FOIA 05-1100
MMS

April 18, 2005

Department of the Army
Bruno C. Leuyer , FOIA/PA Officer
7701 Telegraph Road, Suite 144
Alexandria, VA 22315-3860
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Freedom of Information Act Request

Dear Mr. Leuyer:

Pursuant to the provisions of the Freedom of Information Act, I hereby request a copy of the following document:

DTIC Report number 016374
Army Biological Labs, Frederick, MD
Operational Suitability Test of the RB-36/F-84 Parasite Aircraft System (Phase I)
April 1953
Report SOS88GOA

I believe that this 50 year old report is releasable in full. I agree to pay costs associated with this request up to $25 without additional permission. This request is for noncommercial research and study purposes from a private individual.

Sincerely

O. P. R.
CONTROL # 05-415 LL
DUE DATE 28 June 05

AD NUMBER

AD016374

CLASSIFICATION CHANGES

TO

unclassified

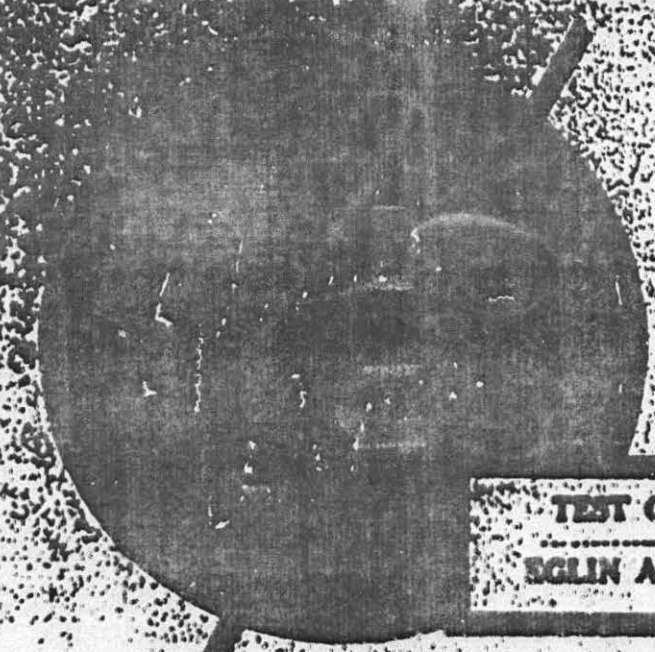
FROM

secret

AUTHORITY

WADC Reclassification List no. 11, 1 Oct 1957

Air Proving Ground Command



TEST CONDUCTED AT EGLIN A.F.B. FLORIDA

PROJECT NO. APG/SAS/97-A

SUBJECT: OPERATIONAL SUITABILITY TEST OF THE RB-36/F-84 PARASITE AIRCRAFT SYSTEM (PHASE I)

DATE
29 APRIL 1963

COPY NO. 12

[redacted]

[redacted] SECURITY INFORMATION

HEADQUARTERS
AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

SECRET
BY AUTH OF
CG APGC

29 April 1959 [illegible]
(Date) (Initials)

OPERATIONAL SUITABILITY TEST OF THE RB-36/F-84 PARASITE AIRCRAFT SYSTEM (PHASE I)

PROJECT NO. APG/SAS/97-A

1. This is the Final Report on Project No. APG/SAS/97-A (Phase I). The object of Phase I was to investigate the tactical feasibility of employing the parasite aircraft system to accomplish long range strategic bombing and photographic reconnaissance missions.

2. The test item was a prototype system consisting of an RB-36F carrier airplane and an F-84E parasite airplane. The RB-36F was equipped with a trapeze installation in the bomb bay for launching, retrieving, and transporting the F-84E. These items did not represent a tactical configuration and testing was limited by that fact.

3. The concept of parasite operation is tactically sound and represents a definite advance in the employment of high performance fighter type aircraft on a global range scale.

4. It is concluded that the RB-36/F-84 parasite system, when further developed, will be capable of accomplishing long range strategic bombing and photographic reconnaissance; that the system, properly employed, should experience a high survival probability on combat missions; and that the "FICON" trapeze installation can be used successfully for parasite operations by flight crews of average ability.

5. The lack of satisfactory navigation equipment appears to be the greatest single limitation of the parasite system. Therefore, it is recommended that development of essential equipment that will provide the parasite system with an all weather navigational and rendezvous capability be expedited. It is also recommended that the deficiencies and limitations noted on the prototype system be eliminated or reduced; and that consideration

[redacted] SECURITY INFORMATION

be given to developing the RB-36 carrier so that the airplane will not be restricted to a singular role, but will have maximum versatility as a carrier and be readily convertible for its original role of strategic reconnaissance. A production RB-36/RF-84F parasite system should be made available for operational suitability testing at the earliest possible date.

PATRICK W. [redacted]
Major General, USAF
Commanding

SECRET
SECURITY INFORMATION

HEADQUARTERS
AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

FINAL REPORT

ON

THE OPERATIONAL SUITABILITY TEST OF THE RB-36/F-84 PARASITE AIRCRAFT SYSTEM (PHASE I)

PROJECT NO. APG/SAS/97-A

SECRET
SECURITY INFORMATION

TABLE OF CONTENTS

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1. INTRODUCTION:

a. General:

(1) This project was initiated at the request of Headquarters, USAF, to determine the operational suitability of the RB-36/F-84 composite aircraft system. This system, with the proper parasite configuration, is intended to accomplish strategic bombing and photographic reconnaissance missions. The project is often referred to by the code name "FICON".

(2) In order to effect the necessary sequence of testing and to expedite production of test results, it was directed that the project be conducted in three phases utilizing combinations of aircraft as follows:

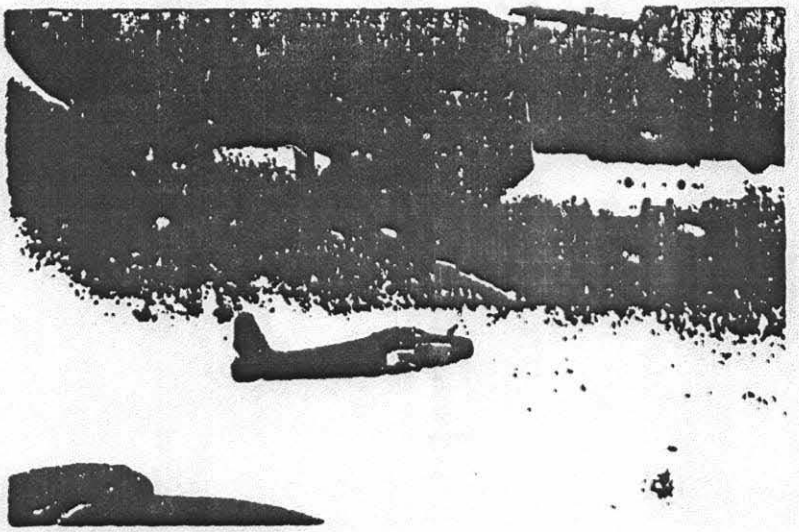
Phase I - RB-36F/F-84E (prototype system).
Phase II - RB-36F/YF-84F (prototype system).
Phase III - Production items.

In general, overall conduct of this project must be governed by the availability of test items.

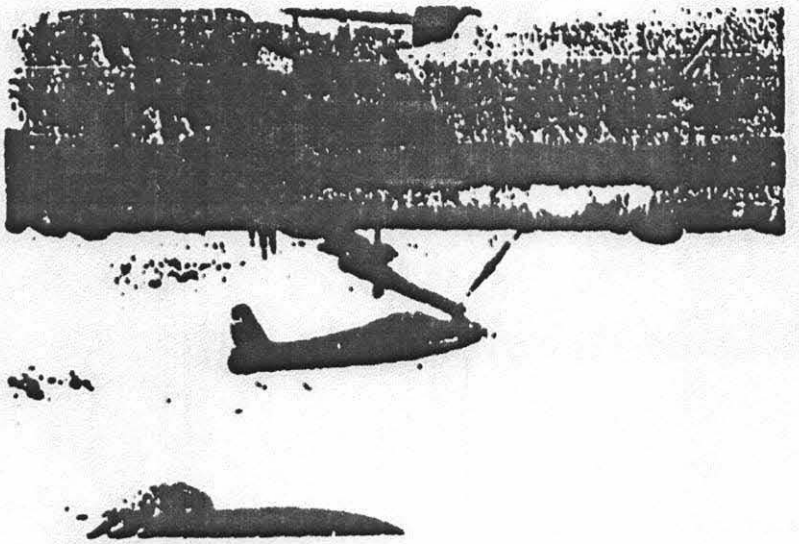
(3) This is the final report on the initial testing, Phase I. The project aircraft did not represent the final tactical configuration and testing was limited by this fact. Insofar as possible, various tactics and techniques were investigated to determine maximum potential of the composite aircraft system as compared to that of more conventional methods of strategic air operations.

b. Description of Test Items (Phase I System):

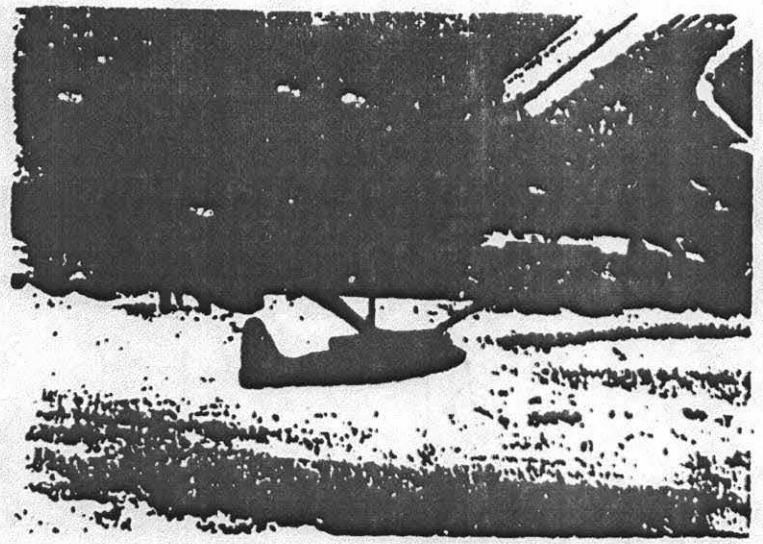
The RB-36F/F-84E prototype system consisted of an RB-36F carrier airplane and an F-84E parasite. This provided a combination of long range in the logistics zone and high performance in the combat zone. The carrier airplane, a conventional RB-36F without certain operational equipment was modified by the addition of a trapeze mechanism in the bomb bay for stowing, releasing, and retrieving the parasite aircraft. The parasite was an F-84E airplane with a special nose probe mechanism ("duck-bill") installed on top of the forward fuselage for engaging the trapeze boom forward receiver, and with two pins, located one on each side of the fuselage aft of the canopy for engaging the trapeze boom aft latches.



