
05C	6040-652191	Indicator (DG)	B-47
03I	4869-67WQ300	Pump	B-47
03I	4815-WE475-1½D	Valve	B-47
03I	4839-TF57300-21	Pump	B-47
05-D	6134-ST2A	Transmitter	KC-97
05-C	2319-8DJ21ADY	Gage	KC-97
05-C	6040-652191	Indicator (DG)	KC-97
03I	4815-WE4991½D	Valve	KC-97
03-C	4224-D1-7	Motor	KC-97
03I	4879-B200-2	Valve	KC-97
05C	6025-7393U-03	Indicator	KC-97
03C	4227-157AYD	Actuator	KC-97
05C	6034-1636-6AA1	Indicator	KC-97
03-B	4103-147635-MST1	Brake	KC-97
03-C	4227-158AY1	Actuator	KC-97

4. The AOCP rate was 6.51% for B-47 aircraft and 7.91% for KC-97 aircraft during the month, computed on a daily basis.

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5. The [illegible] rate was 14.[illegible] for B-47 and 7.[illegible] for KC-97 aircraft during the month.

6. Base Supply average delivery time 41.8 minutes.

STANDARDIZATION BRANCH

1. MA7A mockup was completed.

2. O-15 camera difficulties were cleared up, satisfactory camera bodies either on order or have been received.

3. Ground power operator permits complete re-issue, estimated completion 15 June 1956.

4. Gun chargers fix, 45% completed.

5. Approximately 85% completion on re-training 43171[illegible]'s to 43171[illegible]'s.

6. A/1C Richard A. Custer transferred to Quality Control Unit from Aircraft Maintenance Standardization Branch.

7. A/2C Santos Canales transferred from Standardization Branch to Analysis, Records and Reports Branch.

QUALITY CONTROL UNIT

1. During the month of May 1956, the 376th Bombardment Wing Quality Control Branch conducted quality inspection on thirteen (13) B-47 aircraft, six (6) KC-97 type aircraft and three (3) C-124 type aircraft on the flight line (In-commission).

2. Quality inspections were conducted on four (4) B-47, three (3) KC-97 and three (3) C-124 type aircraft processed through Periodic Maintenance Docks.

3. This Branch processed and supervised Test Flight on thirteen (13) B-47, nine (9) C-124 and five (5) KC-97 type aircraft during the month.

4. There were four (4) jet engine and four (4) reciprocating engine changes installations inspected during the month.

5. A total of 716 Failure Reports, 14 Unsatisfactory Reports and 12 Teardown Deficiency Reports were submitted through PIP Control Section of this Branch.

6. Publications were requisitioned, received and processed in accordance with SAC Manual 66-12.

7. M/Sgt Roberts, Hubert B., T/Sgt Spohr, Karl C., M/Sgt Woods, Theodore, and A/1C Custer were assigned and M/Sgt O'Connor, Gilbert retired from service during the month of May 1956.

Averill F Holman

AVERILL F. HOLMAN
LT COL., USAF
Chief of Maintenance

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HISTORICAL REPORT FOR THE MONTH OF JUNE 1956

376th Wing Maintenance Control Unit

Reports and Analysis and Control Unit

1. The Wing had seventy-two (72) aircraft assigned for the month of June 1956. The Wing possessed an average of fifty-seven (57) aircraft for the month. The average in-commission rate was 80.90%, a total of 1,643:40 hours were flown for an average of 28:50 hours per possessed aircraft. The Wing AOCP rate was 6.58% for the month of June, computed on an hourly basis.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had fifty (50) B-47 aircraft assigned with an average of forty-one (41) aircraft possessed for the month. The average in-commission rate was 81.34% for June, compared to 83.25% for May. There was a total of 1,117:50 hours flown for an average of 27:16 hours, per possessed aircraft. The AOCP factor was 6.38% computed on an hourly basis.

b. KC-97 Aircraft: The Wing had twenty-two (22) KC-97 aircraft assigned with an average of seventeen (17) aircraft possessed for the month of June. The average in-commission rate was 79.84% for the month of June, as compared to 74.67% for May. There was a total of 525:50 hours flown for an average of 30:56 hours per possessed aircraft.

