(Unclassified)

HISTORY

of the

AIR FORCE OPERATIONAL TEST CENTER

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VOLUME I

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(Air Proving Ground Command)

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VOLUME I

DEDICATION

On 10 January 1958 Major Lonnie R. Moore, [redacted] lost his life when an F-101 which he was flying crashed on take-off. Thus, a distinguished service career was brought to an end.

The mission of this organization is frequently referred to as "the testing business," and so it is. It is a business which is conducted by highly skilled and specialized men. Lonnie Moore was one of these. In this business, aircraft accidents are neither expected or accepted. Accidents are not an inevitable by-product of testing.

When an accident occurs the word spreads fast. If the pilot is safe the tension is immediately relieved, and there may even be some nervous laughter about the incident. But an accident involves the whole community, and when one is fatal it strikes sorrow into the heart of that community. The tragedy is felt deeply even by those who did not know the pilot.

The act of losing one's life in an aircraft accident does not make one a hero. Lonnie Moore had proved himself as a hero, in the general sense of the word, long before this accident. The significance of his life, however, is much more than heroism. It is skillfulness, accomplishment, and dedication to ideals which are far above the business of everyday life--dedication especially, for in this trait Lonnie Moore represents a legion of men who have gone before him and a legion who will follow.

With utmost appreciation for his deeds and a deep sense of loss at his absence, we, his survivors and beneficiaries, dedicate this chronicle to Major Lonnie Moore.

MAJOR LONNIE R. MOORE

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CHAPTER I

INTRODUCTION: THE TESTING MISSION

From "OST" to "E-ST"

A new edition of Air Force Regulation 80-14, dated 8 June 1956, changed the designation of the mission of the Air Force Operational Test Center. Formerly known as "operational suitability testing,"[1] this phase in the evolution of a new weapon system or item of equipment was redesignated "employment and suitability testing." The definition of employment and suitability testing was almost identical to that of its predecessor, and this redesignation itself did not affect in any way the mission or responsibilities of the Air Proving Ground Command or the Air Force Operational Test Center, primary mission organization of the command.*

Employment and suitability testing, however, was a more comprehensive and accurate name for the function of AFOTC. The theory behind OST or E-ST was this: The Air Research and Development Command performed a number of phases of testing during the development of a new item which was proposed for production and inventory.[2] An aircraft, for instance, was tested to determine, first of all, whether it would fly. Further

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*The new AFR 80-14 also authorized this command to participate in Phase II testing (Contractor Compliance Tests) and Phase VIII testing (Unit Operational Employment Tests). APGC's entry into Phase II was intended to get the command into the service test program at an earlier point, and to aid in the planning and conduct of the E-ST. The newly-created Phase VIII authorized for all cases what APGC had been doing under individual authorizations, namely conducting unit or "squadron" E-STs.

tests determined whether the engineering, performance, and handling specifications of the contract had been met. Its flight characteristics were probed, and data was compiled for the Handbook and other technical publications. It was tested under a variety of climatic situations so that its capabilities and limitations under adverse weather conditions could be discovered. Throughout these tests the aircraft was refined, and what was to become the eventual production model was approached.

There was, however, one important phase in this process of evolution which had to be completed before the aircraft could be considered truly "combat ready." It had to be determined whether the aircraft could suitably perform the mission for which it was designed, and the most advantageous tactics and techniques for employing the weapon had to be developed. This was the mission of the Air Proving Ground Command, and specifically of the Air Force Operational Test Center. The term "operational suitability testing" was given to this mission.

Although this term covered much of the mission of AFOTC, it did not give a complete picture, for actually within the scope of AFOTC's mission there were several different types of tests conducted: End Item tests (E.S.T. of the F-102A Weapon System); Tactics and Techniques tests (Development of Tactics and Techniques for Employment of the F-[illegible] Aircraft); Unit tests (F-[illegible] Squadron Logistical S.S.T.); and Comparison tests (Chaff Comparison Test).*

O.S.T. moreover, was generally taken to mean the testing of an End Item, and although this type of test represented the greatest number of tests conducted by the Center, it did not represent the most important

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*These projects were all in progress during the reporting period.

or significant tests. This fact was supported by a special study correlated to the revision of Air Force Regulation 80-14 conducted for Major General Robert M. Marcus, AFSC Commander.[3] Ten key officers and civilians most familiar with the overall test program at AFSC listed those completed tests which they considered to be most beneficial to the United States Air Force. Their polled opinions indicated that the tests with the most "potential" were Unit, Tactics and Techniques, Comparative, and End Item tests, respectively.[4] The most "productive" tests were considered to be Tactics and Techniques, Unit, Comparative, and End Item tests, respectively.[5] The report further indicated:

> It is significant that the unit and tactics and techniques type tests were considered to have the most potential by the key personnel of AFSC. This can be attributed in part to the fact that the objectives of Phase VI and the recently established Phase VIII tests somewhat overlap those of Phase VII and relegate Phase VII testing, as conducted in the past, to a subordinate role. However, consideration must be given to the fact that most of the unit and tactics and techniques tests are large and complex, as well as spectacular; and, since they generally follow the normal OST of major weapon system, tend to become the climax to these independent tests. It is felt that it would be foolhardy to de-emphasize the importance of the normal major weapon system tests although they are not considered the most productive by key personnel of AFSC. However, it is felt that the objective of major weapon system tests should include more emphasis on developing tactics and techniques.[6]

This "ad hoc" committee formed a list of the twenty most productive tests conducted at AFSC since 1950.[7] It was significant that three of the top five, and five of the top ten listed tests fell into the category of Tactics and Techniques tests. Three of the top ten were Unit tests, one was a Comparative test, and one--the tenth on the list--was an End Item test.

A further illustration of the relative value of different types of tests was given in a tabulation of all the tests conducted at APG[9] since 1950. There were 473 End Item tests conducted, 352 of which were considered "significant." Two percent of these appeared in the list of the twenty most productive. There were eight Unit tests, all of which were significant, and half of which were listed among the top twenty. Of 63 Tactics and Techniques tests, 56 were significant, and ten percent of these were in the top twenty.[9]

This change in the designation of the mission, therefore, on the surface a relatively unimportant change, had some important implications. It was recognized that the term "operational suitability testing," a term which had been in usage well before World War II, and which had generally been associated with End Item tests, was inadequate to describe fully this concept of testing. Moreover, it pointed to some very practical considerations. Within this scope of testing, what were the most important types of tests? Where were our resources most effectively spent? It was possible that since End Item tests represented an overwhelming majority of the tests conducted here, more important and productive tests might be slighted in the employment of our resources. With this fact recognized, it was important that a sound and effective system of resource utilization and control be effected.[10]

The Planning Factor

The efficiency of resource utilization was dependent upon two primary factors: the planning and programming function and the management control function. Proper planning and programming of personnel,

materiel, and facilities, before the initiation of a test, and close control and analysis of the employment of these resources once a test had been started, were keys to economy in the performance of the mission.

The element of Time was of continuous paramount importance in the planning factor. With a weapon system which was designed to fill a specific need for a specific period of time, delays could have had far-reaching effects. In the planning factor, therefore, the projected time span of the test item and the optimum utilization of test resources were crucial considerations.

Cross-utilization of resources between projects was one method used to exercise resource economy, and was always taken into account in the planning of a test.[11] In the R/ST of the KB-50 Three-Dragon Tactical Tanker, for instance, aircraft assigned to the R/ST's of the B/RB-66 and the F-100C/D were employed. Since all these projects were running simultaneously many ends were served by cross-utilization, and no increase in personnel or materiel was necessitated. In another case, F-84F's, fitted with Firing Error Indicator (FEI) cameras, were used to assess the results of firings by aircraft other than the F-84F--aircraft assigned to other projects. In the area of support equipment, even more flexibility was possible.

Cross-utilization of personnel was easily accomplished on projects which were conducted solely at Eglin, appreciably reducing the personnel requirement of AFOTC. Off-base tests* presented a problem,

*Off-base tests were becoming more frequent as more effort was made to test items in the actual environment in which they would eventually be employed. Phase VIII testing was expected to increase the number of off-base tests conducted by AFOTC.

however, for personnel assigned to such projects could be employed effectively only on that particular test. Off-base tests fell generally into two categories--those which required a project team, and those which required only one or two men. The IOST of an Instrument Low Approach System[12] required one officer from AFOTEC. The project officer conducted the test at a number of Air Force installations at which the test equipment had been installed.[13] Similarly, tests of aircraft flight simulators were conducted by a single project officer at bases of the primary using commands.

Large scale off-base tests, which requires full-time presence of a project team, limited the potential utilization of these personnel to single tests.[14] In many on-base tests no additional manpower authorizations were required, because those requirements could be met by shifting spaces to accomplish the fluctuating workload. An off-base test of any magnitude actually took spaces "out of circulation."

The IOST of the E-3A/CFD Airborne Early Warning and Control Aircraft[15] was a large scale off-base test which was in the planning phase during this period. The test required a total of seven officers, twenty-five airmen, and two civilian authorizations. One additional officer and two airmen spaces were requested, but these could not be provided from within AFOTEC resources. In May a request to AFSC for these additional spaces was granted, and the spaces were to be retained for the duration of the test.[16] In addition to the AFOTEC personnel involved in this test a complete Wing from the Air Defense Command, and bombers and crews from the Strategic Air Command were

to be required. This same situation prevailed during the BEST's of the C-123B and C-130A Transport tests.[17] In both of these tests project teams from AFCTC conducted paradrop and airlift operations with the U.S. Army at Fort Bragg, North Carolina. Utilization of personnel assigned to the HC-121, C-123B and C-130 projects was limited to these tests, and the spaces allocated were "frozen". Thus the flexibility of manning was decreased.

Although off-base tests decreased cross-utilization and ultimately necessitated more personnel to accomplish the mission of AFCTC, they were preplanned far enough in advance so that individual tests were not adversely affected. Unprogrammed tests, however, often created some serious problems. Personnel, materiel, and maintenance capabilities had to be provided, generally at the expense of programmed projects which were in the planning or physical testing phases. In the case of small unprogrammed tests these problems were generally minimized, but large scale tests, with high priorities, caused the suspension or slippage of other projects.

In March 1956, the United States Army requested that AFSC support a test to determine the effects of sonic shock waves on light aircraft and helicopters.[18] This was not a scheduled test, and required the support of AFCTC aircraft, personnel, and facilities. The United States Air Force had no information on this subject, and the results of the test would have been of value to USAF planners as well as the Army. A staff investigation indicated that no serious effects would be encountered by the Center in planning and conducting this test, and the project was completed with no major problems.[19] This project,

[redacted]

however, was relatively brief and of small scale.

Project "Fig Leaf," which was initiated in January 1956 by a letter from Headquarters USAF,[20] pursuant to a directive from the Joint Chiefs of Staff, was a large scale, high-priority project. A suspense date of 1 August 1956 was established for the completion of physical testing, so that the final report and recommendations could be forwarded to the Joint Chiefs of Staff by 1 September. For this reason "Fig Leaf" was given a number one priority in the Command. [redacted]

The project required the use of four F-89H and four F-102A interceptors, as well as two B-47s and two C-131s. The B-47s and C-131s were available from AFOTC's inventory of support aircraft, that is, aircraft which were not undergoing E-ST as weapon systems themselves. The interceptors, however, which were listed in the AFOTC inventory, had been delivered for End Item testing, and the E-ST's of the F-89H and the F-102A were in the planning stage, ready to move into the physical testing stage well before 1 June, the suspense date for the completion of the planning phase of "Fig Leaf."[21]

Because of the urgency and priority of the project, the eight required interceptors were transferred to "Fig Leaf," causing slippage in the respective E-ST's. Although the loss of four F-102As slowed the progress of that project, four more were still available for the F-102 project team. At the time, however, the F-89H project had only four aircraft assigned. Two more F-89Hs were brought into the Command to replace the ones used on "Fig Leaf," but on the initial

[redacted]

test flight of one of them a fire broke out in the aircraft and the pilot was forced to bail out.[22]

When "Fly Leaf" moved into the physical testing phase, some cross utilization of results was possible, for the crews of the interceptors were taken from the interceptor ECSTs. Before this phase started, however, the aircraft had been undergoing instrumentation, and the test equipment was being installed. Because little flying time was being accomplished at that stage, the profit to the ECSTs was minimum.

As a result of this test, the ECST of the F-102A, which had been originally scheduled to move into physical testing on 15 March, was slipped to 2 April, with limited facilities. Physical testing in the ECST of the F-99H was slipped from April to 25 June, with the limitations noted above.[23]

The slippage or delay of a programmed test presented additional problems. In many instances, the End Item test of a major weapon system also included tests of component equipment, so the slippage of one could have caused the slippage of the other. The ECST of Modified Range Servo in the A-1 Gunsight[24] was originally scheduled to be part of the ECST of the F-100D. Delivery of the test aircraft was delayed, and because of an ARDC requirement for a report on the modified range servo by 30 June, it was decided to test the item in conjunction with the F-100C, the employment and suitability testing of which had been completed earlier in the year.

In a similar situation, the ECST of the Simplified Camera Control System (SCCS) in the B-58F,[25] slippage in the delivery date of the

test aircraft almost caused the cancellation of the project. It was anticipated that delivery of the RF-84F could have been delayed until late in the year,* when the RF-101 was expected to arrive for EOST. It was suggested, therefore, that the EOST of the SCCS in the RF-84F be cancelled so that the system could be tested in a higher performance aircraft. SAC, however, was not planning to install the SCCS in their RF-84F's, which were programmed for use for several years, until the results of the EOST were known, so the test was accepted with no adverse recommendations.[26]

Maximum utilization of available materiel was an important element in the planning factor. The cancellation of a test necessitated proper disposition of the resources which had been accumulated for the project, for a surplus of materiel was as detrimental to efficiency as a shortage. Project "FICON", the EOST of the GRU-3GD/RF-84F Composite Aircraft System[27], was suspended during the period. This project provided a good example of the effective distribution of resources assigned to a project which had been cancelled.

FICON, which evolved from a SAC requirement for a strategic reconnaissance system, used a modified B-36 as a carrier aircraft and a modified RF-84F as a parasite fighter. The parasite was carried aloft in the bomb bay of the B-36. A trapeze system enabled the carrier to release the fighter and recover it in the air, thereby greatly extending the range and strategic reconnaissance capability of the RF-84F.[28]

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*The test item actually arrived on 3 July 1956.

[redacted]

In a TWX from Headquarters APGC to the Chief of Staff, USAF, dated 26 September 1955,[29] the requirement for conducting this project was questioned. A number of deficiencies in the system were outlined. The TWX is quoted in part:

> APGC project personnel were informed verbally during a recent test program coordination at Hq SAC that complete evaluation of the FICON program will be recommended to USAF. This is being recommended because the present FICON configuration apparently will not be functional during the time period when SAC deems that would be feasible for operation. [redacted]
>
> Until the aforementioned deficiencies have been corrected, Project APG/SAS 168-A can be conducted on a limited basis only. The policy of APGC is to conduct OSTs only on those weapon systems which are scheduled for introduction into the operational inventory unless development of new tactics and techniques or the gaining of experience for use in testing more advanced equipment is involved...APGC recommends that the requirement for conducting an OST be reviewed because of: a. Present equipment limitations and approaching obsolescence. b. The possibility that the GRB-36D-111/RF-84F weapon system will be dropped from the operational inventory. c. Previous conduct of a test stressing tactics and techniques with the prototype system under Project APG/SAS 97-A. d. Lack of an announced plan for eventually equipping the system with a parasite of higher performance. [redacted]

Plans for conducting the test were continued at AFOTC, but on 27 February 1956 a TWX from Headquarters USAF cancelled the requirement for the project.[30] Cancellation of FICON left AFOTC with three aircraft and a considerable number of components and items of support equipment which had to be disposed of. Certain electronic equipment was retained in the 3245th Test Group for use in another project. Lack of this equipment had been delaying the progress of the latter test. Engines and wing tip tanks which had been in stock were assigned to the 3243rd Test Group to support their F/RF-84 aircraft. Photo flare pods which had been procured for FICON were

[redacted]

allocated to a project within the 3243rd, the EGST of the Night Photo Capability of the RF-4F aircraft. The Directorate of Test Requirements, AFSC, was able to make use of one of the aircraft and some other electronic equipment for future tests. Thus, the exercise of proper planning assured the maximum utilization of existing resources.[21]

The Control Factor

The report by General Campbell's Committee on Command Operations stated that a strong project and resource control capability was required at both Headquarters AFSC and AFOTEC. At that time there existed a limited test resource control capability at Headquarters AFSC, but it was employed primarily to accumulate, analyze, and present data for workload imposition. It was felt that this capability should be expanded to provide information for future planning and management control.[22]

Within AFOTEC, however, the immediate responsibilities of the Center required very specific controls. It was necessary for the Commander to have at his fingertips information concerning the progress of projects and the availability of resources. This information, in addition to presenting a measure of workload accomplishment, also served as an index of potential capabilities of the Center. The Committee's report indicated in part:

> The control procedures now being used by AFOTEC have been improved considerably in the past year. The progress of testing can and is being closely monitored through these control facilities. Major problem areas can be recognized in advance and emphasis placed upon appropriate areas. Further, data available through

> AFUTC control sources provide an effective measure of capability of resources and can be employed in the determination of the Center's ability to absorb both programmed and unprogrammed tests.[33]

The control function in AFUTC was centered in a vault-like room located in the Headquarters building, known as the Control Room. Maintained by the AFUTC Comptroller, this room provided, by means of a variety of visual displays, information pertaining to project progress, aircraft status and utilization, workload and accomplishment, and personnel manning.[34]

On 18 January 1956 the Control Room was the scene of the first weekly project progress meeting in the history of AFUTC. Presided over by Colonel John A. Hilger, AFUTC Commander, and attended by representatives from each staff agency and the commanders of subordinate units, this meeting initiated a new and effective system of project control and management review.[35]

The project progress boards for each of the test groups, which were kept up to date with information supplied by the project officers themselves, indicated the status of each project in progress in the Center at that time. The information presented on these boards was broken down into three categories: the planning, physical testing, and report writing phases of the projects. The number of weeks allotted to each phase was divided into the percentage which had to be accomplished during that phase, and the resultant was the mathematical percentage of accomplishment per week needed to meet the suspense

date."