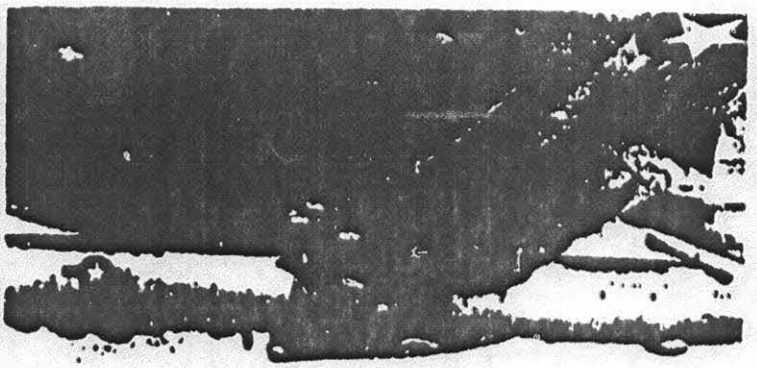
F-84E paresite approaching for hookup.



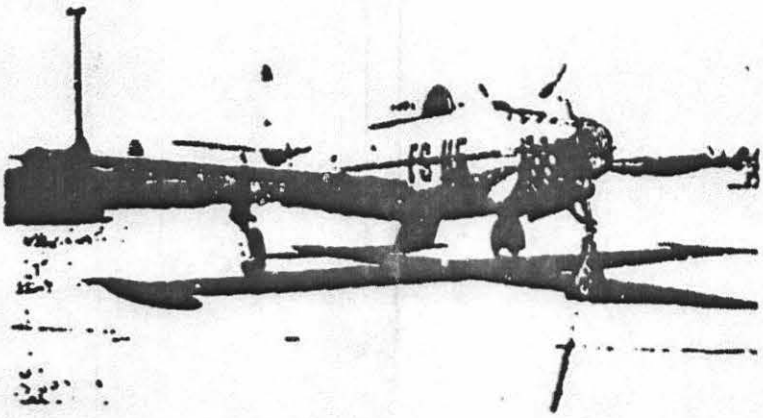
F-84E paresite in single point contact.



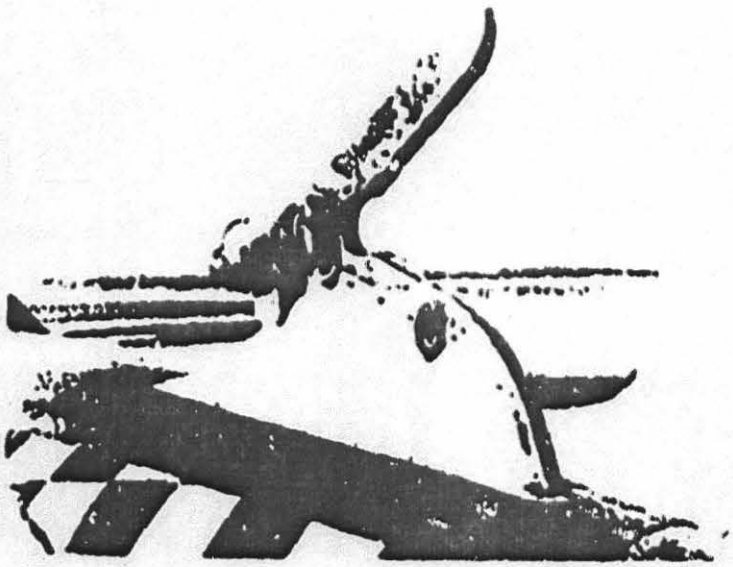
The boom has been raised and aft latches engaged. F-84E 3 point position.



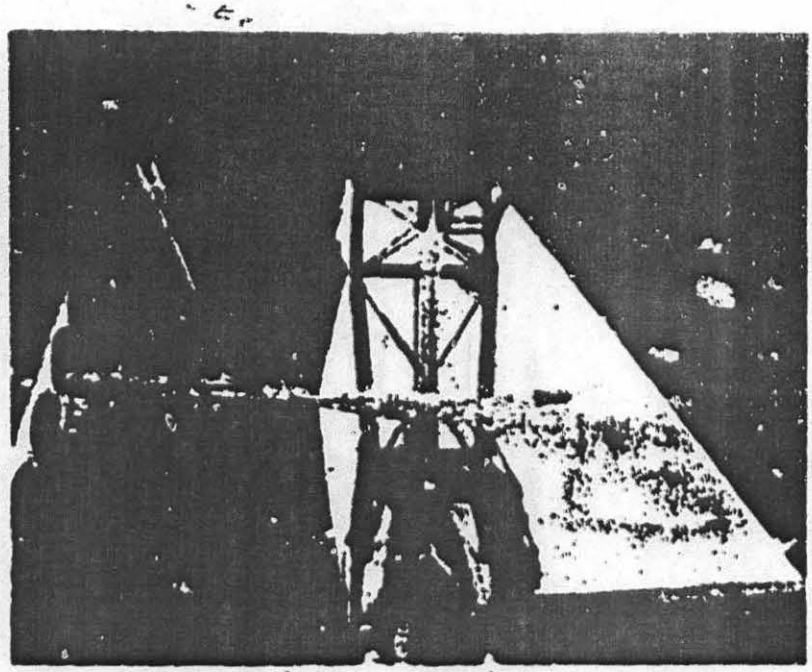
F-84E parasite fully stowed in the RB-36F bomb bay.



F-84E parasite with "duck-bill" nose probe.



The "duck-bill" nose probe, latch extended.



Trapeze extended, boom horizontal, F-84E in 3 point contact.

2. OBJECT:

a. The object of Phase I was to investigate the tactical feasibility of employing the parasite aircraft system to accomplish long range strategic bombing and photographic reconnaissance missions.

b. The object of the overall project (Phase I, II, and III) is to determine the operational suitability of the RB-36/F-84 parasite aircraft system to accomplish long range strategic bombing and photographic reconnaissance missions.

3. OPERATIONAL ASPECTS:

Since only limited testing was possible with the early prototype RB-36F/F-84E system, and since no operational suitability testing could be done on later prototypes, near-production items or related items such as the RF-84F tactical photo reconnaissance airplane and the Ford A-1 Ground Position Indicator, the following operational aspects are discussed in relatively broad terms, unless otherwise noted. Further testing in later phases of this project will produce more exact and specific information.

a. Organizational Impact:

(1) General:

(a) Since the parasite aircraft system concept is based on the complementary performance characteristics of the carrier and parasite, it can be expected that the system requirements in terms of personnel, training equipment, and facilities will be a combination of those required for each respective aircraft. The operation and support of the RB-36 carrier will be similar in many respects to that now existing for RB-36 units, except that the primary mission of the carrier will be to transport, launch, and recover the parasite. The operation and support of the parasite also will be similar in many respects to that now existing for jet fighter units equipped for photo reconnaissance or special weapon delivery. The major difference will be that the parasite will operate alone while over enemy territory, and from an airborne base rather than from a surface base.

(b) It is assumed that the first production items will be the RB-36 as the carrier with the F-84F or RF-84F as the parasite; that new organizations will be formed with personnel from operational RB-36 units and jet fighter bomber or photo reconnaissance units; and that these personnel will have been fully trained for their original jobs. Therefore, the training requirements noted in this report are based on an estimate of initial training necessary for conversion to parasite system operations. These should bring flight and ground crews to a satisfactory proficiency level for unit exercises (not combat missions). (See paragraphs 3a(3)(c) and 3a(4)(b) below and Appendix E.)

(2) Unit Organization:

(a) It is assumed that new combat units designed to employ the parasite aircraft system will be programmed on the basis of approximately two parasites to each carrier. This could be accomplished without disturbing individual squadron integrity by locating a squadron of 20 parasites on the same base with a squadron of 10 carriers.

(b) Experience shows that the carrier-parasite flight crew integrity should be maintained whenever possible. The very nature of parasite operations demands that both parasite and carrier crews have the utmost faith in the other's ability. This will be particularly true of the parasite pilot and carrier navigator relationship in establishing the rendezvous time.