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3. In June there were 193,467.8 manhours assigned with 147,395.9 manhours available for work. There were 7,813.5 manhours expended during the month on overtime or 5.30% of the available manhours. Of the total manhours available there were 66,417.4 hours expended on direct time or 45.06%. There were 79,780.4 manhours spent on productive indirect codes or 54.12% of the available manhours. There were also 1,198.1 manhours or .8% of the available time expended on non-productive work. Of the total manhours assigned there were 53,038.6 hours or 27.41% of the assigned on non available codes.

4. The malfunction figures are taken from the U-15 Report which was completed from 1 June thru 30 June. During this period there were 26 aborts and 35 malfunctions for B-47 aircraft and 9 aborts and 1 malfunction for KC-97 aircraft.

5. A total of 5 B-47 engines were changed during the month of June as compared to 6 for the previous month. There were 6 KC-97 engines changed during the month of June as compared to 3 for the previous month. The average time at change was 361 hours for B-47 and 303 hours for KC-97 aircraft.

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SUPPLY LIAISON

1. Total cannibalization for the month of June was 54. There were 33 cannibalizations for B-47 aircraft and 21 for KC-97 aircraft.

2. There were 8 major line items that were AOCP during the month of June.

3. Following are 5 recurring line items that were causing most AOCP's:

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
03F	4577-18401-11	Refrigeration Unit	B-47
05D	6119-988860303	Harness	B-47
01F	1AFE-FCD 26895	Fuel Cell	B-47
05C	6025-1214BX8-05	Indicator	B-47
05C	6034-16800-1A1A1	Indicator	KC-97

4. The AOCP rate was 9.56 for B-47 aircraft and 11.11 for KC-97 aircraft during the month.

5. The ANFE rate was 9.56 for B-47 aircraft and 22.22 for KC-97 aircraft during the month.

STANDARDIZATION TEAM

1. M/Sgt Campbell was placed on loan to A&E to head A&E Bomb competition Team.

2. M/Sgt Mitchell placed on a team to set up Ground Power Shop in Field Maintenance.

3. Re-issue completed on operators permits (Form 313) for ground power operators.

4. Gun Chargers - 75% complete.

5. M/Sgt Mitchell completed OJT to 43171E.

6. Present manning leaves team short 1 each 43171E and 1 each 43171B.

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QUALITY CONTROL UNIT

1. During the month of June 1956, the 376th Bombardment Wing Quality Control Unit conducted quality inspection on twelve (12) B-47 type aircraft, five (5) KC-97 type aircraft and three C-124 type aircraft on the flight line (In-Commission).

2. Quality inspections were conducted on four (4) B-47, two (2) KC-97 and two (2) C-124 type aircraft processed through Periodic Maintenance Docks.

3. This Branch processed and supervised Test Flight on eleven (11) B-47, four (4) C-124 and eighteen (18) KC-97 type aircraft during the month.

4. There were five (5) jet engine and five (5) reciprocating engine changes installations inspected during the month.

5. A total of nine (9) Unsatisfactory Reports, 1031 Failure Reports and eight (8) teardown deficiency reports were submitted through PIF Control Section of this Branch.

6. Publications were requisitioned, received and processed in accordance with SAC Manual 66-12.

George R Brendle

GEORGE R. BRENDLE
LT COL., USAF
Chief of Maintenance

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[illegible]

__Analysis, Reports & Records Branch__

1. The Wing had seventy-two (72) aircraft assigned for the month of July 1956. The Wing possessed an average of sixty (60) aircraft for the month. The average in-commission rate was 80.70%, a total of 1,[illegible] hours were flown for an average of 30:[illegible] hours per possessed aircraft. The Wing AOCP rate was [illegible] for the month of July, computed on an hourly basis.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 Aircraft: The Wing had fifty (50) B-47 aircraft assigned with an average of forty-two (42) aircraft possessed for the month. The average in-commission rate was 80.42% for July, compared to 81.54% for June. There was a total of 1,234:45 hours flown for an average of 29:24 hours per possessed aircraft. The AOCP factor was 5.99% computed on an hourly basis.

b. KC-97 Aircraft: The Wing had twenty-two (22) KC-97 aircraft assigned with an average of eighteen (18) aircraft possessed for the month of June. The average in-commission rate was 80.42% for the month of July, as compared to 79.84% for June. There was a total of 590:15 hours flown for an average of 32:48 hours per possessed aircraft. The AOCP factor was 6.05%, computed on an hourly basis.