The boards indicated the percentage of accomplishment completed at the start of the current week, the percentage accomplished during the week, and the total percentage accomplished by the end of the week. In another column the number of weeks remaining, the programmed sorties and flying hours remaining, the percentage of accomplishment per week needed to meet the suspense date, and the sorties and flying hours per week needed to meet the suspense date were shown.

The final column on the project progress boards was labeled "remarks," and here the justification for marginal or insufficient progress, or high progress, was listed.

Although this system provided an effective control measure, it was not complete enough to give a true picture, in many cases, of the progress of certain projects. It was conceivable, for instance, that a project officer could meet his mathematical percentages of accomplishment each week, fly all of his scheduled sorties, and yet not collect any significant data. The significant factor in project progress was the percentage of productive sorties flown, and at the end of the reporting period plans were being made to indicate this information on these boards. Too, in non-flying tests, where there was no such specific measure of accomplishment as flying hours or sorties, the project officer's report of progress was necessarily a subjective one.

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*For the purpose of these computations the planning phase was considered to be complete in itself, comprising 10% percent. The physical test phase represented 65 percent of the remaining project activity, and the report writing phase 10 percent. The final five percent included review, publication, and distribution of the final report.

There was no doubt, however, that the Control Room had an extremely beneficial effect upon project efficiency. Problems were brought to light at the weekly meetings and presented to the men who were in a position to remedy them. In the terms of these graphic presentations themselves, marked improvement in workload accomplishment was noted; moreover, a graph which charted the percentage of accomplishment of AFCRC as a whole[36] indicated that at the beginning of 1955 this figure was 50 percent, dropping to a mean of 44 percent, and rising to a last quarter mean of 59 percent. In 1956 the mean for the first quarter was 59 percent, rising to 64 percent during the second quarter.

During this period the Comptroller published in a monthly report entitled "The Trend" much of the information which was contained in the Control Room, so that the Commander, the staff, and organizational commanders would have in book form a periodic review of project progress and resource economy within AFCRC.[37]

CHAPTER II

ORGANIZATION AND PERSONNEL

Organization of the Air Force Operational Test Center

As an Air Force organization at Air Division echelon, the Air Force Operational Test Center had progressed considerably, by the end of this reporting period, toward attaining an internal structure commensurate with that level of organization. When first organized, AFOTC existed as a staffless headquarters with several "operational" divisions. The project officers who conducted the Center's testing activities were assigned to these divisions, whereas the aircraft and maintenance resources were assigned to organizations not under the command of AFOTC. On 1 August 1955 the 3200th Test Wing (Maintenance) and the 3206th Test Wing (Technical Support) were assigned to the Center, thus giving the Commander of AFOTC more direct control of the facilities needed to carry out his assigned mission.[1]

On 24 October 1955 the 3200th was disorganized, the divisions within AFOTC were abolished, and four Test Groups, which amalgamated the functions of the old 3200th and the AFOTC divisions, were created. With this reorganization came the establishment of a headquarters staff. Command policy had been that AFOTC was to be "primarily operational in function [saving] only those administrative activities essential to the conduct of its testing mission."[2] The tremendous increase in personnel, resources, and responsibility, which was a result of the reorganizations of 1 July and 24 October, necessitated that this policy be somewhat tempered. It was during this reporting period that the value of the headquarters staff became manifest. Administrative practices and procedures were gradually

On 1 June the name of the unit was changed once more, this time to "3242nd Test Group (Electronics and Missiles)."[5] In addition to providing a measure of homogeneity and administrative ease within AFOTC, this final redesignation was consistent with the make-up of the 3242nd, and adequately described the organization's responsibilities.

Somewhat less significant was the discontinuance on 1 April 1956 of the Headquarters 3206th Test Group (Range Support),* and the reassignment of its two subordinate units, the 3206th Test Squadron (Electronics) and the 3216th Test Squadron (Range Control), to the 3206th Test Wing (Technical Support).[6] The discontinuance of the Headquarters 3206th Test Group, which had, for all purposes, ceased to function in December 1955, and which had had an assigned strength of one officer, one airman, and two civilians from 1 January through 31 March, was primarily a piece of organizational streamlining, and served to shorten administrative channels within the 3206th Test Wing.

One other change, which enhanced organizational streamlining, was accomplished during the period. The Test Support Branch, which had been a part of the Support Services Division of AFOTC prior to 24 October 1955, had not been integrated into the 3244th Test Group (Transport and Equipment) after that reorganization, but continued to function in AFOTC Headquarters under the Directorate of Materiel. This was an undesirable situation, and in February 1956, action was initiated to house the Test Support Division in the 3244th.[7] Test Support was responsible for investigating the maintenance and logistical support requirements of weapon systems which were undergoing employment and suitability

*A unit of the 3206th Test Wing (Technical Support).

testing, and their findings were incorporated into the final reports. In this sense Test Support was "operational in function."

Relocated in the 3244th, the Test Support Division was redesignated the Logistical Support Branch. Personnel worked closely with major weapon system EZST's, and in one case they conducted a separate test -- the F-86D Squadron Logistical EZST.[8]

One significant change was made in organizational responsibility during the period. After the 24 October 1955 reorganization, the 3244th Test Group was given the responsibility for light bomber maintenance, which included B/RB-66 aircraft.[9] The EZST's of these light bombers were being conducted by the 3245th Test Group (Bombardment) and, in essence, the situation was the same as that before 24 October; the Group Commander did not have direct control of both the test and maintenance facilities. Although there was adequate coordination and cooperation between the two groups, it was an inconsistent situation, and on 21 May 1956 the responsibility for maintaining the B/RB-66 was delegated to the 3245th Test Group (Bombardment).

Personnel[10]

As indicated in the preceding chapter, AFOTC's manning requirements fluctuated as new tests were activated and active tests were completed. Generally, the personnel problems which were reported in the last history still afflicted the Center. There were critical shortages in the skilled levels, overmanning in the semiskilled and unskilled levels, and losses of personnel through separation and withdrawal for overseas assignment.

Although the Unit Manning Documents which became effective on 1 April 1956 cut airmen authorizations by twenty-eight, the assigned airman strength of AFGTC rose steadily from January through June. At the end of the reporting period there were 196 more airmen assigned than at the beginning of the period. This quite naturally had an effect upon AFGTC's manning percentages. In January the Airman Third Class-Airman Basic ranks were 482.5 percent manned, and in June they were 884.8 percent manned. Although it was easy to explain these stratospheric percentages in terms of new TD's and fluctuating personnel requirements, they pointed toward serious personnel problems. AFGTC was critically short in the ranks of Airman First Class and Staff Sergeant, even though statistics showed a rise in the manning percentages of these ranks. Generally, airmen in these grades had attained the "skilled" level in their respective specialties, and had been in the service for at least two years. These men were approaching full productivity as well as the end of their enlistments. The mean percentages of manning for Airman First Class and Staff Sergeant ranks were 69.1 and 61.7, respectively, for the six-month period.

More important than the actual ranks concerned were the AFSC skill levels. At the "3" or semiskilled level, the Center was manned 142.7 percent for the six-month period, whereas at the "5" or skilled level, the percentage was 74.9. Moreover, forecasts for the following three-month period indicated that the situation was to become worse.[11]

There were two obvious means of attempting to remedy this situation internally: first, by increasing the reenlistment rate, so that more of

the men who had reached the skilled levels would remain as assets; and second, by intensifying On-the-job and School Training programs.

Throughout the period, AFUTC's reenlistment rate compared favorably to the overall USAF rate:

Month	AFUTC	USAF
January	38%	39%
February	48%	42%
March	40%	46%
April	48%	48%
May	51%	47%
June	42%	40%

In consonance with Air Force policy, and in an effort to attain a retention goal of 65 percent by fiscal year 1957, the reenlistment program was emphasized and reemphasized at all levels within AFUTC.[12]

The training program appeared to be the more practicable means of easing personnel shortages, however. This program was implemented in several ways. Maximum use was made of Air Training Command schools, factory and special training courses. A total of 371 quotas were filled for this type of training during the period. Retraining personnel into critically short fields from overmanned fields filled some of the requirements of the Center. The career fields in which the most acute shortages existed were: ground radio, radio and navigational equipment, auto-tracking radar, bombing-navigation systems, instrument repair, mechanical equipment and accessories repair, jet engine mechanics, weapons mechanics, supply and personal equipment.[13] On-the-job training programs were continually emphasized as an important source of skilled personnel, and as of the end of the period 95.6 percent of assigned "3" level airmen were on OJT to the "5" level. During May and June, 75 percent of the upgrading actions taken were from the "3" to the "5" levels.[14]

Among officer personnel a similar "curve" in manning percentages existed. The grades of First and Second Lieutenant were manned 122.1 percent during the period; Captain, 80.4 percent; and Major, 66.9 percent. The great majority of project officers came from the ranks of Captain and Major (more, in fact, from the latter than the former), and the low percentage of manning in this grade represented a critical shortage.

In the "supervisory" grades of both officer and enlisted ranks—that is, Colonel, Lieutenant Colonel, and Master Sergeant—there were no apparent critical shortages. When actual numbers were considered, however, it was evident that even a relatively small number of shortages in key positions could have been detrimental to the efficiency of AFOTC.

CHAPTER III

SPECIAL EVENTS

The unique character of the Air Force Operational Test Center has always caused it to be a favorable environment for special events. The extremely diverse inventory of aircraft - representing all of the USAF's major operational commands - and the very "newness" of these aircraft has made the Center somewhat of a "showplace." During the period covered by this report there was an unusually heavy requirement placed upon AFOTC to participate in operations which were unrelated to the conduct of employment and suitability tests.

These events varied greatly in nature, and AFOTC's participation in them was not in all cases a result of this "unique character" mentioned above. It was recognized that these events were of an important nature, and served both to increase the proficiency of AFOTC pilots and to enhance the prestige of the Air Force in the eyes of the American public. It was undeniable, however, that testing was affected by such operations.

Air Defense Exercises

Under Operations Plan 4-64 of the 35th Air Division, Dobbins Air Force Base, Georgia,[1] the Air Force Operational Test Center was committed to furnish aircraft and control and warning facilities for air defense alerts as a part of the Eglin Augmentation Force for Air Defense. During the reporting period there were two exercises held in which AFOTC was involved.

On 27, 28, and 29 February 1956 Air Defense Exercise "Winter's End" was conducted by the 35th Air Division. Aircraft assigned to the 3241st Test Group (Interceptor) and the 3243rd Test Group (Fighter), participated in the exercise, and the ACCW facilities of the 3206th Test Wing (Technical Support) were utilized. Emphasis was placed on the procedural operation of the ACCW systems and ground controlled intercepts.[2]

During April Command Post Exercise "Big Wheel" was held. Coming on a "no-warning" basis, this exercise did not require the "scrambling" of aircraft. AFOTC's ACCW facilities were used to track live aircraft participating in the simulated air defense alert. AFOTC also participated as the recipient of such messages as CONELRAD (Control of Electromagnetic Radiations) and SCATER (Security Control of Air Traffic and Electromagnetic Radiations). It was felt that these exercises provided beneficial training for the facilities of the Eglin Augmentation Force for Air Defense.[3]

LIFE Magazine's "Air Age" Edition

Early in the reporting period plans were laid to support LIFE Magazine in an effort to photograph in one formation more than twenty different operational aircraft. This full-color photograph was to be used as a three-page fold-out in LIFE's "Air Age" edition, scheduled to be published in June.

AFOTC supplied more than half of the primary and "back-up" aircraft in the formation, and more than two-thirds of the formation was

provided by APGC as a whole. Required planes which were not available within APGC were supplied by other commands.

There were several problems inherent in this operation. Since the formation required a wide range of jet- and reciprocating-engine aircraft - fighters, bombers, and transports, it was impossible for all of them to fly in formation simultaneously. This problem was solved by having heavier aircraft - B-52, B-58, B-47, C-131, C-119, KC-97, C-124, and RC-121 - form one element of the formation, and the lighter and speedier planes - F-100, F-102, F-104C, F-89H, F-106A, F-106B, F-84F, F-84G, RF-84F, QF-80, T-33, B-57, B-66, and B-45 - form another element. The lighter element, flying at a slightly higher altitude, made passes over the heavy element, and the photographer, shooting from above, snapped the picture when the two elements fitted into one formation.

Another problem was to find the best possible photo ship for the operation. Initial attempts were made to shoot the formation from a C-131B, but it was found that because of insufficient lateral range and exhaust interference a suitable photograph could not be made from this aircraft. In the last mission a KC-97 was used, and successful results obtained. The LIFE photographer shot from the left rear escape hatch. Four missions were flown before a satisfactory aerial photograph was made. Because of the number of AFOTC aircraft involved in the unprogrammed mission, flying tests were delayed more than one week, according to an estimate made by the Director of Operations.[4]

Aerial Firepower Demonstration

The Aerial Firepower Demonstration, which is conducted three times a year by APGC, was a programmed event that involved AFOTC pilots and aircraft almost exclusively. The first demonstration of 1956 was presented in May for the Joint Civilian Orientation Conference No. 22 and members of the United States Congress.[5]

This demonstration required a stand-down of testing for several days so that pilots and aircraft could be readied. A dry run was held several days before the actual demonstration, and the scheduled wet run had to be cancelled because of bad weather. The demonstration itself was delayed one day because of inclement weather.

The precise timing required for this show necessitated extensive planning, and presupposed a high level of pilot proficiency. Maintenance personnel had to insure that mission aircraft and spares were in commission and ready to fly throughout the practice runs and the final show. The hundreds of minute details coincident to the demonstration required the coordination and cooperation of almost every organization of the Command.

In addition to conducting the flying demonstration, AFOTC was committed to set up a static display and to give T-33 rides to members of the JCOC No. 22. The static display required many hours of preparation. The ramp had to be cleared and cleaned. Display aircraft, many of which were used in the demonstration, had to be positioned in predetermined locations. Guides for each aircraft had to be appointed,

and dummy armament loads had to be displayed by each aircraft. The T-33 rides for the JCDC members involved, in addition to the loading and flying, briefing and outfitting more than seventy prominent civilian visitors.

"Wide, Wide World"

On 13 May, less than a week after the demonstration, AFOTC participated in a live television production entitled "Wide, Wide World". Because of the television requirements, split-second timing was required by all participating aircrews.[6] AFOTC provided a "taxi-by" and static display of aircraft, a display within the Climatic Projects Laboratory, a "miniature" Aerial Firepower Demonstration, a shoot-down of a QB-17 drone, and the launch of a TM-61C "Matador" missile.[7]

The desired effect in the first segment of the Eglin phase was to have the APGC Commander introduce each aircraft as it taxied by the camera, then show a static formation, made up, presumably, of these same aircraft. Since the static formation was actually set up in advance, duplicates of each aircraft were required.

The condensed version of the Aerial Firepower Demonstration was conducted at Range 52 and picked up by remote cameras mounted on the

[6]Two "Matadors" were set up to be fired from the parking lot at the Officers Beach Club. Through unfortunate circumstances neither missile was actually launched. A circuit breaker blew in the JATO unit of the first missile, and when the signal was given to fire the second missile, the power switch was accidentally cut.

photo stand at the Range. It was found, however, that as the munitions from the mission aircraft exploded, the television transmitter was momentarily knocked off the air, resulting in a somewhat "garbled" presentation.

The drone shoot-down, which was a portion of a sequence on Air Defense operations, was accomplished by Colonel Thomas H. DeJarnette and Captain Alexander Bobrowski, firing 2.75" rockets from an F-89D.[8] The timing of the mission was perfect although, because of confusion on the part of the television directors, the actual kill was not shown on the screen.

Armed Forces Day

Armed Forces Day, falling on the Saturday after "Wide, Wide World," did not materially affect AFOTC operations. A static display was set up and tours of the Climatic Hangar were conducted. Fly-bys of jet fighters and a simulated helicopter rescue were performed.

In addition to Armed Forces Day continents at Eglin, AFOTC provided two F-101A's for a static display at Selfridge Air Force Base, Michigan; one F-101A for a display at Bolling Air Force Base, Washington, D.C.; one F-100 for a display at Lockheed Aircraft Corporation, Marietta, Georgia plant; and one F-100 for a display at Altus Air Force Base, Oklahoma.[9]

Special Events and Project Efficiency

In the May issue of The Trend a special study was made by the AFOTC Comptroller of the effects of the Aerial Firepower Demonstration,

"Wide, Wide World," and Armed Forces Day on primary mission accomplishment. In this study project efficiency during May was compared to that of April. Weather was uniformly good throughout April and May, and there was no significant increase in the workload requirements of flying tests due to the receipt of new Test Directives.[10]

During the work week immediately preceding the demonstration total flying time in AFOTC decreased from 434 hours to 264 hours, a drop of 34 percent. At the time of "Wide, Wide World" it had increased to 343 hours, and increased steadily until the end of the month when it had almost recovered to the April level of 400 hours. Test flying followed a similar pattern, decreasing from 113 hours to 30 hours by the demonstration, and increasing to 44 hours by "Wide, Wide World" and 127 hours by the end of the month. The April norm was 130 hours.[11]

The percentage of test time to total flying time decreased from 26.0 percent to 13.6 percent by the demonstration, further decreased to 12.8 percent by "Wide, Wide World," and increased to 34.0 percent by the end of the month. The April norm was 30 percent. In short, the three events "cost" about 225 test hours, the demonstration alone accounting for 109 of these.[12]

During April the norm for the percentage accomplished of programmed test flying hours was 60 percent. In the week prior to the demonstration this declined from 54.1 to 19.5 percent, recovering to 21.8 percent by "Wide, Wide World," and 47.4 percent by Armed Forces Day. This percentage did not increase appreciably after that, due partly to the fact that requirements increased considerably during the period of low accomplishment.[13]

The average number of test missions scheduled and flown during April was 27 per week. This figure declined from 25 to 7 during the week preceding the demonstration, increased to 11 by "Wide, Wide World," and recovered to 32 by the end of the month.[14]

The planning and report writing phases of tests were not affected appreciably by these events. Some influence was suggested, however, and this may be attributed to the fact that project officers were called upon to participate in the events while planning or reporting upon their projects. The physical testing phase naturally reflected the sharpest decline of the three phases in percentage of accomplishment. A 26.8 percent drop from the average preceded the demonstration, and a further decline of 9 percent occurred in the week following. After "Wide, Wide World," however, percentage point accomplishment recovered to a peak of 104.5 percent on 20 May, surpassing the April norm of 81.7 percent a week. Overall accomplishment, including the three phases, dropped 22 percent in the week between the demonstration and "Wide, Wide World," and then recovered to the general level prevailing in the previous month.[15]

An analysis of this study showed that during the preparation and conduct of an Aerial Firepower Demonstration a loss of about 100 hours of test flying and about 25 percent of weekly effectiveness may have been expected (assuming an average workload of 66 tests, 52 of which were active, and 14 of which were flying tests), with a rapid recovery, equalling or surpassing previous norms.[16]

One factor which may have affected the rapid recovery rate was the high in-commission rate of aircraft which came as a result of the maximum effort expended in preparation for the demonstration and "Wide, Wide World." Another factor which did not appear in the findings of the study, but which was coincident to each of the special events discussed in this chapter, was that pilots of the Air Force Operational Test Center were given an opportunity to increase their experience and proficiency by participating in these events. The public relations effect - the increased awareness and appreciation of the mission of the Air Force by the public - was obviously immeasurable and of no small importance during these events.