(3) Carrier Squadron:

(a) Modification of the RB-36:

In determining the final configuration of the RB-36 carrier, consideration should be given to obtaining the maximum versatility of this airplane. It is not desirable that the carrier should be designed to accomplish only a singular role. Modification of the RB-36 to a parasite carrier should be such that it will allow rapid removal of a minimum amount of equipment in reconverting it for its original role of strategic long range reconnaissance. Changes in the RB-36 should also be limited to those which will not reduce its original video detection and ferret capability below the maximum possible. In the case of the RF-84F family of parasites, it is essential that the carrier be designed to permit rapid interchangeability for carrying the photographic reconnaissance or bomber version of this aircraft.

(b) Personnel:

1. Trapeze Operator:

In addition to the normal RB-36 flight crew one airman will be required to perform the primary duty of trapeze operator and to assist in parasite in-flight servicing. This airman should have an aptitude for flying and background training in aircraft hydraulic and electrical systems. This training need not necessarily be as complete as that provided in Course No. 43151A, aircraft mechanic, specialized B-36.

2. Trapeze Ground Crew:

It is estimated that a ground crew of three men will be required for each three carriers for the primary duty of performing trapeze maintenance and supervising parasite ground loading. These airmen should have background training in aircraft hydraulic and electrical systems equivalent to that provided in Course No. 43151A, aircraft mechanic, specialized B-36. Several additional airmen from the carrier and parasite ground crews will be required for 2 to 3 hours to handle the two aircraft during each actual loading or unloading.

3. Navigator-Weather Forecaster:

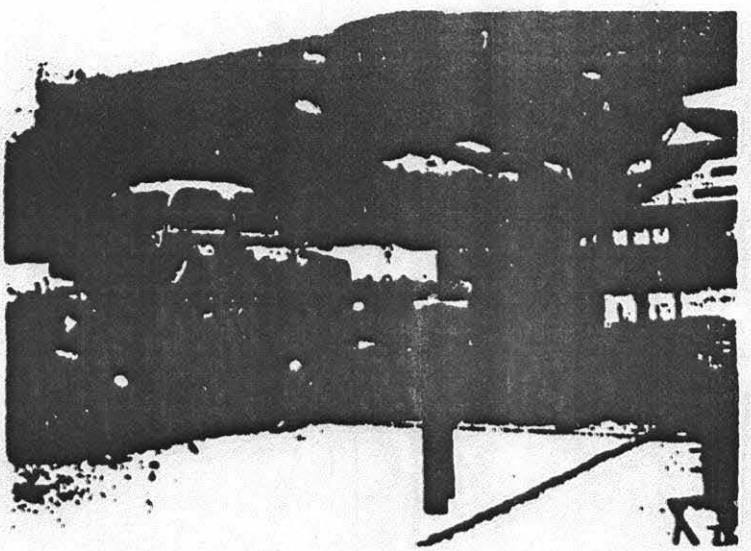
One of the carrier navigators should be trained in weather analysis so that he can compare existing route weather with that originally forecast and predict changes in the weather on the parasite route and at the target.

(c) Training: (See overall comment in paragraph 3a(1) (b) above.)

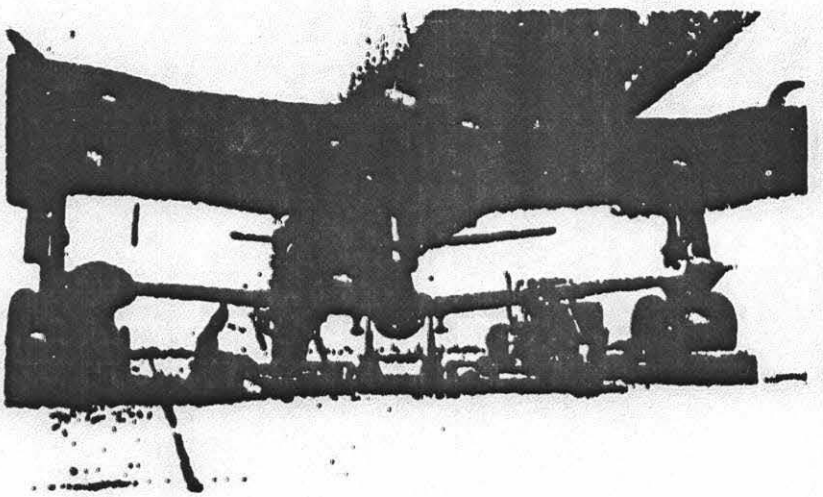
1. Preliminary flight training for the RB-36 carrier flight crew will be required for parasite operations. The carrier pilot will require about 10 hours of familiarization flying to enable him to acquire the technique of maintaining the precise, steady platform essential for launching and retrieving the parasite. Simultaneously, adequate training may be accomplished for the trapeze operator. The carrier pilot and navigator will require about 10 hours additional training in conducting minimum altitude flights at less than 500 feet above the terrain. The keynote of parasite system operation will be precise navigation and rendezvous by both carrier and parasite. The full extent of training necessary to achieve this precision is difficult to estimate but operational units must insure that both crews are capable of meeting this demand before they are considered combat ready.

2. The trapeze ground crew and trapeze operator will require about 40 hours and 20 hours, respectively, of training in trapeze systems and maintenance. The ground crew will require about 10 hours training in parasite ground loading. The trapeze operator will also require about 8 hours training in parasite servicing. By using mobile training units all ground training could be conducted at squadron level.

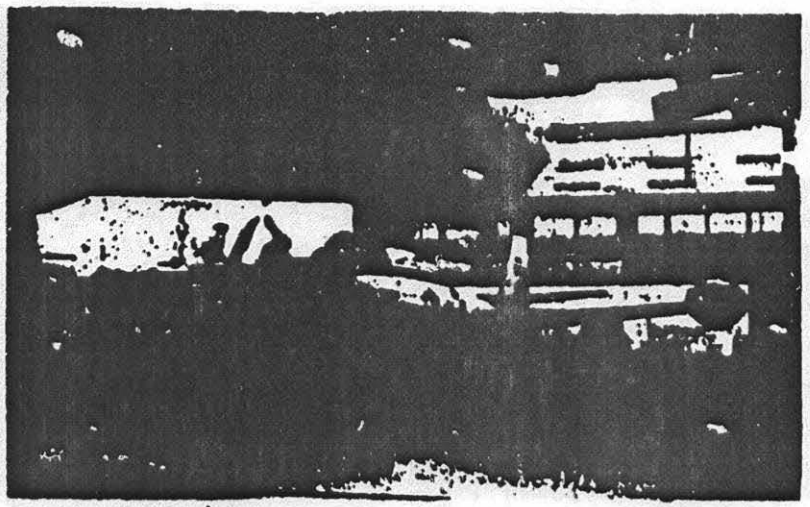
3. An estimated preliminary training schedule for carrier and parasite personnel is shown in Appendix E.



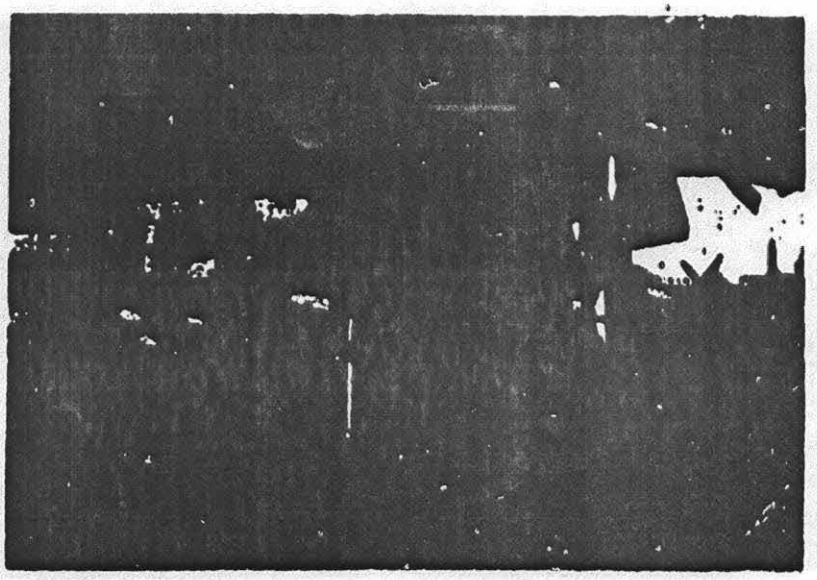
Using tractor and inclined ramp to raise the RB-36F main gear.



F-84E on the ground loading dolly. Dolly jacks are extended.



F-84E on the ground loading dolly. Dolly jacks are retracted.



F-84E in place under the trapeze. Nose and aft latches are engaged.

(d) Ground Handling and Support Equipment:

It is estimated that the ground handling and support equipment normally provided for an RB-36 reconnaissance squadron should be adequate for support of a similar squadron equipped with RB-36 carriers. No special equipment requirements or difficulties are foreseen in maintaining the trapeze installation. Additional equipment will be required for ground loading the parasite into the carrier. Principal needs will be a special loading dolly to transport the parasite and a set of simple wood shoring blocks with inclined ramps to raise the carrier's main gear sufficiently to give clearance for the parasite.

(4) Parasite Squadron:

(a) Personnel:

An alternate parasite pilot should be carried on all composite aircraft combat missions to assume the duties of the primary parasite pilot if the latter becomes incapacitated while enroute to the launching point.

(b) Training: (See overall comment in paragraph 3a(1)(b) above.)

1. The parasite pilot, if proficient in close formation flying or inflight refueling techniques, will require about 10 hours of flight training in launching and retrieving procedures. Also, about 10 flying hours training will be required in precision minimum altitude navigation, 20 flying hours in high altitude navigation and rendezvous, and 0 hours of flight and ground training in servicing the parasite while it is in the stowed position.