3. In July there were 209,057.4 manhours assigned with 160,272.9 manhours available for work. There were 11,032.9 manhours expended during the month on overtime or 6.9% of the available manhours. Of the total manhours available there were 71,504.7 hours expended on direct time or 44.6%. There were 85,406.0 manhours spent on productive indirect codes or 53.29% of the available manhours. There were also 3,362.2 manhours or 2.10% of the available time expended on non-productive work. Of the total manhours assigned there were 59,455.1 hours or 28.44% of the assigned on non-available codes.

4. The malfunction figures are taken from the U-15 Report which was completed from 1 July thru 31 July. During this period there were 21 aborts and 28 malfunctions for B-47 aircraft and 5 aborts and 1 malfunction for KC-97 aircraft.

5. A total of 7 B-47 engines were changed during the month of July as compared to 5 for the previous month. There were 2 KC-97 engines changed during the month of July as compared to 6 for the previous month. The average time at change was 313 hours for B-47 and 138 hours for KC-97 aircraft.

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SUPPLY LIAISON

1. Total cannibalization for the month of July was 70. There were 46 B-47 and 14 KC-97 aircraft cannibalized during this period.

2. There were 9 major line items that were AOCP during the month of July.

3. Following are 8 recurring line items that were causing most AOCP's:

CLASS	STOCK NUMBER	NOMENCLATURE	TYPE AIRCRAFT
01F	1AFH-15-24377-505	P.C.U.	B-47
01F	1AFH-6-33976-1	Vent	B-47
03F	4577-10401-11	Refrigerator Unit	B-47
03-03	9478-01M	Regulator	B-47
03-11	4459-IF57300-21	Pump	B-47
03-03	4224-D1-8	Actuator	B-47
05D	6119-90866050	Harness	B-47
05C	8040-652191	Ind. (D.R.)	B-47

4. The AOCP rate was 6.75 for B-47 and 5.73 for KC-97 aircraft during July.

5. The ANFE rate was 8.33 for B-47 aircraft and 19.54 for KC-97 aircraft during July.

STANDARDIZATION BRANCH

1. M/SGT Campbell has been placed on loan to AME to head AME Bomb competition team.

2. M/SGT Stafford has been supervising all AFC Maintenance on the aircraft scheduled for the Bombing Competition.

3. M/SGT Mitchell has been confined to the Lackland Hospital.

4. This branch continues to schedule and monitor OJT training for all of aircraft maintenance.

QUALITY CONTROL BRANCH

1. During the month of July 1956, the [illegible] Bombardment Wing Quality Control Branch conducted quality inspections on eleven B-47 type aircraft, four KC-97 aircraft and three C-124 type aircraft on the flight line (In-commission).

2. Quality inspections were conducted on seven B-47, two KC-97 and three C-124 type aircraft processed through Periodic Maintenance Docks.

3. This Branch processed and supervised Test Flights on 15 B-47, four C-124, and four KC-97 type aircraft during the month.

4. There were one jet engine and two reciprocating engines change installations inspected during the month.

5. A total of eight Unsatisfactory Reports, 1019 Failure Reports and nine Random Deficiency Reports were monitored through UR Control Section of this Branch.

6. Publications were requisitioned, received and processed in accordance with SAC Manual 66-12.

7. M/Sgt [illegible] I. [illegible] was transferred to the Chief of Logistics Branch of this Wing.

for in absence of Billy R Patterson 1/Lt
GEORGE R. [illegible]
LT COL., USAF
Chief of Maintenance

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HISTORICAL REPORT FOR THE MONTH OF AUGUST 1956

Analysis, Records & Reports Branch

1. The Wing had seventy three (73) aircraft assigned for the month of August 1956. The Wing possessed an average of fifty-nine (59) aircraft for the month. The average in-commission rate was 84.89%. A total of 1790:25 hours were flown for an average of 30:21 hours per possessed aircraft. The Wing AOCP rate was 4.01% for the month of August, computed on an hourly basis.