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CHAPTER IV

TEST OPERATIONS*

Problem Areas in Testing: Targets and Ranges

The very philosophy of employment and suitability testing--subjecting an item to the rigors of the environment in which it was designed to be employed--caused some operational problems which were peculiar to this organization.

One of the most important of these problems which was encountered during the period, and which had implications that extended far beyond the period, was the inadequacy of existing target systems to support current and planned EZST's.[1] The target was, in effect, a "stand-in" for an enemy aircraft, and to be truly representative the target had to be able to simulate the speeds and altitudes of not only what it was known the enemy possessed, but what it was predicted he would have.

> The USAF has utilized World War II aircraft and equipment for the past ten years for towing targets for combat ready training and suitability testing. The advanced jet fighter weapons systems integrated into the Air Force in recent years have not been thoroughly tested at extreme altitudes due to the inability of the testing agency to provide a target at these heights. Of greater significance is the inability of the Air Defense Forces and Tactical Air Units to obtain combat ready training at the extreme altitudes where the threat exists. The requirement exists today for a tow system which will provide a high speed and high altitude target for rocketry and gunnery training and test. [redacted][2]

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*The tests discussed in this chapter were selected for narrative presentation because of their value to the U.S. Air Force or because they provided an insight into the philosophy behind the mission of this command, and AFOTC in particular, and into the importance of that mission to the Air Force. See Appendix B for a complete tabulation of project activity within AFOTC during the period.

[redacted]

Reality or representativeness, although a prime requirement, was not the only characteristic that was needed in a target. Targets had to be inexpensive, radar reflective, easy to operate, and assessable. Moreover, different weapon systems required different targets.[3]

In light of this problem, the Director of Operations, AFOTC, called a meeting early in February 1956 in an effort to effect corrective action.[4] Representatives from the 3241st Test Group (Interceptor) and the 3243rd Test Group (Fighter), the primary using agencies in AFOTC, were queried to determine whether available tow systems would meet their joint requirements. As a result of this meeting a consolidated tow requirement for projects in the physical test and planning phases was drawn up, covering the period from February through September 1956.[5]

The Armament Branch of AFOTC's Directorate of Materiel took immediate action to meet these stated tow requirements. A document listing the Center's tow target capabilities as of May was drawn up in order to point out the problem areas.[6]

During this period four major ESST's were affected by the tow target problem. In Project "Banana Belt" there was a requirement for approximately 60 air-to-air rocketry sorties. The desired target was a 6x30 MA-1 red or orange banner with two X-band reflectors, towed between 20,000 and 30,000 feet at maximum speed by F-86Ds or B-47s. It was found that this target did not provide enough radar reflectivity, however, and the sorties were flown against 9x30 banners and Del Mar Radops. The speed limitations of these targets limited the evaluation

of the interceptor's capabilities.[7]

The F-89H and F-102A ECST's had more complex needs. It had been determined that the Del Mar MC-3 (DF-4) Radop, a frangible tow target, was satisfactory in the support of air-to-air rocketry. But a missile firing phase had been planned for these two interceptors, creating, for one thing, a safety problem. Radar reflectivity also became of paramount importance. The problem was given special study, and it was concluded that a drone-towed target system would fulfill the interim requirement for missile firing. The Del Mar MC-5, a bi-static Radop towed by a drone QF-80, appeared to be the answer.[8]

In the 3243rd Test Group (Fighter) there was also a need for a high-altitude, high-speed target, but the nature of the mission of the Group added other problems. The ECST of the F-100C and the ECST of the F-104 (which was in a pre-planning phase during the period) necessitated visual air-to-air gunnery targets. The final report of the F-100C project emphasized the target problem:

> The presently used banner targets are inadequate for realistic evaluation and training purposes. A high speed, high altitude (.90M$_p$ and 50,000 feet) towed target of approximately the same area is urgently needed.[9]

The 3243rd submitted a request for the Dart Target, but very little information was available at this base on the Dart. In addition to the problem of securing this target, there was the added difficulty of scoring it. Considerably smaller in target area than the banner, the Dart would have required proximity scoring devices, and these would not be available for many months. Proximity scoring devices, moreover, would have incurred prohibitive expenses for installation and maintenance.[10]

Although no such targets were available during the period, it was recognized that new difficulties would be encountered in sighting, flying, and scoring targets at altitudes above 80,000 feet and at speeds in excess of Mach 1. Furthermore, the development of infra-red seeking missiles required targets which emanated infra-red waves. The Del Mar Corporation had in development two new types of IR source tangible targets, and it was planned to procure several of these through local purchase to determine whether they satisfied this future requirement.[11]

As of the end of the period, these requirements for high performance, scorable target systems had been forwarded through channels, but it was considered almost certain that they would not be met.[12]

In February 1960 a problem arose in mission scheduling because of recurring complaints from National Airlines regarding the use and scheduling of missions on the APGC water ranges, Warning Area W-151. An investigation by Headquarters APGC uncovered an old agreement among National Airlines, the Air Coordinating Committee, and APGC regarding the NAN-APLE route which bisected W-151 on a direct line between New Orleans and Tampa.[13]

As a result of this investigation a revised agreement was prepared and submitted to the Air Coordinating Committee. In the interim, missions were scheduled in W-151 so as not to conflict with the airlines schedule, and NOTAMS were dispatched at least 24 hours in advance of the scheduling of missions in the vicinity, or to the south, of this route.[14]

In May a formal proposal for renumbering and realignment of the water ranges in W-151 was submitted by AFOTC. The purpose of this

proposal was to simplify the scheduling of the ranges and to increase range and flight safety by maintaining a high degree of radar surveillance.[16]

The Air Defense Complex

THE F-89H, THE F-102A, THE GAR-1, AND THE Q-2A

During the reporting period there was a group of interrelated projects being conducted within the 3201st Test Group (Interceptor), all of which had a bearing on the air defense capabilities of the United States. Underlying these tests was a basic requirement for this country to have in its inventory of aircraft, in a combat-ready state, a weapon system capable of intercepting and destroying any attacking enemy bomber.

This requirement had a number of important ramifications. First, naturally, the aircraft itself was needed. The aircraft had to be capable of speeds and altitudes which would enable it to intercept any aircraft known to be possessed or in development by a potential enemy. Armament which would give the interceptor a high kill probability was needed, with a dependable, accurate fire control system. A method of evaluating the weapon system, and facilities for training crews and keeping them proficient was also required--a realistic target which would simulate a high performance enemy aircraft.

The job of ARDC was not to develop such a system, but rather to determine whether systems which had been developed to satisfy the basic requirement were suitable. If they were suitable, the next consideration was how best to employ them.

[redacted]

Since the EAST of a weapon system designed for air defense capabilities necessitated operating the system in an environment which simulated combat, it was mandatory that a suitable target and appropriate armament be available by the time the aircraft itself was ready for testing.

The optimum target for the weapon systems which were to be evaluated by ADTC in 1956, the Northrop F-89H "Scorpion" and the Convair F-102A, both missile-carrying (the Hughes GAR-1 "Falcon") jet interceptors, would have been a tow target or an unmanned drone capable of speeds of Mach 1 and altitudes of at least 50,000 feet. The "perfect" target needed other features also. It had to have sufficient radar reflectivity to be picked up and tracked both by air-to-air and ground-to-air radar; it had to be economical, that is of low cost and simple operation; it had to be able to stay aloft long enough to make the launching of it worthwhile; and it had to be assessable.[16]

Because the time factors involved necessitated that these interceptors become operational as soon as possible, and since the development of such a target was behind the development of the aircraft, targets of lesser performance had to be used.

The Ryan Q-2A "Firebee" drone, a jet-propelled, unmanned monoplane, was developed to meet the requirement for a high-speed, high-altitude target for weapon system testing and aircrew training. The EAST of the Q-2A started in October 1955.[17]

The results of the Q-2A test showed that the drone, in its present configuration, would not meet the Air Defense Command's requirements for aircrew missile firing training, principally because of inadequate

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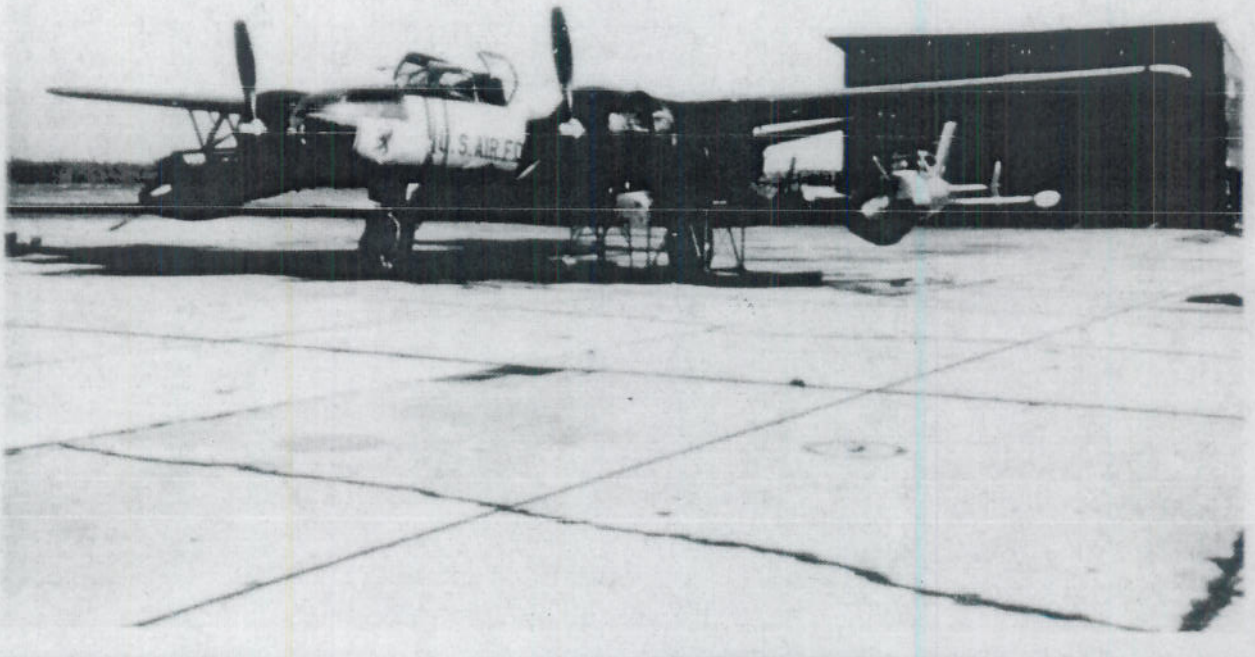
TWO RYAN Q-2A "FIREBEES" MOUNTED ON A B-26



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radar reflectivity, limited endurance, and marginal radar control/beacon system. It was found, however, that the Q-2A did have limited possibilities for use in the support of research and development testing programs of guided missiles.[18] The very nature of employment and suitability testing, therefore, ruled out the Q-2A as an effective target for the support of RDST's of major weapon systems.

The QB-17 and QF-80 drones operated by AFSC's 3205th Drone Group, as well as the Q-2A, had been programmed as targets for the F-89H/F-102A GAR-1 RDST's. Obviously the cost of maintaining, flying, and destroying QB-17s and QF-80s for these tests on a large scale was prohibitive. These modified operational aircraft could meet several of the criteria for a suitable target, however, and it was planned to utilize a few of them in the early phases of the tests.

In May 1955 an investigation was initiated, at the direction of Headquarters AFSC, to determine the feasibility of employing drone towed targets--the high-speed, low drag, radar reflective types which were being used by ATC and ADC for air-to-air rocketry training--for the evaluation of guided missile weapon systems. The project was given the nickname "Dollarwise."[19]

It was determined by the 3205th Drone Group that it was feasible to tow low-drag targets as QB-17 and QF-80 drones without extensive modification to the tow aircraft.[20] In a second phase of the project, conducted by AFOTC in March and April 1956, the Del Mar Radop target was towed by both drones, and dry run intercepts were made by F-86D and F-89 aircraft. Some difficulties were encountered during the test, but no inherent fault in the target system was discovered.[21] The Radop,

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[redacted]

when equipped with a bi-static reflector, towed by a drone, was considered to be an acceptable target for the weapon systems R&ST's which were about to commence. Although this target system was not considered to be "optimum" for advanced Employment and Suitability Tests, Unit Operational Employment Tests, and advanced crew training, it was available to fill an immediate need.[22]

The basic causes of the target problem were not to be found in AFOTC. Weapon system development had so outpaced target development that when it came time for the weapon systems to undergo R&ST, no suitable targets were available. Project officers conducting R&ST's of major weapon systems, when first confronted with the problem, were not able to submit specific requirements for targets because they were not yet completely familiar with the operational capabilities of the systems to be tested. For this problem to have been avoided, target development should have been coincident with, if not antecedent to, the development of the weapon systems.

In May 1963 an employment and suitability test of the Hughes GAR-1 "Falcon" missile was initiated.[23] Originally the test was to cover ground handling and "checkout" equipment for the missile, but in January 1964 the scope of the project was increased to include an air phase.[24] The purpose of the increase in scope of the test was to determine the effects of aircraft flight environment on missile reliability, to determine the airlift capabilities and requirements of the missile on various transport type aircraft, and to support the R&ST's of the F-04H and the F-10LA.

The "Falcon" was a small, rocket-propelled, semi-active, homing, air-to-air guided missile. It was carried in wing tip pods on the F-04H

THREE HUGHES GAR-3 "FALCONS" PERCHED ON THE ARM OF A NORTHROP F-89H "SCORPION"

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and in bays on the F-102A. Because the "Falcon" was a homing missile it required a target which would give enough of a radar reflection on which to guide. [redacted]

Actually the testing of the two interceptors and the GAR-1 required a variety of targets. It would have been impossible in the early stages of these tests to launch the missile against a high-performance target, had one been operational and available, because the projects were not ready for it.* There was too much basic information to be gathered on the operational employment of the weapon system before it could be launched against high-speed, high-altitude targets.

The RQST's of the F-89H and F-102A, originally scheduled to have started in March, were slipped for several reasons. Several test aircraft were assigned to Project "Fig Leaf," others were unavailable because of a series of special events at APGC, and one F-89H was destroyed in an accident.[25] Physical testing of the F-102A started on 2 April. The F-89H test was officially started on 25 June.[26]

On 25 June the concentrated efforts of a great many people in AFUTC, as well as in other agencies of APGC, came to a climax. The F-89H/F-102A GAR-1 systems were to be put into operation in an air defense intercept mission. The target was to be a drone QB-17.[27] Both aircraft were ready for the test, and the F-89H was scheduled to make the first intercept, with the F-102A in a standby position.