NOTE: The pilot training requirements for use of the LABS computer (low altitude bombing system) and the BT-9 toss bombing computer for fighter delivery of special weapons are being investigated on Project Nos. APG/TAT/83-A-1 and APG/TAT/93-A, respectively. From testing accomplished on these projects it is estimated that initial training in the use of the systems will be about 25 flying hours and 8 ground hours on the LABS computer and about 8 flying hours and 4 ground hours on the BT-9 computer.

2. The parasite ground crew will require about 8 hours training in the operation and maintenance of the parasite launching and retrieving installations, and about 10 hours of training in parasite ground loading procedures.

(c) Ground Handling and Support Equipment:

It is estimated that the ground handling and support equipment needed for a squadron of F-84F or RF-84F parasites will be similar to that needed for a corresponding squadron of F-84F fighter bombers or RF-84F photo reconnaissance aircraft. No special equipment requirements or difficulties are foreseen in maintaining the parasite retrieving and launching components.

b. Capabilities and Limitations:

(1) Capabilities:

(a) Prototype Equipment:

The trapeze installation in the bomb bay of the RB-36 aircraft, equipped with the "duck-bill" receiver, provides a means for launching and retrieving the parasite during day or night in smooth or slightly turbulent flight conditions. It also provides a means of carrying the parasite in cruise or during composite take-offs and landings. The system can be used successfully by operational flight crews of average

ability. Parasite stowage in the bomb bay provides two essential facilities. First, parasite pilot fatigue is reduced, since the pilot may leave the cramped space of his small cockpit for the more roomy quarters of the RB-36; and secondly, the parasite is stowed in an accessible location for in-flight servicing.

(b) Survival:

Because of its small size, high speed, and maneuverability the RF-84F parasite aircraft will be able to penetrate the enemy zone at high or low altitudes with a minimum chance of being detected and intercepted, as compared to a larger aircraft.

(c) Radius of Action:

The expected radius of action of the RB-36/ RF-84F parasite system will permit a wide choice of strike routes from airbases encircling the "Iron Curtain" and located at relatively safe ranges. Based on the contractor's estimated performance figures, a standard RF-84F parasite with a combined take-off gross weight of 357,500 pounds will be capable of a no-wind combined radius of action of 2,957 NM for high altitude and 2,855 NM for low altitude photo reconnaissance. Operating from Thule AFB this composite aircraft system could reach a major portion of Europe and Russia proper. Using a stripped RB-36F carrier and a standard RF-84F parasite with a combined take-off gross weight of 370,000 pounds, the two combined radii of action will be increased to 3,614 NM and 3,519 NM respectively. Stripping the carrier may not be considered an acceptable practice. However, in view of the current development program to increase the B-36 carrier take-off gross weight to 410,000 pounds, it is assumed that a combined radius of action of at least 3,400 to 3,500 NM will be possible with a heavy standard (non-stripped) carrier. Appendix G shows that with these radii of action airbases located well outside the Soviet Zone may be used for launching carrier-parasite missions.

NOTE: The four radii of action of 2,957 NM, 2,855 NM, 3,614 NM, and 3,519 NM, were published in Convair Report No. FTP-36-007 on the MX-1602 parasite system, dated 15 December 1951. On the low altitude photo reconnaissance mission, the parasite descends from best cruise altitude for a 50 NM run-in and run-out from target at sea level at normal rated thrust.

(d) Tactical Flexibility:

The three basic advantages of the parasite aircraft system, namely, long range in the logistics zone, high performance in the defended zone, and an aerial base for launching and retrieving, can be combined in many variations to give the air commander an extensive choice of tactics.

(e) Photographic Capability:

The programmed list of photographic equipment for the RF-84F (Appendix F), was presented at a WADC conference on 29 and 30 January 1953. This installation, if proven operationally suitable, should provide the RF-84F parasite with a daylight photographic reconnaissance and charting capability at low, medium, and high altitudes, and with a night photographic reconnaissance capability at low altitudes of about 1,500 to 7,000 feet.

(f) Weapon or Beacon Delivery:

It is believed that the parasite system, properly equipped, could be used to assist in performing the counter atomic mission. In this role the parasite could deliver a special weapon against an airfield to destroy the enemy airplanes while they were still on the ground, or the parasite could be used to plant a radar beacon as an aiming point for subsequent bombardment missions.

(2) Limitations and Deficiencies:

(a) Prototype Equipment:

It is acknowledged that the RB-36/F-84E parasite system is a prototype item and that further engineering development will improve it. However, the following deficiencies, each of which is discussed in paragraphs 2a(8) or 3 of Appendix D, were encountered during Phase I and should be eliminated or reduced before the system can be regarded as tactically acceptable:

1. Accidental releases of the "duck-bill" nose probe latch.

2. Inadequate system for parasite jettisoning during flight.

3. Excessive parasite tail vibration in stowed flight.

4. Lack of parasite in-flight servicing and deicing systems.

5. Inadequate rate of trapeze operation during carrier landing gear operation.

6. Improper trapeze extension after composite aircraft take-offs at high gross weights.

7. Lack of a lock to secure the forward end of the boom when in the stowed position.

8. Inadequate system for trapeze emergency operations.

9. Inadequate provisions for parasite retrieving during turbulent flight conditions.

10. Inadequate carrier and trapeze lighting for parasite retrieving at night.

11. Restrictions to parasite pilot's forward vision.

12. Inadequate parasite ground loading equipment.

(b) Carrier Routes

The vulnerability of the RB-36 will reduce the choice of carrier routes, and will require that consideration be given to the use of low altitude penetrations and to avoiding those areas where the enemy maintains a fighter interceptor defense.

(c) Navigational

1. The success of the parasite aircraft system in accomplishing its mission will depend directly upon the navigational capability of both the carrier and parasite. Of these, the parasite is the most severely limited. Present RB-36 aircraft are equipped with acceptably accurate navigational equipment and have the space and weight allowances to incorporate improved designs as they become available. However, the parasite, with its very limited space and weight allowances, is restricted in the type equipment that can be used.

2. The navigation equipment programmed for the RF-84F parasite is the Ford A-1 Ground Position Indicator (GPI). Successful use of this item will depend upon a method of obtaining wind information for the computer. At present there is no equipment which can be used by fighters to determine continuous and accurate wind data. Wind information provided by the carrier before launching will be an estimate and must be regarded as such. Therefore, it appears that the A-1 GPI will not provide the ultimate navigation aid and that a large portion of the parasite route will have to be flown during visual flight conditions over good checkpoints by which the pilot can locate the target and rendezvous position.

3. The production carrier and parasite aircraft should be provided at the earliest possible date with accurate and fully automatic navigational equipment that is not dependent on signals from ground equipment or limited by weather. The performance should be equal to or better than that of the AN/APN-66 automatic navigator (1% error).

(d) Rendezvous:

Due to navigational inaccuracies rendezvous equipment will be needed to insure that the parasite can locate the carrier. The two aircraft should be equipped with primary rendezvous equipment that will allow the parasite pilot to take the initiative in making rendezvous; will provide a usable range of 150 NM to a minimum of ¼ NM or less, with maximum security to both aircraft; and can be employed with minimum limitations due to line of sight restriction, atmospheric conditions, or aircraft relative position. The aircraft should also be equipped with secondary rendezvous equipment incorporating as many as possible of these features.

(e) Weather:

1. It is estimated that present and near-future rendezvous equipment suitable for the RF-84F will be unable to provide satisfactory range and bearing information at less than ½ NM; therefore, rendezvous in weather with visibility less than ½ NM appears impractical.

2. The need for visual conditions at target combined with existing target weather will determine the type of mission the parasite can perform. The probable inaccuracies in long range weather forecasts will require that the mission planners, whenever possible, give the parasite pilot the choice of a high or low level approach depending on weather over the target at the time of the attack. Consequently, the photographic and weapon delivery systems should be designed to accomplish either type approach and not be restricted to a single purpose.

3. Obvious tactical disadvantages will be imposed on the parasite unless a radar altimeter is provided. The feasibility of a letdown through weather for a target run under low ceilings will be dependent upon a safe combination of expected navigational accuracy, reliability of the radar altimeter, and a knowledge of the local topography.

c. Tactics and Techniques:

(1) Tactics:

(a) General:

It is envisioned that the parasite system will be used to supplement rather than to replace heavy reconnaissance and bombardment aircraft. Although the parasite aircraft will be able to do an effective job, its small size will establish load carrying limitations that may not be overcome except by using larger aircraft.

(b) Basic Missions:

Below are four basic missions which are considered feasible for the parasite aircraft system. Each mission is subject to modification in terms of composite or separate take-offs, routes, altitudes, airspeeds, launching and rendezvous location, etc., to give extensive variation.

1. Basic Radius:

The carrier and parasite depart from the same base and proceed to the enemy zone where the parasite is launched for the target strike and return to rendezvous. The carrier loiters in the same area or proceeds to a displaced rendezvous point to retrieve the parasite and both aircraft return to the same base.

2. Advance Base Pickup and Release of Parasite:

The carrier departs from a rear base and retrieves the parasite over an advance base. Both aircraft proceed to the enemy zone where the parasite is launched for target strike and return to rendezvous. After rendezvous the carrier returns to the advance base, releases the parasite and continues on to its home base. By using the advance base pickup and release procedure it will be possible to conduct strikes at greater ranges from the carrier home base than if the parasite were carried all the way as in the basic radius mission.

3. Parasite Post Strike Stage:

The carrier delivers the parasite to the enemy zone where the parasite is launched for target strike, then the carrier returns to home base. The parasite proceeds from target to a post strike staging base. This procedure eliminates the problems of rendezvous and allows the parasite to withdraw over a defended zone that may not have been alerted.