2. The following is a breakdown of paragraph 1, for B-47 and KC-97 aircraft:

a. B-47 aircraft: The Wing had fifty two (52) B-47 aircraft assigned with an average of thirty-nine (39) aircraft possessed for the month. The average in-commission rate was 82.39% for August compared to 80.82% for July. There was a total of 1192:55 hours flown for an average of 30:35 hours per possessed aircraft. The AOCP factor was 3.05% computed on an hourly basis.

b. KC-97 Aircraft: The Wing had twenty-one (21) KC-97 aircraft assigned with an average of nineteen (19) aircraft possessed for the month of August. The average in-commission rate was 87.4% for the month of August as compared to 80.42% for the month of July. There was a total of 597:30 hours flown for an average of 31:27 hours per possessed aircraft. The AOCP rate was .96% computed on an hourly basis.

3. In August there were 200,520.0 manhours assigned with 165,665.1 manhours available for work. There were 10,252.3 manhours expended during the month on overtime or 6.18% of the available manhours. Of the total manhours available there were 80,322.3 hours expended on direct time or 48.48%. There were 83,517.3 manhours spent on productive indirect codes or 50.41% of the available manhours. There were also 1,826.4 manhours or 1.10% of the available time expended on non-productive work. Of the total manhours assigned there were 44,968.5 hours or 22.42% on non-available codes.

4. The malfunction figures are taken from the U-15 Report which was completed from 1 August thru 31 August. During this period there were 22 aborts and 28 malfunctions for B-47 aircraft and 15 aborts and 1 malfunctions for KC-97 aircraft.

5. A total of 9 B-47 engines were changed during the month of August as compared to 7 for the previous month. There were 5 KC-97 engines changed during the month of August as compared to 2 for the month of July. The average time at change was 624 hours for B-47 507 hours for KC-97 aircraft.

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SUPPLY LIAISON

1. Total cannibalization for the month of August was 60. There were 41 B-47 and 17 KC-97 aircraft cannibalized during this period.

2. Rate of climb indicators and Fuel system components caused the majority of AOCP's during the month of August.

3. The AOCP rate was 2.45 for B-47 and 1.01 for KC-97 during August.

4. The ANFE rate was 8.89 for B-47 aircraft and 16.19 for KC-97 aircraft during August.

STANDARDIZATION BRANCH

1. 50% of the assigned strength was on loaned to the 514th Bombardment Squadron and further place on TDY for Bomb competition.

2. M/SGT Mitchel on convalesant leave from Lackland AFB Hospital.

3. Training resumed normally throughout the month of August.

QUALITY CONTROL BRANCH

1. During the month of August 1956, the 376th Bombardment Wing Quality Control Branch conducted quality inspections on eleven (11) B-47 type aircraft, five (5) KC-97 type aircraft and three (3) C-124 type aircraft on the flight line (In-Commission).

2. Quality inspections were conducted on seven (7) B-47, one (1) KC-97 and three (3) C-124 type aircraft processed through periodic Maintenance Docks.

3. This Branch processed and supervised Test Flight on fourteen (14) B-47, seven (7) C-124 type aircraft and fifteen (15) KC-97 type aircraft during the month.

4. There were thirteen (13) jet engine and three (3) reciprocating engine changes installations inspection during the month.

5. A total of nine (9) Unsatisfactory Reports, 1030 Failure Reports and eighteen teardown Deficiency Reports were submitted through PIF Control Section of this Branch.

6. Publications were requisitioned, received and processed IAW SAC Manual 66-12.

7. M/SGT Edward J. Urbaschak was reassigned to 376th Air Refueling Squadron. A/1C Custer was discharged from service. M/SGT Charles A. Martin was assigned to this Branch from the 376th Air Refueling Squadron.

George R Brendle
GEORGE R. BRENDLE
LT COL., USAF
Chief of Maintenance

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