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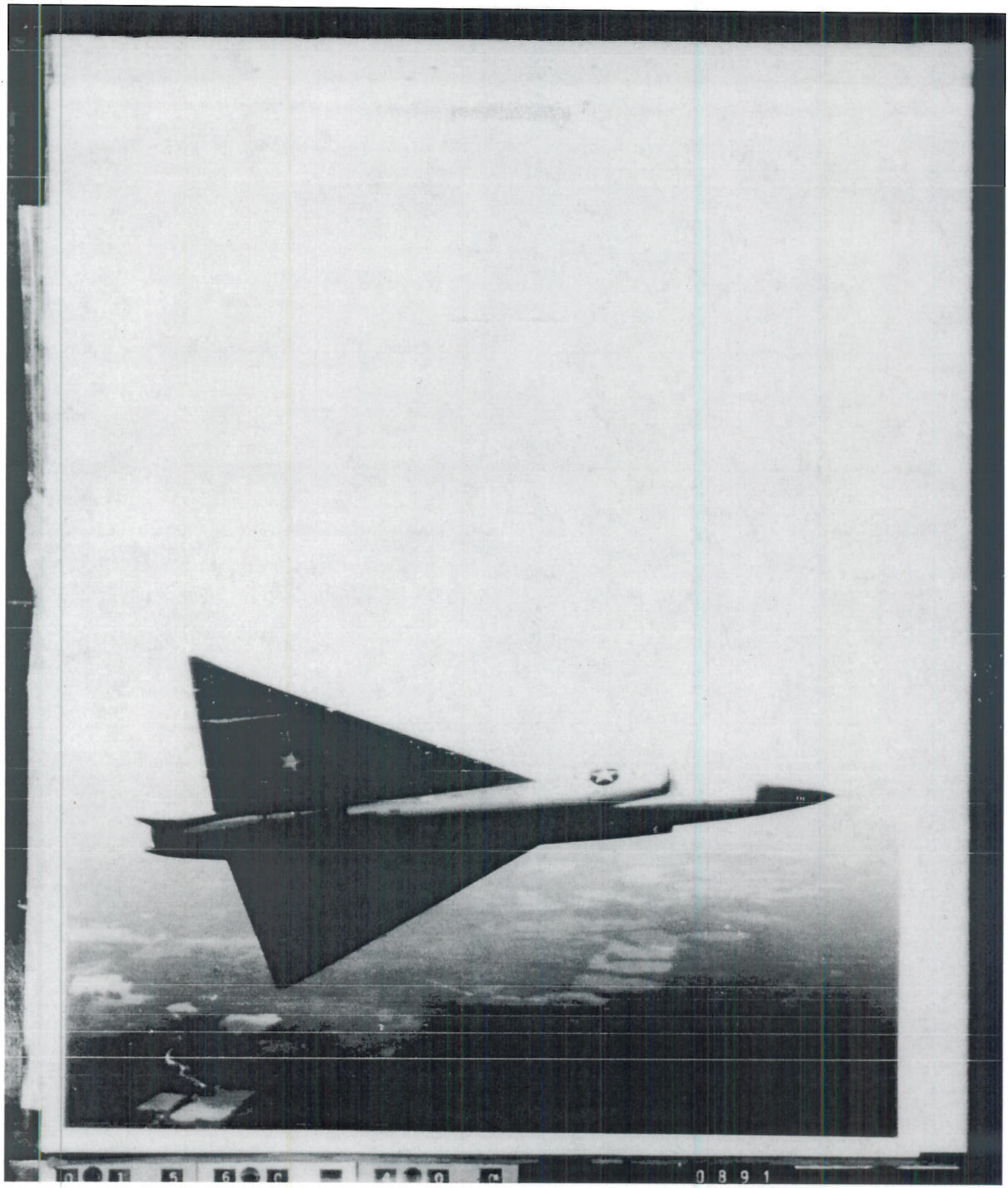
*The missile had been fired in earlier phase testing by ARDC, but these firings were under optimum weapons conditions. The firings at AFUTC were to be in a simulated air defense environment.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The QB-17 was flown in a horseshoe pattern over the water ranges about forty miles out in the Gulf of Mexico. On the first firing pass, the F-89H, flying at 25,000 feet and at an angle of 60° to the target, launched six missiles. All the missiles guided, but no hit was obtained.[28] The F-102A made a firing pass at an angle of 70°, launching six missiles, none of which guided on the target.[29]

The following day the mission was repeated. The interceptors carried five live missiles and one inert missile for determining parameters. The F-89H, flown by Lt. Colonel Louis E. Andre, Jr. and Flight Lieutenant Gordon T. G. Richards, of the 324lst Test Group (Interceptor), scored a kill. One hit was noted, and no data was available on the other four missiles.[30]

On 30 June another QB-17 was sent up, and an F-102A, piloted by Major Robert T. Goetz of the 324lst, scored hits with two missiles. Immediately following this mission the Air Force Armament Center was scheduled to send up an F-89H and an F-102A against a second QB-17. Both aircraft were forced to abort, and because of a previous agreement between AFOTC and AFAC, an AFOTC F-102A was given a chance to fire at the drone. Although none of the missiles struck the target, four showed guidance.[31] There was not sufficient range time left after this firing for an additional pass on the drone.

Although these missions were conducted in a simulated air defense environment--the interceptors were scrambled and directed to the target by ground controlled intercept--they were not, in an overall sense, realistic. The target was flying at 25,000 feet with an indicated airspeed of 180 mph. Naturally, an actual attack would be at a much higher

altitude and considerably greater speed. As previously stated, these weapon systems were not ready to be tried out on high performance targets, even if they had been available at the time. As this reporting period ended, plans were being made to fly these weapon systems against drone-towed, fragible targets.

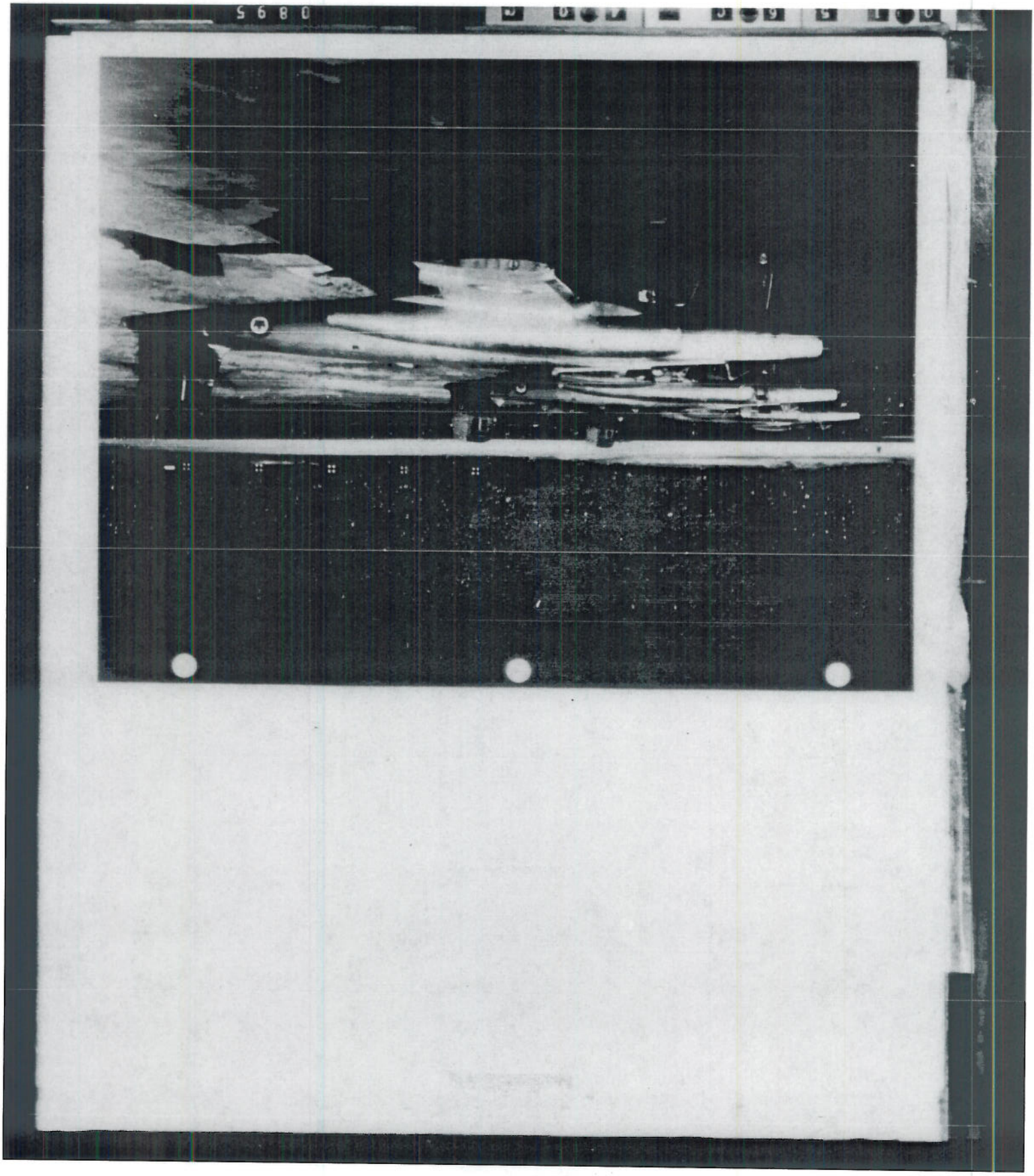
PROJECT "BANANA BELT"

Project "Banana Belt" was the nickname of the TEST of the Avro CF-100 Mark IVB "Canuck." The CF-100 was a two-place, twin-jet, all-weather interceptor, manufactured in Canada. The test was initiated by direction of Headquarters USAF, at the request of the Canadian government.[32]

The stated purpose of the test was: "To determine the operational suitability of the CF-100 Mark IVB as an all-weather fighter in a USAF Air Defense environment." At the time of this test, the CF-100 was the first-line all-weather interceptor in the inventory of the Royal Canadian Air Force, and had been in RCAF squadron service for approximately three years. The USAF Air Defense environment, moreover, was essentially the same as that of Canada.[33]

The project team was formed of a detachment from the RCAF and personnel from the 3241st Test Group. All maintenance and logistical support for the project was furnished by the RCAF, and aircrews were formed from both sources.[34]

After the project was in progress, a CF-100 Mark V was added to the inventory. It was found, in an operational evaluation, that the Mark V, which had been retrofitted with an additional 44 inches to each



wing tip and 24 inches to each horizontal stabilizer, was capable of higher combat ceilings and increased altitude performance than the Mark IV.[35]

The results of the test showed that the CF-100 compared very favorably with similar aircraft in the USAF inventory, especially the F-89D and the F-94C. In rate-of-climb and combat radius, it proved slightly superior to these two aircraft.[36]

The CF-100 filled the interceptor role as set forth in joint agreements between the United States and Canada for Western Hemisphere defense. In reviewing the test results, it was determined that the CF-100, in view of the predicted estimate of enemy offensive capabilities, had approximately the same potential and life span as other two-place subsonic interceptors presently employed by the USAF.[37]

PROJECT "PIG LEAP"

In January 1956 APGC received a letter from Headquarters USAF stating that the Joint Chiefs of Staff had directed that the U.S. Air Force and the U.S. Navy conduct a joint evaluation of certain Air-to-air Identification Friend or Foe (IFF) equipment which was under development by each service.[38] This equipment, the USAF's X-Band System (AN/APX-26, AN/APX-27) and the Navy's "Black Maria" (AN/APX-20, AN/APA-119), was to be evaluated in a simulated air defense environment to determine which of the two systems best met the tactical requirements of the two services.

[redacted]

The Air Force and the Navy, with requirements which were basically the same,* had been developing individually these two IFF systems, and a need was recognized at a high level to consolidate this effort. The Joint Chiefs of Staff directed that a report on the joint test, including a discussion, conclusions, and recommendations as to which system was most suitable for joint use, be submitted by 1 September 1956, so that a decision could be reached by the Joint Chiefs of Staff on 1 October. [redacted]

Because of the urgency of this project it was assigned a number one priority within AFSC.** Four F-89Hs and four F-102As were assigned from the respective ECST's of these aircraft to participate in "Fig Leaf." In addition, two B-47s and two C-131s from AFOTC were assigned to support the test. A complete Marine squadron was moved in, with eight F2H4s and four F3Ds. The F-89Hs and F-102As were equipped with the AN/APX-2b, and the F2H4s had the "Black Maria" interrogation equipment installed. The B-47s, C-131s, and F3Ds were fitted with the AN/APX-27 and the "Black Maria" answering equipment.[40]

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*In addition to the joint requirements for airborne equipment to provide positive and instantaneous identification of targets, simplify tracking of friendly traffic, provide automatic friend-from-foe identification, operate in an environment of heavy electronic traffic and aircraft density, the Navy had the special requirements that the system should be usable in surface and sub-surface craft, land vehicles and fixed shore positions, should be as small and light as possible, should discriminate friend from friend, and should be capable of operation with any system of which detection equipment is a component part.[39] [redacted]

**The effect of this high priority, unprogrammed test on other AFOTC projects is discussed in Chapter I.

[redacted]

[redacted]

Four basic air defense situations were used during the test: single interceptors against single attackers, multiple interceptors against single attackers, multiple interceptors against multiple attackers, and single interceptors against multiple attackers.[41]

It was concluded from this test that the AN/APX-26/-27 equipment met more of the joint operational requirements, but it was felt advisable that neither system be adopted until they were made secure and free from "spoofing" or jamming.[42] [redacted]

Although the USAF X-Band system had previously undergone E/ST at AFGTC, and the "Black Maria" was still in pre-production configuration, both systems were essentially in the development stage. Approximately 150 AN/APX-26/-27s were in existence, while only 21 "Black Marias" had been produced. The Navy had conducted functional tests of its equipment, but additional functional difficulties were discovered during "Fig Leaf."[43] AFGTC does not, as a rule, test equipment which is still in development. The IFF equipment which was being tested in "Fig Leaf," however, was in a state of development which was advanced enough that an immediate evaluation could be made as the basis for the decision which the Joint Chiefs of Staff was going to make. [redacted]

"Fig Leaf" was a significant project for two important reasons. First, the duplication of effort in the development of these systems was recognized at the level of the Joint Chiefs of Staff, and steps were taken to consolidate this effort. Secondly, a major test, involving more than 20 aircraft and approximately 75 personnel of two services, was planned, conducted, and reported upon in the space of seven months.

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electronic emissions. The effectiveness of present air defense systems can be reduced by approaching target areas at very low altitudes, or behind shielding terrain features, thus avoiding detection.[47] [redacted]

During Phase II of APG/SAS/100-A-1 the capability of the B-47 to [redacted] on visual and radar target approaches was examined. This phase was completed in mid-1955, and in a subsequent test, APG/SAS/100-A-2, a comparison was made of the capabilities and limitations of the MA-2 Low Altitude Bombing System (LABS) and the Wings Level Bombing System (WLBS) in the B-47. These tests proved it was not only feasible but advantageous to employ high-speed jet bombers in low altitude missions, utilizing the toss-bombing technique.[48] [redacted]

These tests also proved that greater accuracy of bomb delivery was possible in radar sighting than in visual sighting. The targets used, however, were pin-point radar reflective targets on Eglin's land and water ranges. The system still had to be tried out against realistic strategic targets. Physical testing on APG/SAS/100-A-3 was initiated in January 1956 to determine the low altitude, level flight, radar release capabilities of this system.[49] [redacted]

Four airfield targets and two urban complexes were selected for the test, and a pre-determined aiming point was chosen at each. The targets included Robins AFB, Georgia; Eglin AFB, Florida; Turner AFB, Georgia; North AFB, South Carolina; Atlanta, Georgia; and Birmingham, Alabama. Simulated bomb runs were made by day and night over these targets, at altitudes ranging from 100 to 800 feet. The bomb runs

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[redacted]

and in bays on the F-102A. Because the "Falcon" was a homing missile it required a target which would give enough of a radar reflection on which to guide. [redacted]

Actually the testing of the two interceptors and the GAR-1 required a variety of targets. It would have been impossible in the early stages of these tests to launch the missile against a high-performance target, had one been operational and available, because the projects were not ready for it.* There was too much basic information to be gathered on the operational employment of the weapon system before it could be launched against high-speed, high-altitude targets.

The RQST's of the F-89H and F-102A, originally scheduled to have started in March, were slipped for several reasons. Several test aircraft were assigned to Project "Fig Leaf," others were unavailable because of a series of special events at APGC, and one F-89H was destroyed in an accident.[25] Physical testing of the F-102A started on 2 April. The F-89H test was officially started on 25 June.[26]

On 25 June the concentrated efforts of a great many people in AFOTC, as well as in other agencies of APGC, came to a climax. The F-89H/F-102A/GAR-1 systems were to be put into operation in an air defense intercept mission. The target was to be a drone QB-17.[27] Both aircraft were ready for the test, and the F-89H was scheduled to make the first intercept, with the F-102A in a standby position.

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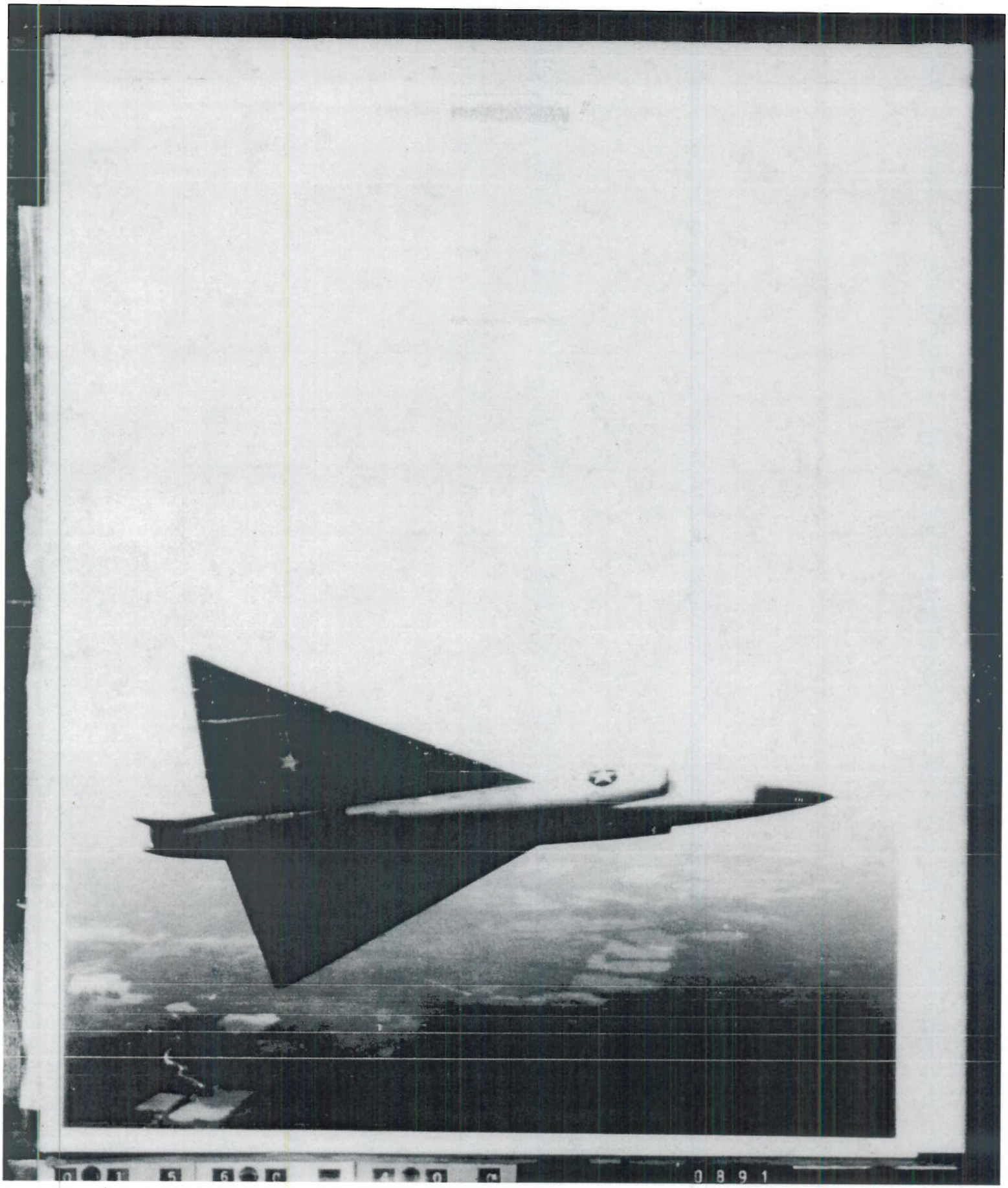
*The missile had been fired in earlier phase testing by ARDC, but these firings were under optimum research conditions. The firings at AFOTC were to be in a simulated air defense environment.