4. Parasite Retrieve by a Second Carrier:

The first carrier delivers the parasite to the enemy zone, launches the parasite for target strike, then proceeds to home base. The parasite proceeds from target to rendezvous with a second carrier and is carried back to the second carrier's home base. This procedure will allow considerable versatility in parasite routing but is the most complicated of the four missions noted because of expected rendezvous timing problems with the second carrier and essential pre-mission coordination.

(c) Launching and Rendezvous Point:

1. The maximum radius of action for a single carrier and parasite on the basic radius mission will be obtained by the carrier loitering at the launching point and retrieving the parasite in the same location. However, this does not improve mission security and should be avoided. By relocating the rendezvous point at a reasonable distance from the launching point a much greater degree of security is provided, deception is facilitated, and the radius of action is reduced only slightly.

2. The problem of security of the launching point usually will be less than that for the rendezvous point. Proper selection of the carrier approach route will secure the launching point, but once the parasite has penetrated the target area mission security will have been compromised and care must be exercised to prevent the enemy from following the parasite back to rendezvous and the carrier. The most secure method would be to select a rendezvous point outside the area of interception. But if it is necessary to make rendezvous within the area of interception it is believed that this can be done by having the parasite descend to minimum altitude a reasonable distance (say 100 NM) short of the rendezvous and proceeding "on the deck" to the carrier.

3. The RB-36 carrier does not have to cruise at high altitude for maximum range. Therefore, it can approach a radar net at low altitude, remain undetected, and launch the parasite from a position closer to the target than would be possible at higher altitudes. Although this procedure may not increase the parasite radius of action it can be used to reduce the extent of enemy radar screen through which the parasite would have to penetrate.

4. Commensurate with route security, launching and rendezvous points should be established in the vicinity of prominent checkpoints to facilitate positive identification of these two critical points.

(d) Minimum Altitude Operations

1. The requirement for maximum range will in most cases dictate that the parasite fly at optimum cruise altitudes, hence at high altitudes. However, if it is possible to establish the launching and rendezvous points within minimum altitude range for the parasite, and assuming the mission requirements can be satisfied by a low altitude run, the parasite will have a much better chance of not being intercepted. Every effort should be made to protect the relatively slow flying and vulnerable carrier from enemy surveillance and fighter interception by keeping the carrier out of enemy areas. However, if the carrier must penetrate the enemy zone, penetration should be accomplished at minimum practical height while in areas of radar coverage or ground observers in order to reduce the effectiveness of these systems. When the carrier and/or parasite are operated at minimum altitude in areas of possible interception the flight course should be altered at frequent intervals and the aircraft flown actually on the tree tops to gain full advantage of reduced enemy effectiveness.

2. Navigation at minimum altitude is a difficult but not impossible task. It was demonstrated in this Phase I that by very careful route selection, mission planning, and restricting operations to daylight VFR conditions minimum altitude navigation could be done by the carrier and parasite. Eventual employment of the automatic navigator will simplify the problem.

(a) Separate Take-off:

Airloading the parasite into the carrier after separate take-off is practical and can be used:

1. To gain an increase in the carrier fuel load equal to the weight of the parasite less the amount needed to refuel the parasite.

2. To eliminate the time and effort of ground loading the parasite into the carrier.

3. To gain possible tactical advantages of operating from separate airbases.

(2) Techniques:

(a) Parasite Launching and Retrieving:

The individual crew techniques for accomplishing parasite launching and retrieving were found to be within the capability of average operational flight crews. The parasite pilot technique for retrieving consisted primarily of flying good formation on the trapeze receiver of the RB-36. From an initial point about 25 feet below the aft bomb bay, the parasite approached the trapeze at about 1 knot to mate the parasite "duck-bill" nose probe and trapeze "duck-bill" receiver. The time required to make hookup was about 1 minute from the initial point to single point contact. The parasite was then held in steady flight, in single point position, while the trapeze operator raised the boom and parasite to engage the trapeze aft latches. Then the trapeze and parasite were raised to the stowed position. The parasite was launched by being lowered to the three-point position for engine starting, then to the single-point position where the parasite pilot released the nose latch and allowed the parasite to slide back a few inches to disengage the "duck-bills". The carrier pilot was required to maintain a steady platform whenever the parasite was approaching for hookup or was in single point attachment. Carrier indicated airspeeds of 160 to 200 knots

were found satisfactory for launching and retrieving. Additional discussion of techniques is noted in Appendix D.

(b) Parasite Ground Loading:

Procedures recommended by the Utility Flight Handbook for ground loading the parasite into the RB-36 carrier were modified during the tests. The modifications consisted of using two inclined wood ramps and two tractors instead of fifty ton jacks and supports for raising the RB-36 main gear. The tractors with tow bars pushed the RB-36 backwards up the ramps onto the shoring blocks. This modified procedure was found to be much simpler, safer, and reduced the time to raise the main gear from an estimated 4 to 6 hours to about 1/2 hour. The inclined ramps, approximately 18 feet long, 20 inches high, and 52 inches wide, were locally constructed of ordinary 2" stock lumber. The ramps can be constructed of any good scrap lumber by unskilled labor. This modified procedure should be adaptable for ground loading later model parasites.

d. Collective Analysis:

(1) Requirement:

The requirement for which the parasite aircraft system is being developed exists today. The requirement will increase due to the continued need for a more suitable system to accomplish both high and low level missions and to penetrate improving enemy air defenses.

(2) Operational Equipment:

It is believed that the parasite aircraft system, when further developed (assuming the RB-36/RF-84F system to be the first for operational units), will be able to fulfill its intended mission dependent mainly upon the availability of suitable parasite bombing, photographic, rendezvous and navigation equipment. Usable bombing, photo reconnaissance, and rendezvous equipment is available today and improvements are being made. The present rendezvous

equipment lacks a good degree of security and is somewhat restricted by weather and/or line of sight limitations. Meanwhile, the lack of accurate and fully automatic navigation equipment, which functions independently of signals from ground equipment, appears to be the greatest single limitation of the parasite aircraft system. Procurement of satisfactory equipment seems possible within two to three years considering the expected development and miniaturization of the Doppler radar navigation systems. Until satisfactory navigation equipment can be provided, the parasite aircraft will have a restricted capability, particularly in weather.

(3) Cost:

(a) Since the obvious carrier for several years to come is the RB-36 type aircraft, the initial cost of aircraft design and procurement has been met and is no longer a major factor. It is unlikely that modification of the RB-36 for carrier use would approach the initial procurement cost. Furthermore, as the B-36 type becomes obsolete in its original role, further utilization in the carrier role will extend its useful life by several years.

(b) The basic concepts of the parasite system are such that some additional training for the flight and ground crews, although necessary, would not be a major cost factor.

(c) An increase in the logistical cost of the weapon would be experienced if operational needs dictated that the carrier-parasite force be subdivided into small detachments located at several bases encircling the enemy area. However, since the parasite system, at present, is envisioned as supplementing the heavy strategic bombardment and reconnaissance units, it seems that the increased logistical demands for separate detachments would be acceptable. Airbases needed to utilize this system effectively now exist and would not comprise a major additional cost.

(4) Intelligence:

The best military intelligence is always desired when planning an operation. However, the nature of the parasite system permits a reduction in the essential intelligence that is normally required. Due to the difficulties we can expect the enemy to encounter when trying to destroy a single jet aircraft, the parasite, as compared to larger type aircraft, will be able to operate over areas of which less is known of the enemy defenses. Also, since the parasite, at the present time, must necessarily make visual runs over the target, there will be reduced requirements for ECM and radar survey of the target.

(5) Growth Potential:

The growth potential of this system is a major consideration because new fighters adapted to the parasite role will increase the capability of the system without necessitating a complete and expensive redesign of the system.

(6) Comparison with RB-47 and RB-36:

As compared to the RB-47 and RB-36 aircraft the RF-84F parasite aircraft will be unable to carry as much photo-reconnaissance equipment. However, compared on the basis of probable survival (a most important consideration if the reconnaissance information is to be useful) and tactical flexibility, the parasite system will have certain advantages over the RB-47 and RB-36. Furthermore, the RB-47 cannot attain the 3,500 NM or more expected radius of action of the RB-36/RF-84F system without using multiple inflight refueling. Therefore, it is estimated that the RB-36/RF-84F parasite system, when developed, will be better able to accomplish photographic reconnaissance missions, commensurate with its capabilities, than will the unrefueled RB-47 aircraft.

4. CONCLUSIONS:

It is concluded that:

a. The RB-36/F-84 parasite aircraft system, when further developed, will be capable of accomplishing long range strategic bombing and photographic reconnaissance missions.

b. The parasite aircraft system, properly employed, should experience a high survival probability on combat missions.

c. The "FICON" trapeze method for launching and retrieving a parasite aircraft can be used successfully by operational flight crews of average ability.

d. The lack of an accurate and fully automatic navigation equipment, capable of functioning independently of signals from ground equipment, appears to be the greatest single limitation of the parasite aircraft system. Until satisfactory navigation equipment can be provided, the parasite aircraft will have a restricted capability, particularly in weather.

5. RECOMMENDATIONS:

It is recommended that:

a. Development of essential equipment that will provide the parasite aircraft system with an all weather navigational and rendezvous capability be expedited.

b. The deficiencies and limitations noted on the RB-36/F-84E prototype system, and outlined in the report, be eliminated or reduced to the minimum in production items. (Paragraph 3b(2).).

c. Consideration be given to developing the RB-36 carrier so that the airplane will not be restricted to a singular role, but will have maximum versatility as a carrier and be readily convertible for its original role of strategic reconnaissance. (Paragraph 3a(3)(a)).

d. A production RB-36/RF-84F parasite aircraft system be made available for operational suitability testing at the earliest possible date.

Patrick W. Timberlake

PATRICK W. TIMBERLAKE
Major General, USAF
Commanding

COPY-AG Log 5146 DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
AFDRQ-SA Washington 25, D. C.

11 Jun 52

SUBJECT: Operational Suitability Test of RB-36/F-84 Parasite Aircraft System (Project FICON)

TO: Commanding General
Air Proving Ground Command
Eglin Air Force Base, Florida

1. It is requested that a test be established by your Command to determine the operational suitability of the RB-36/F-84 composite aircraft system to accomplish the strategic photographic reconnaissance mission.

2. A prototype parasite aircraft system consisting of the RB-36 and F-84E aircraft has been developed to fulfill a requirement for strategic photographic reconnaissance. The engineering flight tests of the present phase utilizing a straight wing jet fighter (F-84E) have been completed and the feasibility of aerial launching and retrieving have been satisfactorily demonstrated. The second phase of the project will be the parasite combination of the RB-36 and YF-84F aircraft. Due to nonavailability of the YF-84F, the second phase tests are not expected to commence prior to October 1952.

3. In the interest of overall economy and to insure no delay in testing, the project will be conducted at Consolidated-Vultee Aircraft Corporation, Fort Worth, Texas. That organization has the test aircraft on bailment and a contract to cover maintenance.

4. The present test aircraft do not represent a tactical configuration and the operational suitability test will be limited by that fact. However, a requirement exists for a test program at the earliest date to explore the tactics and techniques which will provide the optimum performance from this new concept of strategic air operations, as well as to determine what impact would be created by introducing this concept into the tactical units. The results of the suitability testing will determine the feasibility of employment and enable timely force and modification programs to be implemented.

5. The suitability test program will include the following:

a. The investigation of tactics and techniques which will exploit the composite system performance to the maximum extent.

b. The estimated suitability of the RB-36/RF-84F aircraft system to perform long range strategic photographic reconnaissance at high and low altitudes.

c. The comparative analysis of the system as compared to the RB-36 and/or RB-47 to perform the strategic photo-reconnaissance mission.

d. The suitability of the system to perform the counter atomic Air Force mission. In this operation it is envisioned that the fighter will be used to plant beacons as an aiming device for the bomber force against air base targets and secondly, to use the fighter for delivery of atomic bombs.

e. The requirement for and the adequacy of ground handling and support equipments.

f. The recommended personnel and equipment augmentation of a T/OE.

g. The requirements for individual and organizational training for operational employment of the weapons system.

6. The Air Research and Development Command is being requested to support this APGC test program. The test program will be coordinated with SAC and copies furnished this Headquarters. Periodic progress reports are desired.

7. A USAF priority of 1B with an APGC relative priority of 30a is assigned this project. It is requested that this test be completed 120 days after start of physical testing.

BY COMMAND OF THE CHIEF OF STAFF:

/s/ and /t/ JAMES O. GUTHRIE
Colonel, USAF
Deputy Director of
Requirements

Information copy to:
CG SAC
CG ARDC
CG AMC

DESCRIPTION OF TEST ITEMS (PHASE I)

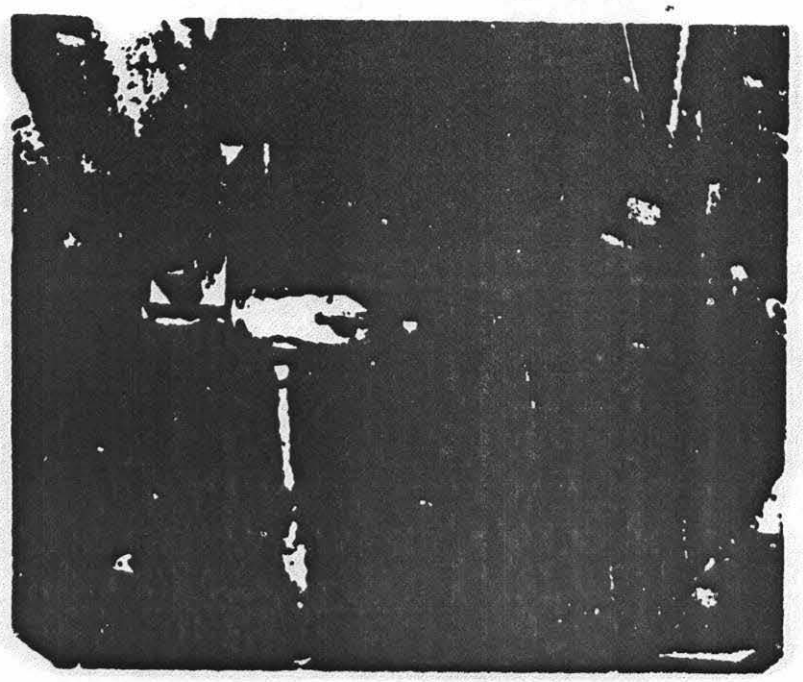
1. GENERAL:

a. The Phase I test item was a prototype parasite aircraft system consisting of an RB-36F as the carrier airplane and an F-84E as the parasite. Both airplanes were delivered to the APGC on an "as is" basis and were received without certain operational equipment. This system was the first of a series of parasite aircraft combinations undergoing development trials on the "FICON" project and could in no way be considered a production item. (The RB-36F and F-84E airplanes were only test beds for the trapeze assembly.) Obviously required improvements in this system were not accomplished prior to or during Phase I, except for a change in nose probe and boom receiver (see paragraphs 3b and 4b below), as they were to be scheduled for incorporation in subsequent development or production items.

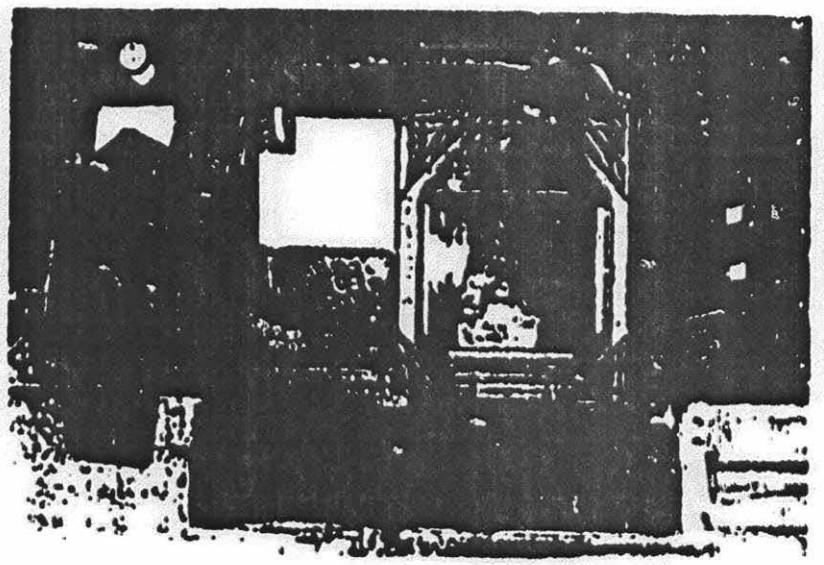
b. As published technical orders and maintenance manuals were not available for the test items, two CONVAIR maintenance employees and one field service representative were on duty at the APGC throughout the test to assist APGC personnel.

2. CARRIER AIRPLANE:

a. The carrier airplane was a conventional RB-36F from which operational equipment such as navigational radars, photographic installations, etc., had been removed for convenience during development trials. The bomb bay doors were removed and a trapeze mechanism, designed to retrieve, stow, and launch the parasite, was installed in the bomb bay. A trapeze operator's station was created in the camera compartment. An interphone system for the trapeze operator, carrier pilot, and parasite pilot (while attached) was installed. Provisions were made for parasite battery charging, for cockpit heating and defrosting while the F-84E was stowed, and for defrosting the trapeze operator's observation window. Either the trapeze operator or carrier pilot could release the parasite from any carrying position in case of emergency by means of an electrically operated jettisoning system. A catwalk, a fairing strip, and safety harnesses on the right side of the bomb bay enabled the parasite pilot and his helper to reach the parasite. Bomb bay parasite fairing doors were not installed and the bomb bay remained open at all times. Two rubber bumper pads were attached on the under rim of the bomb bay to prevent the parasite horizontal stabilizer from contacting the rim and to reduce F-84E tail vibration when the parasite was carried in the stowed position. There were no provisions for parasite refueling, or for deicing or anti-icing.



Trapeze and boom retracted into bomb bay. Trapeze operator window is shown in the background.



Trapeze operator's station.

b. The AN/ART-13 transmitter was modified at the APGC to operate on 500-600 kcs for use with the parasite's radio compass to provide a simple rendezvous capability. No other rendezvous equipment was installed.