THE CONVAIR F-102A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The QB-17 was flown in a horseshoe pattern over the water ranges about forty miles out in the Gulf of Mexico. On the first firing pass, the F-89H, flying at 25,000 feet and at an angle of 60° to the target, launched six missiles. All the missiles guided, but no hit was obtained.[28] The F-102A made a firing pass at an angle of 70°, launching six missiles, none of which guided on the target.[29]

The following day the mission was repeated. The interceptors carried five live missiles and one inert missile for determining parameters. The F-89H, flown by Lt. Colonel Louis E. Andre, Jr. and Flight Lieutenant Gordon T. G. Richards, of the 324lst Test Group (Interceptor), scored a kill. One hit was noted, and no data was available on the other four missiles.[30]

On 30 June another QB-17 was sent up, and an F-102A, piloted by Major Robert T. Goetz of the 324lst, scored hits with two missiles. Immediately following this mission the Air Force Armament Center was scheduled to send up an F-89H and an F-102A against a second QB-17. Both aircraft were forced to abort, and because of a previous agreement between AFCDC and AFAC, an AFCDC F-102A was given a chance to fire at the drone. Although none of the missiles struck the target, four showed guidance.[31] There was not sufficient range time left after this firing for an additional pass on the drone.

Although these missions were conducted in a simulated air defense environment--the interceptors were scrambled and directed to the target by ground controlled intercept--they were not, in an overall sense, realistic. The target was flying at 25,000 feet with an indicated airspeed of 150 mph. Naturally, an actual attack would be at a much higher

altitude and considerably greater speed. As previously stated, these weapon systems were not ready to be tried out on high performance targets, even if they had been available at the time. As this reporting period ended, plans were being made to fly these weapon systems against drone-towed, frangible targets. [redacted]

PROJECT "BANANA BELT"

Project "Banana Belt" was the nickname of the TEST of the Avro CF-100 Mark IVB "Canuck." The CF-100 was a two-place, twin-jet, all-weather interceptor, manufactured in Canada. The test was initiated by direction of Headquarters USAF, at the request of the Canadian government.[32]

The stated purpose of the test was: "To determine the operational suitability of the CF-100 Mark IVB as an all-weather fighter in a USAF Air Defense environment." At the time of this test, the CF-100 was the first-line all-weather interceptor in the inventory of the Royal Canadian Air Force, and had been in RCAF squadron service for approximately three years. The USAF Air Defense environment, moreover, was essentially the same as that of Canada.[33] [redacted]

The project team was formed of a detachment from the RCAF and personnel from the 3246st Test Group. All maintenance and logistical support for the project was furnished by the RCAF, and aircrews were formed from both sources.[34]

After the project was in progress, a CF-100 Mark V was added to the inventory. It was found, in an operational evaluation, that the Mark V, which had been retrofitted with an additional 44 inches to each

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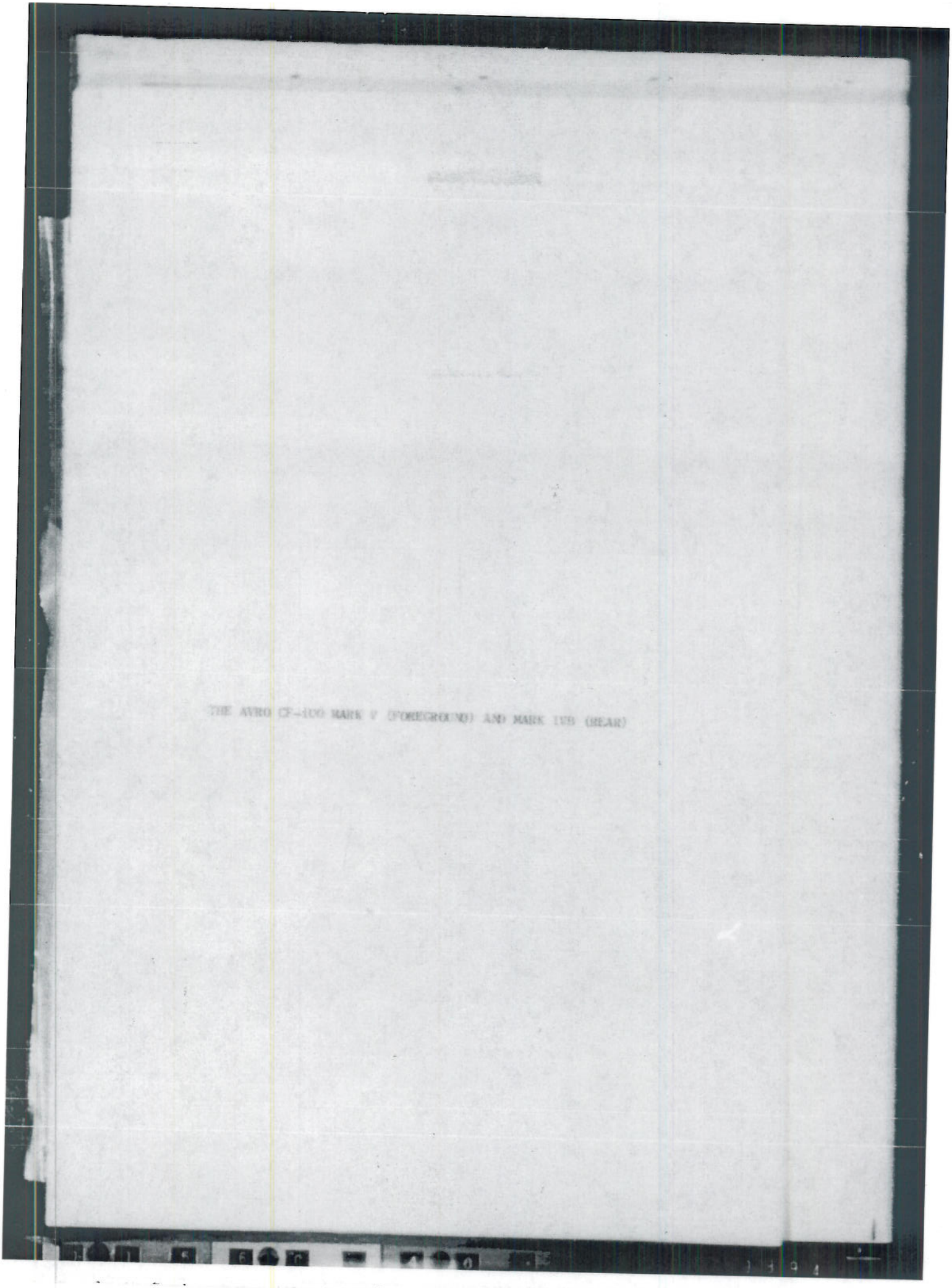

THE AVRO CF-100 MARK V (FOREGROUND) AND MARK IVB (REAR)

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[redacted]

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PROJECT "SEED APPLE": AN OLD SAW SHARPENED

It was pointed out earlier that tests which were conducted to develop tactics and techniques were considered to be the most important type of test by AFOTC.[44] In the list of the twenty most productive tests held since 1950 a project nicknamed "Seed Apple" headed the list.[45] "Seed Apple" was an early nickname for the SAS/100-series of tests conducted by AFOTC to determine the low-level bombing capabilities of high-speed jet bombers.

The employment by fighter aircraft of a munitions delivery technique known as "toss bombing" was not a new thing in 1954. During 1954 Boeing Airplane Company engineers, who were running a series of tests on target breakaway maneuvers for the B-47, and operations analysts of the Strategic Air Command generated the idea that the B-47, which had been operational in the U.S. Air Force since early in 1952, might be used to employ these fighter techniques.[46]

In November 1954 planning for Phase I of AFS/SAS/100-A-1 was initiated. This test was to explore the feasibility of navigating and maneuvering the B-47 at low altitudes. The test directive for this project stated, under the heading "Operational Requirement":

> A general operational requirement exists for the development of new tactics and techniques which, by their employment, will improve or diversify combat capability. The combat capability of high-speed jet bombers is constantly being countered by improved early warning radars, advanced design interceptor aircraft, and guided missiles. Air Defense measures are primarily dependent upon line-of-sight

[redacted]

electronic emissions. The effectiveness of present air defense systems can be reduced by approaching target areas at very low altitudes, or behind shielding terrain features, thus avoiding detection.[47] [redacted]

During Phase II of APG/SAS/160-A-1 the capability of the B-47 to [redacted] on visual and radar target approaches was examined. This phase was completed in mid-1955, and in a subsequent test, APG/SAS/160-A-2, a comparison was made of the capabilities and limitations of the MA-2 Low Altitude Bombing System (LABS) and the Wings Level Bombing System (WLBS) in the B-47. These tests proved it was not only feasible but advantageous to employ high-speed jet bombers in low altitude missions, utilizing the toss-bombing technique.[48] [redacted]

These tests also proved that greater accuracy of bomb delivery was possible in radar sighting than in visual sighting. The targets used, however, were pin-point radar reflective targets on Eglin's land and water ranges. The system still had to be tried out against realistic strategic targets. Physical testing on APG/SAS/160-A-3 was initiated in January 1956 to determine the low altitude, level flight, radar release capabilities of this system.[49] [redacted]

Four airfield targets and two urban complexes were selected for the test, and a pre-determined aiming point was chosen at each. The targets included Robins AFB, Georgia; Eglin AFB, Florida; Turner AFB, Georgia; North AFB, South Carolina; Atlanta, Georgia; and Birmingham, Alabama. Simulated bomb runs were made by day and night over these targets, at altitudes ranging from 100 to 800 feet. The bomb runs

[redacted]

were scored by radar scope and visual photography. It was found that the average value of the distance from the calculated impact point of the bomb to the target (CEA) was 1028 feet. The CEP-I (the radius of a circle, with its center at the target, which contains 50 percent of the impact points) was 990 feet.[50] [redacted]

This test proved that the B-47 could be used to attack such strategic targets as airfields and urban complexes at minimum altitudes if the aiming point produced a suitable radar return. This limitation, moreover, could be reduced with the addition of an offset bombing capability to the system. The final report stated:

> The adoption of the low altitude, level flight radar bombing technique will afford the Strategic Air Command an additional capability which will open another avenue toward the accomplishment of its strategic mission when special weapons with delayed action detonation are perfected. However, the results of this test can be applied to the already proven toss-bombing capability of the B-47. The adoption of this technique will not affect the previously demonstrated capabilities of the B-47 weapon system.[51] [redacted]

The importance and significance of this series of tests was evident. A completely new method of employment was developed for a bomber which had been in the USAF inventory for several years. Tactical fighter techniques were applied to medium bombers and strategic techniques evolved. The potential of the B-47, as well as that of other programmed jet bombers, was tremendously increased with no effects on the original usefulness of the weapon system. (S)

[redacted]

A farther test in this series, APG/SAS/160-4, was initiated in June 1956. This project, a comparative evaluation of the LABS and MLBS in the B-47, was conducted to determine which of the two most current low altitude bombing systems was more suitable for installation in SAC B-47s.[52]

SAC aircraft were to have the same configuration as the aircraft used in the AFOEC tests. In March a meeting was held in Washington to decide which equipment would be available and preferable for installation in SAC aircraft by fiscal year 1958. Since time was of the utmost importance in these evaluations, no formal test program was published. Part I of the project, the evaluation of the AERO-2I LABS, began on 14 June and was completed on 20 June.[53]

Because the evaluation of the MLBS had not been completed by the end of the reporting period, no comparison of these systems could be made at that time. The AERO-2I LABS did not prove to be much better than the MA-2 LABS which had been tested earlier in this series. This was due mainly to the location of the mean point of impact (MPI). When the CEP (MPI) was examined for individual missions, it was noted that the results were comparatively small, varying from 420 to 2785 feet from the target. The location of the MPI in relation to the target was caused by the inability of technical representatives to align the system to the aircraft's flight altitude. The change of the MPI from mission to mission was caused by the adjusting of the alignment and level of the system after each mission.[54]

Two cracks in the fuselage skin of the test aircraft were discovered at the completion of Part I, and it was decided to save

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representatives of AMC and Boeing make a structural inspection of the aircraft. Results of the inspection disclosed that there was no damage to the primary structure of the plane. Although not a primary problem during this project, skin fatigue from turbulence at low altitudes had been a recurring trouble area during this series of tests.[55]

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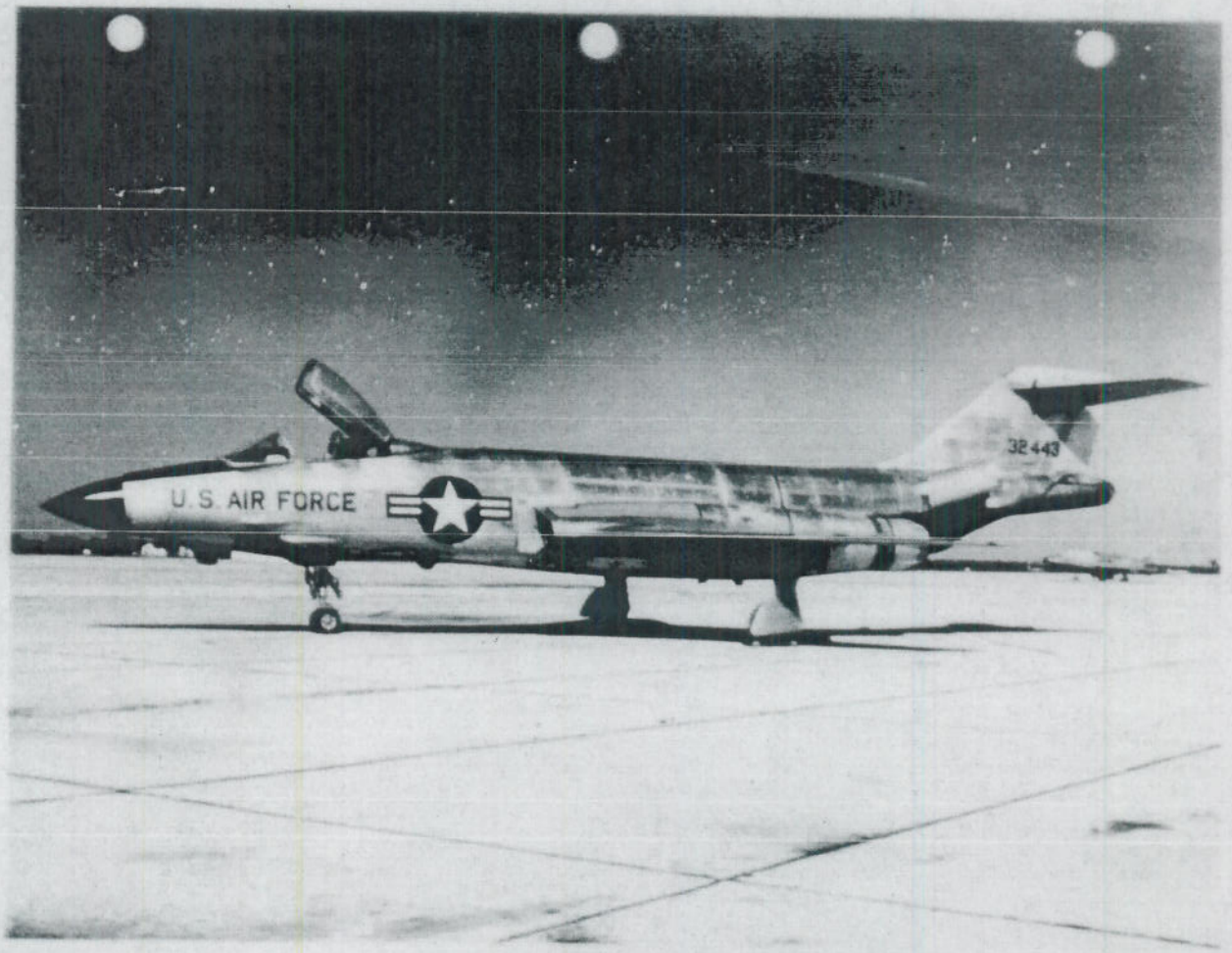
TEST OF THE F-101A

Testing of the McDonnell F-101A "Voodoo" was to have started early in 1956, but because of a number of deficiencies which were discovered in the weapon system, the test was suspended. The F-101A was the first aircraft to be affected by a new theory of aircraft procurement, known as the "Cook-Craigie Plan."*

In April 1951 a special study was made by the Deputy Chief of Staff for Development at Headquarters USAF on "Combat Ready Aircraft."[56] In this study, which reflected the philosophy of what was later to be known as the "Cook-Craigie Plan," the sequence of development, testing, procurement, and delivery of new aircraft was closely examined, with the purpose in mind of establishing this sequence in such a manner as to deliver new planes to combat forces as soon as possible, and to eliminate costly retrofit programs once the planes had been delivered.