3. PARASITE AIRPLANE:

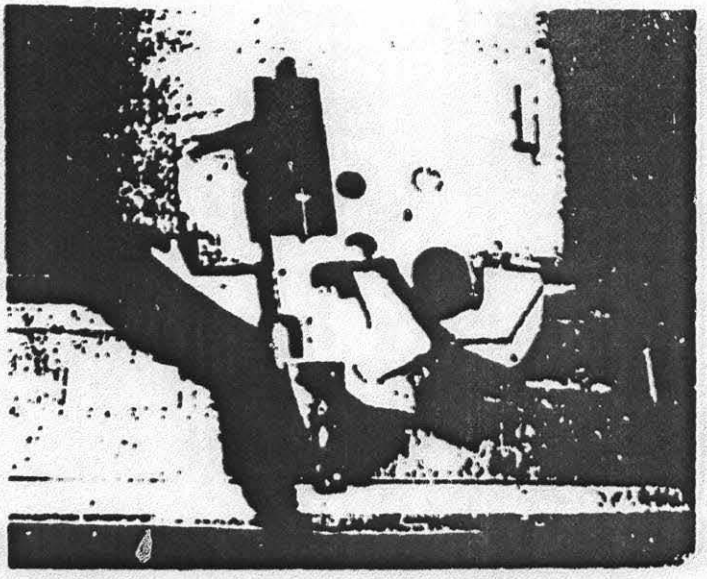
a. The parasite was a conventional F-84E airplane with tiptanks, modified with a special nose probe latching mechanism installed on top of the forward fuselage for engaging the trapeze boom forward receiver. Two pins were also installed, one on each side of the fuselage aft of the canopy, for engaging the trapeze boom aft latches. The gun trigger switch was connected to give normal release of the nose probe latch (electrically energized air bottle release). Two levers on the instrument panel were provided for manual release of the nose and aft latches. An electrically operated explosive system was provided for emergency release of the nose probe latch. A three-axis damper was provided to reduce yaw, pitch, and roll motions when the parasite was in single point attachment. The damper was not an auto pilot in the accepted sense. Other revisions to the parasite included the addition of a fire extinguisher system, an interphone-radio control panel, and a small forward beamed "pen-light" on the nose probe to illuminate the probe and boom receiver during night operations.

b. The nose probe latching mechanism used in Phase I was modified from a cylindrical probe to an improved "duck-bill" probe very early in the trials. The purpose of the "duck-bill" wide mouth design was to guide the nose probe to the latching position even if the initial contact was made several inches off-center.

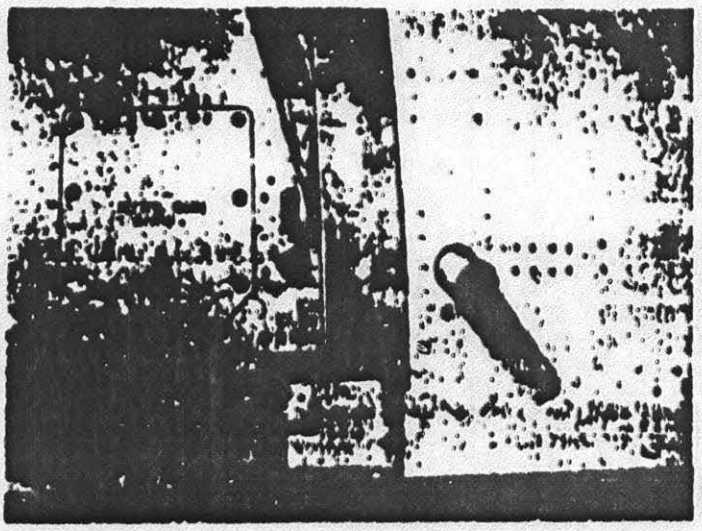
4. TRAPEZE:

a. The trapeze mechanism installed in the B-36F bomb bay consisted primarily of a trapeze hydraulic actuating cylinder, drag brace, boom snubber, and suspension boom. The actuating cylinder which was attached to the wing rear spar, extended and retracted the boom as required to stow, launch, and retrieve the parasite. A latching mechanism on the actuating cylinder locked the trapeze in the stowed (fully retracted) position. When the trapeze was extended, the drag brace straightened and locked with hydraulic pressure applied to the top of the actuating cylinder to maintain extension. The boom snubber braced the forward end of the boom, stabilizing it for an easier contact with the parasite nose probe.

b. The boom provided suspension at three points on the parasite, at the nose and on each side of the fuselage. The original nose attachment on the boom was a funnel-shaped receiver



Inboard view of trapeze aft latch.



Pin on F-84E aft fuselage for engaging trapeze aft latch.

for the parasite's cylindrical nose probe. This was modified to an improved "duck-bill" receiver very early in the trials. The aft boom latches were engaged from below by two pins on the parasite's fuselage.

c. The trapeze used four operating positions with the parasite attached.

(1) Stowed position - fully retracted into the bomb bay. This position was used for normal stowage of the parasite or trapeze during flight and for pilot access to the F-84E.

(2) Loading position - twenty inches below the stowed position. This position will be used for pilot access to later parasites with a rear hinged canopy.

(3) Three point position - trapeze extended, boom horizontal with nose probe and aft latches engaged. This position was used for securing the parasite from single point position during retrieving, or for parasite engine air start and checkout before going to single point position for launching.

(4) Single point position - trapeze extended, boom down, aft latches disengaged, nose receiver engaged. This position was used for parasite initial contact during retrieving or for last contact during launching.

d. The trapeze, boom, and latches were manipulated by electrical controls in the trapeze operator's station. The trapeze aft latches were normally released by the operator on signal from the parasite pilot who later released the nose latch. Manual hydraulic operation of the trapeze and boom was provided by emergency hydraulic hand pumps and a system of main selector control valves. A hand operated winch and cable system provided emergency retraction for the trapeze only.

e. Bomb bay dome lights, a top directed boom light for the boom receiver, and small lights on the aft boom latches provided illumination for retrieving and launching the parasite at night.

f. In order to extend or retract the RB-36 main landing gear while the parasite was aboard it was necessary that the

trapeze be fully extended; otherwise, the wings of the parasite would interfere with the RB-36 gear. After the gear operation was completed the parasite could be restowed.

5. SPECIAL GROUND LOADING EQUIPMENT:

a. The parasite ground loading dolly (contractor-designated SK 2250) consisted of four separate multi-wheeled dollies interconnected with linkages to provide a platform for transporting the parasite under the RB-36. The separate dollies (2 nose dollies and 2 wing dollies) were equipped with jacks for supporting the parasite when its gear was retracted.

b. Other special equipment consisted of four wooden shoring blocks, each approximately 12 feet long, 2 feet wide, and 20 inches high, used to support the RB-36 main landing gear during the parasite loading, and two wooden inclined ramps approximately 18 feet by 52 inches by 20 inches, used instead of jacks to raise the carrier main gear trucks from ground level on to the shoring blocks. These simple inclined ramps were made locally at Eglin Air Force Base of ordinary 2 inch stock lumber. The ramps and shoring blocks could be constructed of any good scrap lumber by unskilled labor.

TEST PROCEDURE

1. GENERAL:

Using the RB-36F/F-84E prototype system, physical testing in Phase I was conducted to investigate, insofar as possible, the tactical feasibility of employing the parasite aircraft system to accomplish long range strategic bombing and photo reconnaissance. No attempt was made to determine specific aircraft performance capabilities, such as distance requirements for take-off and landing or radii of action of the separate and/or composite aircraft under various load conditions and profiles. Prototype-derived data for the above values would not be representative of those of a production-type system. Similarly considered were only those problems of maintenance and support of the RB-36F and the F-84E aircraft encountered as the direct result of parasite system operation.

2. FLIGHT PHASE:

a. General Missions:

Missions were flown to investigate the problems of and to allow development of the best procedures for:

(1) Parasite launching and retrieving:

(a) During day, night, weather, and turbulent air conditions.

(b) At altitudes up to an operational maximum.

(2) Carrier-parasite composite aircraft take-off and landing.

(3) Crew access to the parasite during stowed flight and inflight safety provisions for handling the parasite.

(4) Crew decompression during parasite operations.

(5) Parasite deicing, heating, and servicing while being carried.

(6) Inflight jettisoning of the parasite.

(7) Parasite and carrier navigation.

(6) Parasite - carrier rendezvous.

b. Penetration Missions:

(1) Six penetration missions were flown against the Eastern Air Defense Force network to investigate various tactics and techniques for employment of the parasite aircraft system.

(2) The mission routes were planned so as to pass within GCI radar detection, to allow a reasonable chance for tracking, while the aircraft were using likely tactics for parasite system operations. Penetrations were initiated through the Atlantic and Traverse City ADIZ's. Position reports were omitted to insure that the track would be declared hostile. Due to the use of limited navigation and rendezvous equipment, the penetration portions of the routes were flown only during daylight VFR conditions. The parasite was launched and retrieved at 500 feet altitude on each mission. The carrier proceeded from the launching point so as to arrive at the rendezvous point 5 minutes before the ETA of the parasite, at which time the AN/ART-13 transmitter was operated to provide a homing signal for the parasite. Wind information used was that obtained by carrier navigation equipment and/or that obtained from prognostic charts.

(3) Notification and reporting of these missions was in accordance with ADC Regulation 51-6, dated 17 September 1952, an SOP originally set up for "FAST FREIGHT" missions. The ADC and the EADF were advised of the flight plan prior to each mission and invited to make interception. This information was further disseminated to Air Divisions but not to the radar stations.

3. GROUND PHASE:

In conjunction with the missions outlined in paragraphs 2a and 2b above, a study was made of the following items:

a. Parasite ground handling equipment.

b. Functional deficiencies, damages incurred, maintenance, and inspection time requirements for the trapeze installation and the corresponding parasite installation.

c. Special tools.

d. Estimated personnel and training requirements for flight and ground crews.

INDEX OF TEST RESULTS

TEST RESULTS

1. GENERAL:

a. The test results quoted below were obtained using the RB-36F/F-84E (prototype) parasite aircraft system.

b. The original cylindrical nose probe and funnel-shaped receiver were replaced by the improved "duck-bill" probe and receiver early in the trials, therefore, only the results obtained with the latter system are treated in this report.