Before World War II, this study pointed out, this sequence included the initial requirement, design evaluation, mock-up, the "X" (or experimental) aircraft, first flight and test, the "Y" (or prototype) aircraft,

*After General Orval R. Cook and Lt. General Lawrence C. Craigie (Ret.), who were at that time Deputy Chief of Staff, Materiel, and Deputy Chief of Staff, Development, respectively, at Headquarters USAF.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"Y" test, the production aircraft, and delivery to combat forces. Each process began after the completion of the preceding step, and the all-important Production Decision followed the successful service testing of the "Y" model. This sequence extended over a six- or seven-year period, and by the time the aircraft was delivered in substantial numbers it was technically obsolete.[57]

During and after World War II strong efforts were made to compress this time cycle. The Production Decision was made in many cases before the mock-up. Large numbers of aircraft were delivered to combat forces, mainly at the expense of aircraft used for testing. The inevitable result was that functional difficulties were discovered after the weapons were in service use, and extensive modification programs were required. This, in the long run, delayed us long as the previous method had the availability of combat-ready aircraft to combat units.[58]

The staff study recommended a radical change in this cycle. The Production Decision was to be made at the time of mock-up, and the "X" and "Y" models were to be eliminated entirely. Quantity production was to be planned for, but not initiated until the engineering integrity of the aircraft had been established. Once this had been done, the production aircraft, with any modifications found to be necessary already accomplished, were to be delivered to combat forces. Tests of the production aircraft continued, however, overlapping the delivery phase, but eliminating the need for extensive retrofit programs. This system made possible the delivery of proven production models almost two years earlier than before. It eliminated the costly experimental models,

[redacted]

lessened the chances for obsolescence of the weapon before combat delivery, and provided an adequate number of aircraft for all necessary testing programs.[59]

In the case of the F-101A, an initial production run of 31 aircraft, two of which were reconnaissance versions, was planned. The R&ST program at AFOTC included a minimum, and then a complete R&ST, to be run on these first production models early in 1956.* In July of 1956 full production was to begin, and subsequent to that, minimum and complete R&ST's were to be run on these production models.[60] [redacted]

It had been discovered as early as the wind tunnel tests that there was a stability problem in the F-101A. It was also known that the F-101 developed a pitch-up characteristic at a certain angle of attack. In the early research and development tests, however, this pitch-up had not been encountered, because when the aircraft approached the critical angle of attack the engine compressor stalled, and the pitch-up was not reached. Shortly before the R&ST aircraft were delivered to AFOTC, this engine compressor problem was corrected.[61] [redacted]

Four aircraft were scheduled for test at AFOTC, two of which were delivered during the last quarter of 1955. A third F-101 arrived early in January 1956. Even before physical testing was initiated, several deficiencies were discovered in the weapon system. So serious were these deficiencies that, even in view of the plan under which the project was being conducted, it was felt that a valid R&ST could not

*Although according to the plan they were production models, these were actually test aircraft, and did not differ appreciably from what had previously been designated the "X" model.

[redacted]

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be conducted until a retrofit program had been accomplished. It was planned early in January to return two of the test aircraft to the factory. At that time the fourth aircraft had not yet been delivered. On 10 January Major Lonnie E. Moore suffered a fatal crash in one of AFCTC's F-101s. The cause of the crash was determined to be pitch-up.[62] This tragedy precipitated cancellation of the ESST and return of all test aircraft to the manufacturer for correction of the stability problem and retrofit modifications.[63] [redacted]

After suspension of the ESST, difficulties in correcting the stability problem were encountered, and testing at AFCTC was slipped considerably. At the close of this reporting period it was expected that delivery of ESST aircraft would be in November or December 1956. The Test Directive for the project was revised, and included in the revision was the following statement:

> The OST of the F-101A Weapon System was indefinitely suspended when the initial activation of the test at Eglin Air Force Base proved that the aircraft had not reached a satisfactory state of development to permit successful prosecution of the test. Numerous system deficiencies, characterized by a dangerous stability problem, resulted in an indefinite suspension of the OST by Headquarters USAF on 26 January 1956. As a result of the deficiencies encountered the contractor is now exerting a major effort to find solutions to the problems, and it is now anticipated that active testing will be resumed in August 1956. This revision to the original Test Directive will serve as a directive and guide to responsible organizations and interested agencies. It should be noted that continuation of active testing at AFCTC will involve production type aircraft and all reference to the test series had been deleted. (S)[64]

It was an unfortunate series of circumstances, stemming from the great number of deficiencies in the weapon system as delivered to AFCTC, that caused this project to be delayed for such a long

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period of time. Theoretically, if all had gone well, delivery of the F-101A to combat units would have begun late in 1956. [redacted]

This sequence of events was very significant, however. For one thing, this Command entered the development-testing-procurement-delivery sequence at a much earlier stage. Although this early entry meant that AFUTC was subjecting prototype models to employment and suitability tests, it enabled the project team to discover functional difficulties at an earlier stage. Specifically, in the case of the F-101 it enabled the Air Force to funnel back to the manufacturer necessary modification requirements before full-scale production had been started, and although some time was lost in progressing with the sequence, a great saving in time and money which might have been spent at a much later and more critical time was realized. [redacted]

Tactical Air Projects: The Thunder Operations

EAST OF THE TM-61C

The TM-61C was a single-jet, high wing, tactical missile, which was "zero launched" from a mobile launcher. Its flight range was approximately 600 nautical miles. The SHANICLE guidance system, which was to be employed with this missile, was a "base line" system, composed of four ground radar stations which developed hyperbolic patterns providing range and azimuth references for the airborne equipment. The design range of SHANICLE was 250 statute miles. The object of this AFUTC test was to determine the suitability of the TM-61C weapon system with SHANICLE guidance.[63] [redacted]

Ten years of research and development effort were to have culminated in October 1955 when the EAST of the TM-61C "Matador" was

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[redacted]

scheduled to start. The test was to have been conducted in a realistic tactical environment, employing a completely equipped TM-61C squadron.[66]

During the planning phase of this project at AFOTC it was found that there was a serious shortage of checkout and assembly equipment, and that adequate squadron training had not been accomplished, thus limiting the squadron's capability to participate in an E/ST. Furthermore, it was learned that the missiles allocated for this test had been modified and specifications waived to the extent that they could not be considered tactical.[67] [redacted]

This command had monitored the research and development phases of TM-61C testing closely, and had learned that there were serious restrictions and deficiencies in both the missile and guidance systems. This monitoring enabled AFSC to consolidate the findings of other agencies into the projected operational environment of the E/ST.[68] [redacted]

It was concluded that, although the groundwork for a realistic test had been completed, the E/ST had been compromised to such an extent that a valid test was not possible. The missile was not yet operational, and the complexity, difficulty of operation, and vulnerability of the weapon system led to a recommendation that the E/ST be delayed until the requirements and objectives of the test program could be fulfilled. It was further recommended that the bulk purchase of SHANGRI-LA equipment be delayed, and that the deployment of the 11th Tactical Missile Squadron as a TM-61C unit, and the conversion of the 1st and 6th Squadrons to TM-61C units be delayed until the E/ST could be conducted on a realistic basis.[69] [redacted]

[redacted]

[redacted]

Headquarters USAF, on the basis of this report, cancelled the project. The missiles which had been allocated to APGC for the EOST were reallocated to the 11th Tactical Missile Squadron, and that unit was directed to conduct a training exercise with these missiles so that further operational information could be obtained.[70] Eighteen of the twenty missiles were fired by the 11th, and the results of the training exercise further emphasized the deficiencies pointed out in AFOTC's report. ARDC was directed to explore further these deficiencies, so that a realistic EOST could be planned. The 11th TMS, meanwhile, was deployed to Europe as planned. The squadron was deployed, however, with the AN/MSQ-1/APW guidance capability rather than the SHANICLE system.[71] [redacted]

APGC was then directed to prepare for an employment and suitability test at such time as ARDC testing was completed. At the close of this reporting period the EOST of the TM-61C was projected for early 1957, to be conducted at Wheelus Air Base, Tripoli, North Africa, utilizing a trained tactical missile squadron from USAFE.[72] [redacted]

This project demonstrated the advantages of the monitoring by this Command of the early phases of research and development testing. The TM-61C project was a large scale operation, and had AFOTC initiated physical testing of the Matador without a total picture of what had gone before, there would have been a waste of time and effort. More important, a valid evaluation of the tactical capability of the missile--a vital consideration in the light of the time phasing of the missile and the organizational changes which had to be made to produce combat-ready tactical missile squadrons--would have been further delayed.

[redacted]

[redacted]

37

TEST OF THE KB-50 TANKER

During this period the physical testing phase of the KB-50 tanker was initiated. A modified version of the post World War II "Superfortress," the KB-50 was designed to provide aerial refueling of tactical aircraft by means of the "probe and drogue" system. The General Operational Requirement for this tanker outlined the need for such a capability in tactical units:

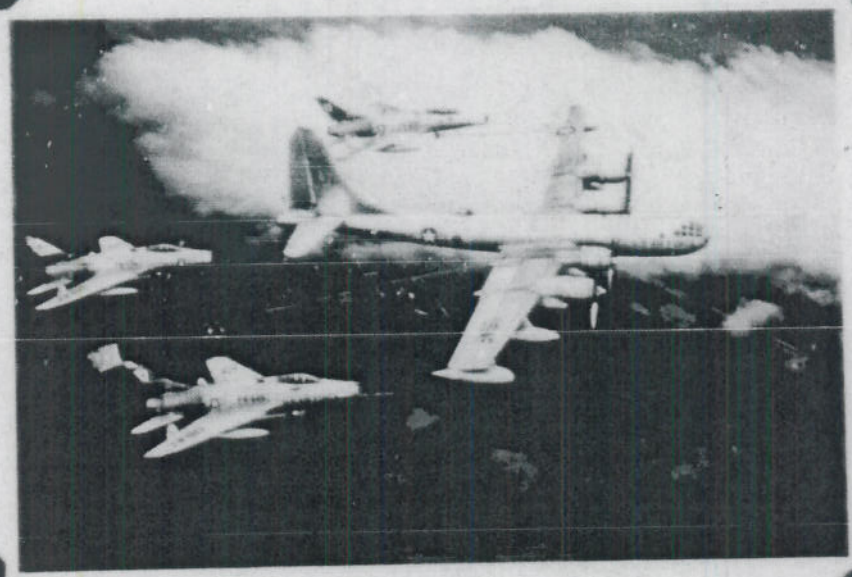
> A tanker aircraft is required to extend TAC combat aircraft ferrying ranges, combat radii of action, and duration of flight at destination because of weather or other difficulties. The requirement also exists for "over-base" refueling of aircraft operating from short runways, and for transporting fuel to tactical units for ground resupplying. The tanker will accompany or rendezvous with receiver aircraft and will be required to operate under various operational weather and visibility conditions. [redacted][3]

In tactical employment, the KB-50 was to operate from overseas theaters under the same environmental conditions as the weapon systems which it supported. It was envisaged that operations would also begin in the Zone of the Interior and terminate either at home, interim, or advanced bases.[74]

Since early models of the F-100, and some production models of the F-84 were being delivered to operational units, the KB-50 loomed as an important support system in the Tactical Air Command. A letter from Headquarters Tactical Air Command early in April stated that that command was making a concerted effort to produce a demonstrated deployment capability of their tactical units in as short a time as possible.[75] TAC planned to have ready by 1 January 1957 a deployable striking force, composed of F-100s, F/RF-84Fs, B/RB-66s and necessary support aircraft. As a means of training, and to demonstrate this

[redacted]

KB-50 TANKER REFUELING THREE NORTH AMERICAN F-100Cs



[redacted]

deployment capability prior to the readiness date of 1 January 1957, the 19th Air Force planned to deploy a squadron of F-100s to Europe during the fall of 1956 to participate in NATO maneuvers. It was thought that one or two squadrons of F-84Fs, with a flying-boom refueling capability, might be deployed also. In view of these impending operations, TAC requested that AFOTC expedite the IOT of the KB-50 so that as much information as possible concerning the refueling envelopes of the F-100, F-84F, and B-66 could be obtained.[76]

Employment and suitability testing of the F-100C had been completed by AFOTC before the KB-50 tests were to begin, and physical testing of the F-100D and B/RB-66B was in progress before and during this test. Seven F-100Ds and four B/RB-66Bs were fitted with probes for aerial refueling.

During the test little difficulty was experienced by the pilots of receiver aircraft in attaining proficiency in the techniques of probe and drogue refueling. It was determined that F-100 pilots who were proficient in formation flying should not require more than one hour of practice to develop this technique. No difficulty was experienced in B-66 refueling. It was found that for night missions best results were obtained by focusing the probe light straight ahead, with the right edge of the beam illuminating the probe head. This allowed the receiver pilot to see the drogue from a distance of approximately 50 feet out.[77]

Simulated ferry missions were flown twice with F-100s which carried two 275-gallon drop tanks. One aircraft remained airborne for 6 hours and 50 minutes, flying approximately 3100 nautical miles.[78]

[redacted]

During the test it was found that the presence of a factory technical representative was extremely desirable. This established a direct contact with the manufacturer, and was an invaluable aid in procuring certain scarce supplies. Minor modification discrepancies were also resolved through this source, and the "fixes" related to the assembly line, avoiding the high cost and extreme inconvenience of modifying aircraft which were already in the field.[79]

The presence of representatives from the prime Air Materiel Area was also found to be valuable, not only in expediting the delivery of replacement parts and spares, but also in determining and establishing from results of the test the stock levels which using commands would require.[80]

F-100s from Foster AFB, Texas were refueled during several missions. It was recommended by the project officer that using commands be required to participate in all phases of a test of this nature so that they would gain first hand knowledge of their future mission, and, by so doing, it would be possible to incorporate some of their ideas into the test.[81]

In a sense the use of the B-50 as a tanker "reclaimed" this aircraft for the U.S. Air Force. Obsolete as a bomber, the B-50 modified as a tanker was able to be serviced with standard Air Force ground handling and maintenance equipment. The tanker itself provided the Tactical Air Command with an increased capability for its in-service and programmed aircraft.

[redacted]

(U)

TEST OF THE F-100C

During this reporting period the TEST of the F-100C was completed. This aircraft was designed to be the fighter-bomber version of the F-100A day superiority fighter, but it was felt that it was more accurately described as "an air superiority fighter with fighter-bomber capabilities." The non-availability of new series ordnance severely limited the aircraft as a conventional fighter-bomber, although it was considered to have great potential as an atomic weapons carrier.[82] [redacted]

In its mission as a day fighter, the F-100C was found to be limited by inaccuracies and tracking difficulties in the MA-3 Fire Control System. This deficiency was traced to the range servo unit, and after the test had been concluded a modification of this unit was proposed to correct the F-100C Fire Control System to the same level as older day fighters.[83] A comparison of this fighter with contemporary USSR fighters showed that it was inferior in combat altitude, acceleration and maneuverability. Furthermore, when it was to be employed against high-speed, high-altitude bombers of the "Bison" type, the F-100C was totally incapable of effective combat. Its service ceiling was 33,000 feet, compared to 39,900 feet for the "Fresco C" and 39,400 for the "Farmer" USSR fighters. Intelligence performance data showed that the "Bison" had a terminal target altitude of 57,000.[84] [redacted]

Throughout the TEST the Low Altitude Bombing System (LABS) delivery capabilities of the aircraft were extensively investigated. It was found to be an excellent LABS aircraft, and when a technique developed during the test was employed the toss-bombing method was

[redacted]

[redacted]

found to yield extremely profitable results.[64] This finding varied with findings published by the Air Force Flight Test Center in the Phase VI report. At Edwards, AFTC pilots accomplished toss-bombing by entering a range at 565 KIAS or V_{max} (approximate maximum carrying shape at military rated power) and selecting afterburner about 10 seconds prior to pull-up. Using this technique, they decided that the aircraft was marginal or even unsatisfactory. At AFOTC an entrance speed of 500 - 530 KIAS was employed, and afterburner was selected at pull-up.[65] [redacted]

It was not possible to explore the maximum capabilities of this aircraft during the ESST because much of the armament it was designed to carry was not available. Conventional ordnance delivery was restricted to 750-pound bombs. New series ordnance--bombs, rockets, and napalm--had not been procured at the time of the test. The restrictions of the F-100X weapon system when pitted against a high performance bomber emphasized the need for a target-seeking missile for the aircraft. Although there was a program in effect to fit the F-100 series with missiles, no such capability existed during the ESST.[66] [redacted]

Although this aircraft exhibited many shortcomings when measured against the known capabilities of the USSR, it represented a significant advancement in airframe performance and was considered to be the U.S. Air Force's most effective operational weapon system to date to combat the enemy in the air.[67] [redacted]

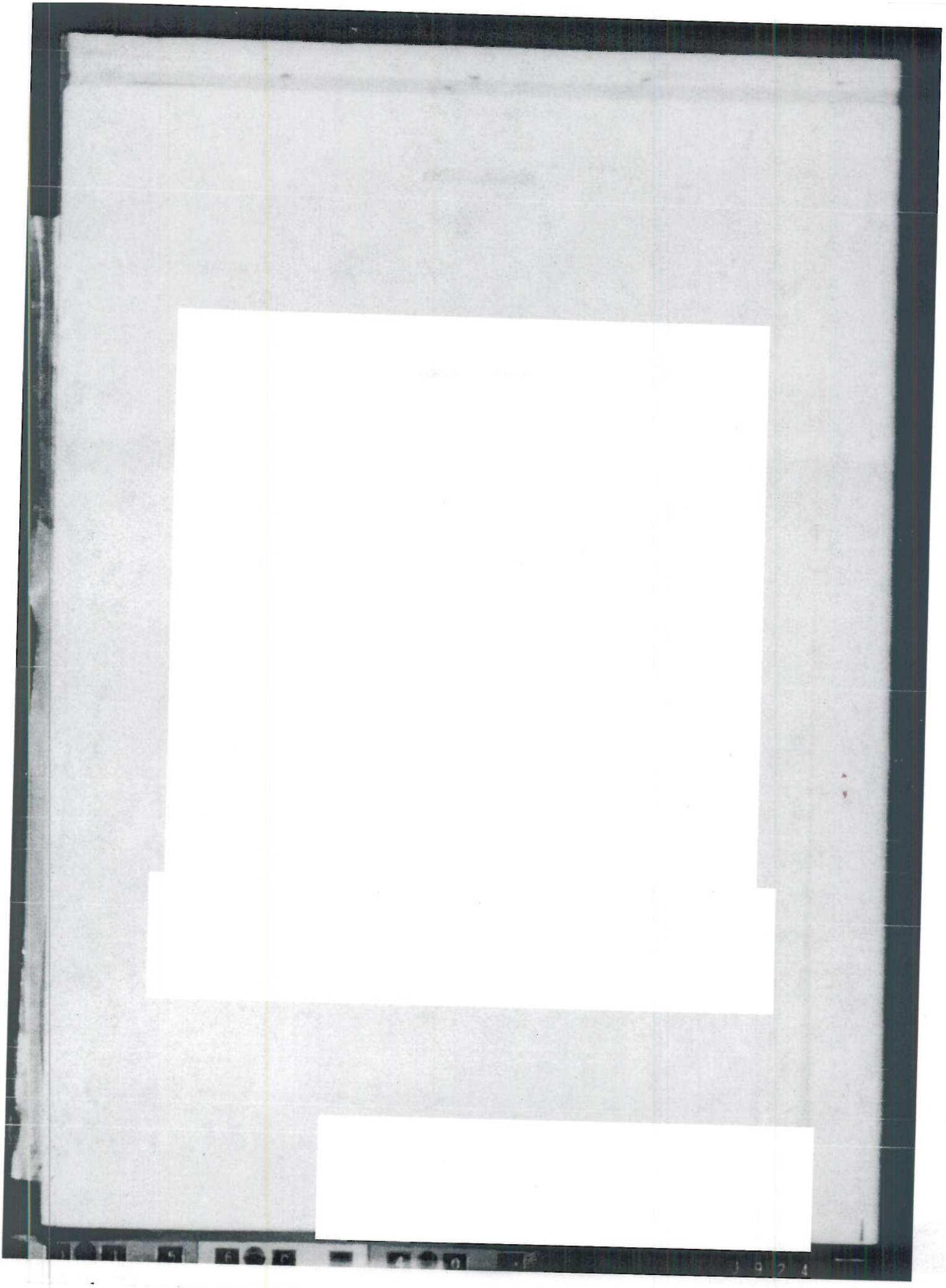
[redacted]

[redacted]

the chances of its unsuitability or inadequacy were slight. Also,
the obvious safety and political factors involved, as well as the

[redacted]

[redacted]



GLOSSARY

ACEW	Aircraft Control and Warning
ADC	Air Defense Command
AEC	Atomic Energy Commission
AFAC	Air Force Armament Center
AFDRD	Directorate of Research and Development, DCS/Development, Hq USAF
AFDRQ	Directorate of Requirements, DCS/Development, Hq USAF
AFFTC	Air Force Flight Test Center
AFOTC	Air Force Operational Test Center
AFR	Air Force Regulation
AFSC	Air Force Specialty code
AFSWC	Air Force Special Weapons Center
AMC	Air Materiel Command
APGC	Air Proving Ground Command
ARDC	Air Research and Development Command
ATC	Air Training Command
BANANA BELT	EAST of the CF-100
CE	Circular error
CEA	Circular error average
CEP	Circular error probability
CONELRAD	Control of electromagnetic radiations
DCS	Deputy Chief of Staff
DCS/O-TR	Directorate of Test Requirements, DCS/Operations, Hq APGC
E/ST	Employment and suitability test

FCS	Fire control system
FEI	Firing error indicator
FICON	Fighter conveyance
FIG LEAF	Joint E/ST (USAF) and Operational Evaluation (USN) of Air-to-Air IFF Systems
GAR	Guided aircraft rocket
IFF	Identification friend or foe
JATO	Jet-assisted takeoff
JCOC	Joint Civilian Orientation Conference
JCS	Joint Chiefs of Staff
KIAS	Knots indicated air speed
LABS	Low altitude bombing system
MPI	Mean point of impact
NATO	North Atlantic Treaty Organization
NOTAM	Notice to airmen
NWD	Nuclear Weapons Division (Detachment 1, AFOTC)
OIS	Office of Information Services
OJT	On-the-job training
OST	Operational suitability test
RCAF	Royal Canadian Air Force
SAC	Strategic Air Command
SCATER	Security control of air traffic and electromagnetic radiations

[redacted]

WLBS Wings level bombing system

Footnotes to Chapter I

1. See AFR 80-14, 27 Aug 54.

2. AFR 80-14, 8 Jun 56.

3. Memo, Dep Comdr APGC to Comdr APGC, subjt: Report of Special Committee on "Command Operations," headed by Brigadier General Daniel S. Campbell, 1 Jun 56 (hereinafter cited "Campbell Committee Report").

4. Ibid.

5. Ibid.

6. Ibid.

7. See Tab 1, "Most Productive Tests," from Campbell Committee Report.

8. See Tab 2, "Type Tests Having Most Potential," from Campbell Committee Report.

9. Campbell Committee Report.

10. Ibid.

11. Historical Report, Directorate of Plans, Hq AFOTC, Jan-Jun 56.

12. Proj. No. APG/CSC/333-A, OST of Approach System AN/MRN-7 and AN/MRN-8.

13. Hq APGC, Monthly Projects Report, May 1956, clas SECRET.

14. Historical Report, D/Plans, Jan-Jun 56.

15. Proj. No. APG/ADA/85-A-3.

16. Historical Report, D/Plans, Jan-Jun 56.

17. Proj. No. APG/TAC/448-A, ECST of C-123B Assault Transport Aircraft, and Proj. No. APG/TAS/130-A, ECST of C-130A Medium Troop Carrier/ Transport Aircraft.

18. See Tab 3, ltr DCS/O, APGC to Comdr AFOTC, subj: OST of Sonic Shock Wave Damage to Light Aircraft and Helicopters, 2 Mar 56.

19. See Tab 4, memo, D/Plans AFOTC for Dep Comdr AFOTC, subj: OST of Sonic Shock Wave Damage to Light Aircraft and Helicopters, 22 Mar 56.

20. See Tab 5, ltr, AFDRQ, Hq USAF to Comdr APGC, subj: (U) Joint Operational Suitability Testing (USAF) and Operational Evaluation (USN) of Air-to-air IFF Systems, 12 Jan 56, clas SECRET.

21. Hq APGC, Monthly Project Reports, Mar, Apr, May, and Jun 56, clas SECRET.

22. Historical Report, 3241st Test Group (Interceptor), AFOTC, Jan-Jun 56.

23. Hq APGC, Monthly Project Reports, Mar, Apr, May, Jun 56, clas SECRET.

24. See Tab 6, memo, D/Plans AFOTC for Dep Comdr AFOTC, subj: Test Directive for OST of Modified Range Servos in A-4 Gunsight, Project APG/TAT/423-A-1, 4 Jun 56.

25. Proj. No. APG/TAT/112-A-1.

26. See Tab 7, memo, D/Plans AFOTC for Dep Comdr AFOTC, subj: Test Directive for the OST of the Simplified Camera Control System (SCCS) in the RF-84F Aircraft, Project No. APG/TAT/112-A-1, 25 Apr 56.

27. Proj. No. APG/SAS/168-A.

28. Test Directive for the Operational Suitability Test of the GRB-36D-III/RF-84F Composite Aircraft System (FICONO, Proj. No. APG/SAS/168-A (U), 3 May 55, clas SECRET.

29. TWX, DCS/O-TR-SAD to Hq USAF, reference No. 26073, subj: Current Requirements for Conducting Project No. APG/SAS/168-A, OST of GRB-36D-III/RF-84F Composite Aircraft System, clas SECRET.

30. See Tab 8, TWX, AFDRQ-SA/A, Hq USAF, reference No. 56832, to Comdr APGC, subj: OST of GRB-36D-III/RF-84F Composite Aircraft System, 27 Feb 56, clas SECRET.

31. See Tab 9, ltr, 3245th Test Group (Bombardment) to Comdr AFOTC, ATTN: Director of Materiel, subj: Notification of Cancellation of Project (FICONO, 14 Mar 56.

32. Campbell Committee Report.

33. Ibid.

34. See Tab 10.

35. Historical Report, Comptroller, AFOTC, Jan-Jun 56.

36. See Tab 10, AFOTC Workload and Accomplishment chart.

37. See Tab 11.

Footnotes to Chapter II:

[redacted]

3. See Tab 12, ltr, Hq AFOTC to Hq APGC, subj: Redesignation and Responsibilities of the 3242nd Test Squadron, 1 Feb 56.

4. Pursuant to Hq APGC GO 14, 28 Mar 56.

5. Pursuant to Hq APGC GO 18, 22 May 56.

6. Pursuant to Hq APGC GO 14, 28 Mar 56.

7. See Tab 13, ltr, Hq AFOTC to Hq APGC, subj: Transfer of the Test Support Division, 6 Feb 56.

8. Historical Report, 3244th Test Group (Transport and Equipment), AFOTC, Jan-Jun 56.

9. Historical Report, 3245th Test Group (Bombardment), AFOTC, Jan-Jun 56.

10. See Tab 14, AFOTC Personnel Statistics, Percentage Assigned of Authorized Personnel, Grade Spread on Airmen, and Grade Spread on Officers.

11. The Trend, Jan, Feb, Mar, Apr, May, and Jun 56.

12. Historical Report, Directorate of Personnel, AFOTC, Jan-Jun 56. See also Tab 15, DF fr D/Pers to Comdr AFOTC, 7 Jun 56.

13. Historical Report, D/Pers.

14. The Trend, May and Jun 56.

Footnotes to Chapter III:

1. Dated 15 October 1954.

2. Historical Report, Directorate of Operations, AFOTC, Jan-Jun 56.

3. Ibid.

4. Ibid.

5. See Tab 16, Hq AFOTC, Operations Order 134-56, 20 Jun 56. This operations order pertained to an Aerial Firepower Demonstration which was to be held in July. It was basically the same, however, as the operations orders for previous demonstrations.

6. Historical Reports, D/Operations, Jan-Jun 56.

7. See Tab 17, Wide, Wide World Time Routine.

8. Historical Report, 324ist Test Group (Interceptor), AFOTC, Jan-Jun 56.

9. Pursuant to Hq AFOTC SO 95, 15 May 56; SO 97, 17 May 56; SO 102, 24 May 56.

10. The Trend, Hq AFOTC, May 56, p.8.

11. Ibid., p. 9.

12. Ibid., p. 9.

13. Ibid., p. 10.

14. Ibid., p. 10.

15. Ibid., pp. 11 and 11a.

16. Ibid., p. 11.

Footnotes to Chapter IV:

1. Historical Report, Directorate of Operations, AFOTC, Jan-Jun 56.

2. Hq APGC, Test Directive for E/ST of B-57E Weapon System, Project No. APG/ADA/562-A, 4 Nov 55, clas CONFIDENTIAL.

3. Interview with Major Jon B. Peratt, Chief of Armament Branch, Directorate of Materiel, AFOTC, 10 August 1956.

4. See Tab 18, Ltr, Dir/Ops, AFOTC to Comdrs 324ist and 324Brd Test Groups, subj: Re-evaluation of Tow Target Requirements, 30 Jan 56.

5. See Tab 19.

6. See Tab 20.

7. Hq APGC, Final Report, OST of CF-100 Mark IVB, Project No. APG/ADA/900-A, 11 Jul 56, clas SECRET, and interview with Captain Philip S. Porter, "Banana Belt" Project Officer, 14 Aug 56.

8. Historical Report, Directorate of Materiel, AFOTC, Jan-Jun 56.

9. Hq APGC, Final Report, OST of F-100C Weapon System, Project No. APG/TAT/423-A, 16 Mar 56, clas SECRET.

10. Historical Report, D/Materiel, Jan-Jun 56.

11. Ibid.

12. Ibid.

13. Historical Report, D/Operations, Jan-Jun 56.

14. Ibid.

15. Ibid.

16. Interview with Major John R. Phillips, F-99B Project Officer, 6 Aug 56.

17. Hq APGC, Final Report, OST of Q-2A Pilotless (Drone) Aircraft, Project No. APG/ADA/615-A, 27 Jun 56, clas SECRET.

18. Ibid.

19. See Tab 21, ltr Hq APGC to Comdr AFOTC and Comdr 3200th Drone Group, subj: Development of a Drone Towed Target System, 13 May 56.

20. Ltr, 3215th Drone Sq to Comdr 3200th Drone Group, subj: Progress Report Project Dollarwise, (no date on copy used).

21. See Tab 22, ltr, Hq AFOTC to Comdr APGC, subj: Report on Ph II of Project Dollarwise (Development of Mission Procedures for Drone Towed Targets), clas CONFIDENTIAL.

22. Ibid.

23. Pursuant to Hq APGC, Test Directive, subj: OST of GAR-1 Ground Equipment, Facilities, and Procedures, 25 Jan 55, clas SECRET.

24. Ltr, Hq APGC to Comdr AFOTC, subjt: Amendment to Test Directive of Project No. APG/ADA/36-A, OST of GAR-1 Ground Handling Equipment, Facilities, and Procedures, 25 Jan 56, clas SECRET.

25. See above, p. 8.

26. Hq APGC, Monthly Projects Report, Jul 56, clas SECRET.

27. See Tab 23, Hq AFOTC, Operation Plan 6-56, 15 Jun 56.

28. Hq APGC, Monthly Projects Report, Jul 56, clas SECRET.

29. See Tab 24, TWX fr Comdr APGC to CofS, USAF, reference No. DCS/O-TR 0021C, subjt: ECST of F-102A Weapon System, 29 Jun 56, clas SECRET.

30. See Tab 25, TWX, DCS/O-TR, APGC, to AFDRQ, Hq USAF, subjt: Interim TWX Report No. 1 on Project No. APG/ADA/431-A, ECST of F-[illegible] Using the E-9 FCS, clas SECRET.

31. Hq APGC, Monthly Projects Report, Jul 56, clas SECRET.

32. Hq APGC, Final Report, OST of CF-100 Mark IVB, Project No. APG/ADA/900-A, clas SECRET, p.i.

33. Ibid., p. 26.

34. Ibid., p. 1.

35. Ibid., p. ii.

36. Ibid., p. 27.

37. Ibid., p. ii.

38. See Tab 5, ltr, AFDRQ, Hq USAF to Comdr APGC, subjt: (U) Joint Operational Suitability Testing (USAF) and Operational Evaluation (USN) of Air-to-Air IFF Systems, 12 Jan 56, clas SECRET.

39. Hq APGC, Test Directive for Joint Evaluation of Air-to-Air IFF Systems, 29 Mar 56, clas SECRET.

40. Hq APGC, Monthly Projects Reports, Mar, Apr, May, and Jun 56, clas SECRET.

41. Interview with Major Winfield M. Stein, "Fig Leaf" Evaluation Officer, 20 Aug 56.

42. Ibid.

43. Ibid.

44. See above, p. 3.

45. See Tab T.

46. Interview, Major George A. Gradel, "Seed Apple" Project Officer, 16 Aug 56.

47. Hq APGC, Test Directive, Development of Tactics and Techniques for Employment of High Speed Bombers, Project No. APG/SAS/160-A-1, 3 Jan 55, clas SECRET.

[redacted]

49. Hq APGC, Test Directive, Project No. APG/SAS/160-A-3, 26 Aug 55, clas SECRET.

50. Final Report, Project No. APG/SAS/160-A-3.

51. Ibid.

52. Hq APGC, Monthly Projects Report, Jul 56, clas SECRET.

53. Interview with Major Gradel, 16 Aug 56, and historical report, 3245th Test Group (Bombardment), AFOTC, Jan-Jun 56.

54. Historical Report, 3245th Test Group.

55. Interview with Major Gradel, 16 Aug 56, and historical report, 3245th Test Group.

56. Combat Ready Aircraft, an Air Force Staff Study Prepared by Deputy Chief of Staff, Development, Apr 51, clas CONFIDENTIAL.

57. Ibid., p. 16.

58. Ibid., p. 17

59. Ibid., pp. 19-24.

60. Interview with Capt. George M. Smythe, Jr., 3245rd Test Group (Fighter), AFOTC, 3 Sep 56.

61. Ibid.

[redacted]

[redacted]

65. Hq APGC, Monthly Projects Report, Apr 56, clas SECRET.

66. See Tab 27, TWX Hq APGC to CofS, Hq USAF, reference No. DCS/O-TR-TA 50007C, subj: Interim Report No. 1 on Project No. APG/TAM/56B-A, TM-61C OST, 5 Mar 56, clas SECRET.

67. Ibid.

68. Interview with Mr. Thomas H. Dalenite, Chief Technical Advisor, AFOTC, 10 Aug 56.

69. Interim Report No. 1 on TM-61C OST.

70. See Tab 26, TWX, AFDRQ-TA/B, Hq USAF to Comdr APGC, 20 Mar 56, clas SECRET.

71. Interview with Mr. Dalenite, 10 Aug 56.

72. See Tab 29, ltr, AFDRQ-TA/B to Comdr APGC, subj: (U) TM-61C Operational Suitability Test, 9 May 56, clas SECRET.

73. Hq APGC, Test Directive, Operational Saitability Test of KB-50 Three Drogue Tactical TankerAircraft, Project No. APG/TAS/790-A, 7 Sep 55, clas CONFIDENTIAL.

74. Ibid.

75. Ltr, Hq TAC, to TAC Resident Liaison Officer, APGC, subj: KB-50 OST, 5 Apr 56.

76. Ibid.

77. Historical Report, 3245th Test Group (Bombardment), AFOTC, Jan-Jun 56.

78. Ibid.

79. Ibid.

80. Ibid.

81. Ibid.

82. Hq APGC, Final Report, Operational Suitability Test of F-100C Weapon System, Project No. APG/TAT/423-A, 16 Mar 56, p. ii, clas SECRET.

83. Briefing notes from Project No. APG/TAT/423-A, EOST of F-100C Airplane, prepared for Dep Comdr AFOTC, undated, clas CONFIDENTIAL.

84. Final Report, OST of F-100C, pp. 11-14.

85. Briefing notes referenced in note 83 above.

86. Final Report, OST of F-100C, p. 5.

87. Ibid., p. ii.

88. Interview with Maj. George W. Kremmer, Hq AFOTC, 19 Sep 56.

91. Interview with Maj. Harold E. Wells, Hq APGC, 20 Sep 56.

93. Ibid., p. ii.

94. Ibid., p. ii.

95. Ibid., p. 46.

APPENDIX A

ROSTER OF KEY PERSONNEL

APPENDIX A

Roster of Key Personnel
(as of 30 June 1956)

Colonel John A. Hilger	[redacted]	Commander AFUTC
Colonel Edward W. Szaniawski	[redacted]	Deputy Commander AFUTC
Mr. Thomas A. Dalekite	Civilian	Technical Advisor
Major Arthur McCrea	[redacted]	Executive
Captain William E. Hoppe	[redacted]	Adjutant
Lt. Colonel Nicholas Arabicko	[redacted]	Director of Materiel
Colonel Preston C. Newton	[redacted]	Director of Operations
Major Robert J. Grady	[redacted]	Director of Personnel
Lt. Colonel John H. Washington	[redacted]	Director of Plans
Major O.A. Bradford	[redacted]	Comptroller
Captain Clinton E. Johnson	[redacted]	Inspector General
Captain Eugene G. Larson	[redacted]	Commander, Hq Sqdn Sect*
2d Lt. John O. Hawke, Jr.	[redacted]	Information Services Officer
Colonel Marion Malcolm	[redacted]	Commander 3206th Test Wing
Colonel Thomas O. Bodarsette	[redacted]	Commander 3241st Test Group
Colonel Daniel F. Sharp	[redacted]	Commander 3243rd Test Group**
Colonel Joseph G. Perry	[redacted]	Commander 3242nd Test Group***
Colonel Richard P. Fulcher	[redacted]	Commander 3244th Test Group
Colonel Joe C. Briley	[redacted]	Commander 3245th Test Group
Colonel Charles F. Matheson	[redacted]	Commander Det. 1 [redacted]

* Replaced Major Gaylen A. Woods, AO567125
** Replaced Lt. Colonel Julian A. Harvey, 0470A, who replaced Colonel Robert A. Elder, 0613A
*** Replaced Major Glenn H. Koontz, AO2044774, who replaced Lt. Colonel Blair D. Taylor, AO668044

APPENDIX B

SUMMARY OF AFOTC PROJECTS

[redacted]

Appendix B

Summary of AFUTC Projects

Projects Initiated During Period

APG/ADA/49-A-9	Determination of E-Series Fire Control System Lock-on and Attack Capabilities under Effective Airborne X-Band Jamming Conditions [redacted]
APG/ADA/49-A-14	Determination of Effects of GCI Altitude Control Errors on the Success of Fighter-Interceptor Lead-Collision Course Co-Altitude Attacks (U)
APG/ADA/85-A-5	Limited E/ST of the Lincoln Laboratory AEW/UHF Search Radar Set, AN/APS-70 (XD-1), Project "Gray Wheel" (U)
APG/ADA/450-A	Joint Evaluation of Air-to-Air IFF System (U) Project "Fig Leaf" (U)
APG/ADA/552-A	E/ST of the F-102A Flight Simulator (U)
APG/ADA/914-A	E/ST of the GAR-2 (U)
APG/ADC/1245-A	E/ST of Apprentice AEW Radar Repairman, Graduates of TTAF Courses No. AB30132A-1 and AB30132B-1 (U)
APG/ADC/1274-A	E/ST of Apprentice Aircraft Mechanic (Jet, Two Engines), Graduates of TTAF Course No. AB43131D (Channel A) (U)
APG/CSC/274-ABC	E/ST of Crash Locator Beacon (U)
APG/CSC/348-A-1	E/ST of Commercial Vehicle for Towing Aircraft up to 100,000 Pounds Gross Weight (U)
APG/CSC/375-A	E/ST of EL-3 Photographic Drier (U)
APG/CSC/433-A	E/ST of the KA-1 Camera (U)
APG/CSC/434-A	E/ST of the KA-2 Camera (U)
APG/CSC/477-A	E/ST of the AN/ARA-21 Navigational Computer Group (U)
APG/CSC/844-A	E/ST of 70mm Film Processing Equipment (U)
APG/CSC/892-AB	E/ST of Bolted Aluminum Fuel Storage Tanks (U)

APG/CSC/990-AB	E/ST of MA-1A Gas Turbine Compressor (U)
APG/CSC/994-A	E/ST of Joint USAF-CAA Overrun and Approach Lighting (U)
APG/CSC/1005-A	E/ST of Apprentice Aircraft Propeller Repairman, Graduates of TTAF Course No. AB42131 (U)
APG/CSC/1006-A	E/ST of Apprentice Personnel Specialist, Graduates of TTAF Course No. AB73231 (U)
APG/CSC/1030-A	E/ST of Apprentice Aircraft Mechanic (Jet, Over Two Engines), Graduates of TTAF Course No. AB43131E-1 (U)
APG/CSC/1113-A	E/ST of Apprentice Organizational Supply Specialist, Graduates of TTAF Course No. AB64131(U)
APG/CSC/1256-A	E/ST of Apprentice Automotive Repairman, Graduates of TTAF Course No. AB47131 (U)
APG/CSC/1259-A	E/ST of Apprentice Ground Communications Equipment Repairman, Graduates of TTAF Course No. AB30433A (U)
APG/CSC/1264-A	E/ST of Apprentice Control Tower Specialist, Graduates of TTAF Course No. AB27231 (U)
APG/CSC/1275-A	E/ST of Apprentice Communications Machine Repairman, Graduates of TTAF Course No. AB36330 (U)
APG/CSC/1276-A	E/ST of Apprentice Aircraft Loading Control Operator, Graduates of TTAF Course No. AB27232 (U)
APG/CSC/1319-A	E/ST of Apprentice Metals Processing Specialist, Graduates of TTAF Course No. AB53230 (U)
APG/SAC/73-A-2	E/ST of High Pressure Gas Servicing System, Type MC-4 (U)
APG/SAS/166-A-0	Comparative E/ST of LABS and WLIS in B-47 Aircraft (C)
APG/SAS/165-A-1	B-52C Squadron E/ST (U)
APG/SAS/165-A-2	E/ST of the B-52B Flight Simulator, Type S-9 (U)
APG/SAT/400-A-3	E/ST of the F-101A Flight Simulator (U)
APG/SAS/967-A	Development of Tactics and Techniques for Bombing and Navigation with the AN/APN-82 (U)

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APG/SAS/980-A	E/ST of the MA-1 Astrograph (U)
APG/SAS/1030-A	E/ST of MC-97G Simulator Type MB-27 (U)
APG/SAC/1165-A	E/ST of Apprentice Inflight Refueling Specialist, Graduates of TTAF Course No. AB43330 (U)
APG/SAS/1262-A	E/ST of Maximum-Minimum Airspeed Indicator (U)
APG/SAC/1266-A	E/ST of Apprentice Turret Systems Mechanic, Graduates of TTAF Course No. AB32330C (Channel A: MD-5, A-5) (U)
APG/SAT/1292-A	E/ST of the Adequacy of Airspace Areas Allocated Jet Aircraft for Holding Patterns, Penetration Turns, and Procedure Turns (U)
APG/SAS/1297-A	E/ST of Fighter Attacks Against Missile-Defended Bombers [redacted] (U)
APG/TAT/112-A-1	E/ST of the RF-4[redacted] with an Improved Photographic System (U)
APG/TAC/390-A	E/ST of the T-37A Jet Trainer (U)
APG/TAT/423-A-1	E/ST of the MIT Range Servo for the A-4 Gunsight in F-100 Series Aircraft (U)
APG/TAC/446-A	E/ST of the C-123H Assault Transport Aircraft (U)
APG/TAC/446-A-2	E/ST of the C-123B for Personnel Drops (U)
APG/TAT/504-A	E/ST of the F-100D Aircraft. (U)
APG/TAT/527-A	E/ST of the Computer, Indicator Set for Fighter Aircraft, AN/ASN-6 (U)
APG/TAT/571-A	E/ST of the Phase II Tactical Air Control System (U)
APG/TAC/906-A	E/ST of Improved AN/PRC-14 Air-Ground Communications Set for Crash Rescue Teams (U)
APG/TAC/1026-A	E/ST of C-124 Cargo Drop Kit (U)
APG/TAT/1029-A	Limited E/ST of AN/GPA-30, Video Mapping Group (U)

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Projects Completed During Period

APG/ADA/49-A-12	Development of Tactics and Techniques for the Employment of the K-14C Visual Gunsight in the F-86D (U)
APG/ADA/49-A-13	EGST of the Rho-Theta Computer, Type T-269 in the F-89D (U)
APG/ADA/32-A-2	EGST of the Selective Identification Feature (SIF) Addition to the Basic Mark X IFF (Manual Coding) [redacted] Project "Pinball" (U)
APG/ADC/55-ABC	EGST of Tactical Omnibearing Distance-Measuring System (TACAN) (U)
APG/ADA/79-A	EGST of Auxiliary Search Radar Modification Kit and Improved Radar Receiver for AN/CPS-6B (U)
APG/ADA/363-A-1	Limited EGST of AN/GPA-37/AN/ARR-39 Ground Control Data Link (U)
APG/ADA/465-A	Development of Tactics and Techniques for Employment of F-86K Aircraft (U)
APG/ADA/515-A	EGST of the Q-2A Pilotless (Drone) Aircraft (U)
APG/ADA/676-A	Limited EGST of IFF Diversity Antenna Switch SA-(XA-29)/A, Project "Flip Flop" (U)
APG/ADA/887-A	Limited EGST of the AT-309/GPX Antenna (U)
APG/ADA/900-A	EGST of the RCAF CF-100 Mark IVB "Canuck" All-Weather Jet Fighter (U) Project "Banana Belt" (U)

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APG/CSC/327-A-1	EGST of Snow Removal Equipment (U)
APG/CSC/328-A	EGST of Air-Transportable Hydrant Refueling System (U)
APG/CSC/351-A	EGST of the XN-352 Munitions Trailer (U)
APG/CSC/354-AB	EGST of the Type 0-6 Crash Fire Truck (U)
APG/CSC/355-A-1	Limited Evaluation of the Improved Spar GCA (U)

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APG/CSC/414-A	Comparative E/ST of the MD-1 Liquid Oxygen Trailer (U)
APG/CSC/485-A	E/ST of the Couse 12-Ton Shop Trailer (U)
APG/CSC/496-A	Comparative E/ST of Aggregate Spreaders (U)
APG/CSC/506-A	E/ST of EN-6 Continuous Contact Printer (U)
APG/CSC/547-AB	E/ST of Simulated F-84 and F-86 Aircraft (U)
APG/CSC/806-A	E/ST of Apprentice Ground Powered and Support Equipment Repairman, Graduates of TTAF Course No. AB47230 (U)
APG/CSC/895-A	E/ST of Apprentice Airframe Repairman, Graduates of TTAF Course No. AB53450 (U)
APG/CSC/910-A	E/ST of Apprentice Jet Engine Mechanic, Graduates of TTAF Course No. AB43230 (U)
APG/CSC/947-A	E/ST of Apprentice Reciprocating Engine Mechanic, Graduates of TTAF Course No. AB43231 (U)
APG/CSC/974-A	E/ST of Apprentice Special Vehicle Repairman, Graduates of TTAF Course No. AB47132 (U)
APG/CSC/998-A	E/ST of Joint USAF-CAA Overrun and Approach Lighting (U)
APG/CSC/1005-A	E/ST of Apprentice Aircraft Propeller Repairman, Graduates of TTAF Course No. AB42131 (U)
APG/CSC/1274-A	E/ST of Apprentice Aircraft Mechanic (Jet, Two Engines) Graduates of TTAF Course No. AB43131D (Channel A) (U)
APG/SAS/28-A-3	Chaff Comparison Test (U)
APG/SAS/92-AB	E/ST of Radar Set AN/APN-42 (U)
APG/SAS/126-A-1	E/ST of the Improved K-4A Bombing System (U)
APG/SAS/143-A	E/ST of Countermeasures Transmitting Set AN/ALT-7 (U)
APG/SAS/160-A-3	E/ST of Low Altitude, Level Flight Radar Release Capabilities of the B-47 [redacted]
APG/SAS/165-C	E/ST of the B-52B (Arctic Phase) (U)
APG/SAS/165-A-2	E/ST of the B-52B Flight Simulator, Type S-9 (U)

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APG/SAS/371-A	E/ST of Indirect Bomb Damage Assessment Equipment (U)
APG/SAS/400-A-1	E/ST of the RB-47H Reconnaissance System (Minimum E/ST Phase) (U)
APG/SAS/549-A	E/ST of Rapid-Scan Receiver S121 and Converter CMC-1(T) (U)
APG/SAS/625-A	Operational Evaluation of Radar Set AN/APQ-56 (XA-2, Mod III) (U)
APG/SAS/900-A	E/ST of the MA-1 Astrograph (U)
APG/TAT/93-A-2	E/ST of the M-1 Toss Bomb Computer (U)
APG/TAT/112-A-2	E/ST of the RF-84F with Automatic Navigation Computer Type AN/ASN-6 or AN/ASN-7 [redacted]
APG/TAC/113-A-1	E/ST of Radar Beacon AN/PPN-18 [redacted]
APG/TAT/116-A-4	E/ST of Probe Tanks for F-86 Aircraft (U)
APG/TAC/392-A	E/ST of the AN/PPN-12 Transponder (U)
APG/TAT/423-C	E/ST of the F-100C (Arctic Phase) [redacted]
APG/TAC/448-A-1	E/ST of the C-123B Assault Transport Aircraft (Phase I) (U)
APG/TAC/448-C	E/ST of the C-123B Assault Transport Aircraft (Arctic Phase) (U)
APG/TAT/501-A	Project "Close In" (U)
APG/TAS/519-A	Operational Evaluation of the MA-3 Shoran Reconnaissance Navigational System in the RB-57A (U)
APG/TAT/573-A	E/ST of the Quadradar GCA Unit (U)
APG/TAT/573-C	E/ST of the Quadradar GCA Unit (Arctic Phase) (U)
APG/TAT/NEB-A	E/ST of AN/MSC-4 (XW-1) Tactical Mobile Communications Center, Project "Wagon Wheels" (U)
APG/TAT/717-A	E/ST of the Collins Flight Director System in High Performance Aircraft (U)
APG/TAC/986-A	E/ST of the Improved AN/PRC-14 Air-Ground Communications Set for Ground Rescue Teams (U)
APG/TAC/1026-A	E/ST of C-124 Cargo Drop Kit (U)

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APG/SAS/980-A	E/ST of the MA-1 Astrograph (U)
APG/SAS/1030-A	E/ST of KC-97G Simulator Type MA-27 (U)
APG/SAC/1165-A	E/ST of Apprentice Inflight Refueling Specialist, Graduates of TTAF Course No. AB43330 (U)
APG/SAS/1262-A	E/ST of Maximum-Minimum Airspeed Indicator (U)
APG/SAC/1266-A	E/ST of Apprentice Turret Systems Mechanic, Graduates of TTAF Course No. AB32330C (Channel A: MD-5, A-5) (U)
APG/SAT/1292-A	E/ST of the Adequacy of Airspace Areas Allocated Jet Aircraft for Holding Patterns, Penetration Turns, and Procedure Turns (U)
APG/SAS/1297-A	E/ST of Fighter Attacks Against Missile-Defended Bombers [redacted] (U)
APG/TAT/112-A-1	E/ST of the RF-84F with an Improved Photographic System (U)
APG/TAC/390-A	E/ST of the T-37A Jet Trainer (U)
APG/TAT/423-A-1	E/ST of the MIT Range Servo for the A-4 Gunsight in F-100 Series Aircraft (U)
APG/TAC/448-A	E/ST of the C-123B Assault Transport Aircraft (U)
APG/TAC/448-A-2	E/ST of the C-123B for Personnel Drops (U)
APG/TAT/504-A	E/ST of the F-100D Aircraft. (U)
APG/TAT/527-A	E/ST of the Computer, Indicator Set for Fighter Aircraft, AN/ASN-6 (U)
APG/TAT/571-A	E/ST of the Phase II Tactical Air Control System (U)
APG/TAC/906-A	E/ST of Improved AN/PRC-14 Air-Ground Communications Set for Crash Rescue Teams (U)
APG/TAC/1026-A	E/ST of C-124 Cargo Drop Kit (U)
APG/TAT/1029-A	Limited E/ST of AN/GPA-30, Video Mapping Group (U)

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Projects Suspended During Period

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APG/SAS/92-A8** E/ST of Radar Set AN/APN-42 (XA-3) (U)

APG/SAS/156-A8 E/ST of AN/MPS-5 (U)

APG/SAS/165-A-1 B-52C Squadron E/ST (U)

APG/SAT/400-AC* E/ST of the F-101A Weapon System (U)

APG/SAS/459-A E/ST of Chaff Dispensing Set, AN/ALE-2 (U)

APG/TAC/116-A-3* F-86H Squadron Logistical E/ST (U)

APG/TAT/132-A-2 E/ST of the T-28E-2 Fragmentation Bomb Cluster (U)

APG/TAS/357-A* E/ST of the RB-66B Aircraft (U)

APG/TAS/301-A E/ST of Interim Fire Control System for B-57B (U)

APG/TAW/366-A E/ST of TM-61C Matador Guided Missile Weapon System (U)

APG/TAT/1029-A Limited E/ST of AN/GPA-30 Video Mapping Group (U)

Projects Cancelled During Period

APG/ADA/491-A E/ST of the AN/CPS-19B and "Search Arrow" Lightweight Pod Radars in the F-86F and F-84F (C)

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APG/SAS/113-AB-1 E/ST and Comparison of the AN/ALT-6 and AN/ALT-8 (U)

APG/SAS/160-A E/ST of the GRB-36D-III/RF-84F Composite Aircraft System (FICON) (U)

APG/TAT/527-A E/ST of the Computer, Indicator Set for Fighter Aircraft, AN/ASN-8 (U)

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