2. FLIGHT PHASE:

In order to obtain a fair sampling of crew opinion on techniques and procedures, a total of five parasite pilots with widely varying fighter experience, three carrier pilots of which two had minor experience with the RB-36, two experienced navigators, and two trapeze operators were employed in the test.

a. General Missions:

(1) Parasite Launching and Retrieving:

(a) Parasite Pilot Technique:

1. Smooth Air:

The parasite pilot technique for accomplishing launching and retrieving in smooth air conditions was found to be well within the ability of the average jet fighter pilot skilled in level formation flying. To make a hookup, the parasite pilot established his position at an initial point about 25 to 30 feet below the RB-36 aft bomb bay. He then flew good formation on the RB-36 and approached the boom receiver at about 1 knot to mate the probe and receiver. It was a common and natural tendency on the first attempted hookup to reduce power just before contact in order to lessen the shock; however, this usually resulted in a failure to latch and a missed hookup. Once this tendency was

eliminated and the pilot had demonstrated to himself that it was relatively easy to "land-in-mid-air", hookups during smooth air conditions became routine. Launching was much easier than retrieving since the pilot, essentially, had only to release the nose latch, slide back a few inches to disengage the "duck-bills", then drop down several feet and fly away from the carrier.

2. Rough Air:

The difficulties of making a hookup were increased with an increase in air turbulence conditions. Hookups in conditions not exceeding light turbulence were considered safe and within the ability of the average jet pilot. However, under conditions more severe than light turbulence hookups became more a matter of luck than skill. All pilots had a strong tendency to wait until the air smoothed out before attempting to make contact, in order to reduce the risk of collision with the trapeze or boom. Also, there was the risk of damaging the parasite by collision with the trapeze aft latches when raising the parasite from the single point to the three point position during retrieving, or vice versa during launching. Because of potential hazards, parasite operations were not attempted in more than moderate turbulence.

In view of the above comments, it is considered that the present trapeze arrangement is unsatisfactory for parasite launching and retrieving during rough air conditions exceeding light turbulence. It is believed that some alternate device located aft of the carrier airplane and suitable for parasite hookup and towing to an area of smooth air for later hookup on the trapeze would be more satisfactory. The device should also provide a means of refueling the parasite to a fuel capacity that will insure a reasonable amount for

hookup on the trapeze after reaching the smooth air area.

3. Weather:

Hookups in daylight weather presented no special problems as long as the parasite pilot could maintain visual contact with the carrier. This was similar to other formation flying in weather. Hookups were not considered safe in rain due to the distortion of vision through the parasite windscreen. Hookups at night in weather were not attempted. The problems of making rendezvous and reaching the initial point in actual weather were not investigated as the test aircraft were not equipped with suitable rendezvous gear.

4. Night:

Parasite hookup at night was a matter of two problems - first, the technique of gaining the initial position under the aft bomb bay, and second, the furnishing of adequate probe and receiver illumination that would not destroy the pilot's depth perception. Illumination of the RB-36 by its navigation lights alone was not sufficient to allow the parasite pilot to assess, rapidly, aircraft relative positions, speeds, and headings during his attempts to reach the initial position promptly. With the rear scanners shining Aldis lamps on the RB-36 jet engine pods, in addition to the help given him by the navigation lights, the parasite pilot was able to reach the initial position in less time than was possible without the Aldis lamps. However, both lighting systems destroyed any security gained by cover of darkness and illuminated the carrier much in excess of that which could be permitted over enemy territory. Development of a suitable lighting system for external illumination of the RB-36 to allow the parasite

pilot to reach the initial position promptly and without unduly disclosing the RB-36 to enemy observation, is required.

When the parasite pilot approached from the initial position to single point contact, he found that dim bomb bay lights and the top-directed beam light shining dimly on the probe receiver provided the best lighting combination for making a night hookup. With this lighting night hookups were readily accomplished and only slightly more difficult that daylight hookups. The parasite nose probe "pen-light" was of no value, occasionally distracting, and, therefore, was disregarded. But due to inadequate shielding, the lights in the bomb bay area were readily visible to ground observers and would be unsatisfactory for use over enemy territory. It is recommended that the lights be relocated and/or properly shielded to give adequate illumination for parasite hookup without providing excessive external illumination.

5. Low and High Altitude:

Five hundred feet was considered a practical minimum height for parasite launching and retrieving in order to provide a safety measure in case of parasite emergency. Maximum altitude for launching, about 20,000 feet, was limited by the ability of the F-84E to make an air start. Maximum altitude for retrieving was limited by parasite aircraft performance. Hookups were accomplished up to a maximum altitude of about 33,000 feet.

6. Three-Axis Damper:

It was determined that there was no need for the three-axis damper to assist the pilot after making single point contact.

All pilots preferred to use unrestricted normal flight controls.

(b) Carrier Pilot Technique:

1. The sucess of launching and retrieving the parasite depended very much on the ability of the carrier pilot to maintain a steady platform during the operation. Rough handling of the controls was accentuated at the boom receiver and could easily have prevented the parasite from making a successful contact, or could have caused a collision. As the parasite approached the trapeze it was possible for the carrier pilot to "feel" the approach of the parasite. At this time, the carrier pilot had to resist the slight climb or descent of the carrier by very gentle control pressures in order to maintain the steady platform.

2. It was determined that the autopilot should not be used during retrieving and launching as it was unable to maintain the RB-36 in steady flight as well as the carrier pilot could. This was particularly true during turbulent air conditions.

(c) Trapeze Operator Technique:

The recommended trapeze operator technique outlined in the Utility Flight Handbook for RB-36F/F-84E Composite Aircraft, dated 11 July 1952, was used and was considered adequate. Close cooperation and frequent communication, preferably by interphone, otherwise by visual signals, were required between the trapeze operator and the parasite pilot during launching and retrieving.

(d) Time Requirements:

1. The time required to make a single point hookup under daylight smooth air condition was approximately 3 to 4 minutes beginning from a point about 300 yards

to either side or aft of the RB-36. The time to reach the initial point was variable, of the order of 2 to 3 minutes, depending upon relative position at the beginning and individual pilot technique. The time from initial point to single point contact was about 1 minute. Under these ideal conditions an allowance of 5 minutes for hookup was considered adequate. An additional 2½ to 3 minutes time was required to fully stow the parasite from single-point contact. (Paragraph 2a(1)(d)4).

2. The time required from initial point to single point contact under smooth night condition, weather, high altitude, and light turbulence was also about 1 minute, the same as for smooth daylight conditions since the rates of approach were similar.

3. The time required for launching was not considered critical as plenty of time usually will be available for the pilot to get into the parasite, check the cockpit, make an air start, and check out the engine and equipment. Approximately 20 to 30 minutes time was allowed for launching the F-84E. Trapeze extension times were inconsequential in this operation. The air start was made at the 3-point position to prevent jet exhaust damage to the bomb bay. Actual time of release was at the pilot's discretion, but on flights requiring parasite navigation and rendezvous the release time was established by the carrier's actual time of arrival over the predetermined release point. To facilitate immediate orientation the parasite was launched on his initial course heading.

4. The approximate times required for normal trapeze operation with the parasite attached were:

1 min, 30 sec: stowed to 3-point position.

0 min, 40 sec: 3-point to 1-point position.

1 min, 20 sec: 1-point to 3-point position.

1 min, 20 sec: 3-point to stowed position.

(c) Indicated Airspeeds:

Carrier indicated airspeeds of 160 to 200 knots were found satisfactory for parasite operations.

(2) Composite Aircraft Take-off and Landing:

(a) Composite aircraft take-offs were conducted at combined gross weights up to the maximum allowable, 357,500 pounds, and were considered routine. The carrier pilots experienced no unusual difference between the take-off characteristics of the EB-36 so loaded and those of a normal B-36.

(b) Composite aircraft landings were conducted and considered routine. A final approach speed of 140% of stall speed was used instead of the recommended 135% to reduce "mushing" during the flareout for touchdown. Only the Nos. 1, 2, 5, and 6 propellers were reversed during the landing roll, as reversal of Nos. 3 and 4 propellers would cause a backflow over the stowed parasite and possible damage to the control surfaces.

(3) Parasite Accessibility:

Parasite accessibility during stowed flight was considered reasonable for a prototype system. Crew safety harnesses and oxygen facilities were adequate. There was no requirement for crew members to be in the bomb bay during normal launching and retrieving. Their presence was needed only when the parasite was actually stowed. Installation of bomb bay parasite fairing doors on later models should eliminate the turbulence and hazards of the open bomb bay that existed on the test item.

(4) Crew Decompression:

Separate decompression of the camera compartment during parasite operations was routine and without incident. Since launching altitude was restricted to about 20,000 feet, because of parasite engine air starting requirements, crew decompression was no problem. However, as retrieving could be accomplished at much higher altitudes, it was considered advisable, for personnel safety, to descend below 25,000 feet as soon as the parasite was retrieved before decompressing the camera compartment.

(5) Parasite Heating and Battery Charging:

The provisions for parasite cockpit heating and battery charging during stowed flight were adequate.

(6) Navigation:

(a) General:

Due to lack of suitable operational equipment in the carrier and parasite all navigation missions were planned for VFR conditions. The parasite route and all low level routes were flown during daylight. The carrier crew used a combination of dead reckoning, pilotage, and celestial observations while the parasite pilot used only pilotage and dead reckoning. The navigational accuracy obtained was commensurate with the techniques used and, as would be expected under these rather ideal conditions, was adequate for locating the launching point, target, and rendezvous point. The following paragraphs outline problems encountered even under these ideal conditions, and which will bear on parasite system operations.

(b) Forecast Winds:

The estimated winds along the parasite route were based on observed winds at carrier altitude and on those obtained from prognostic

charts prior to start of mission. When both the carrier and parasite were flown at minimum altitude the observed wind was adequate for calculating the parasite [redacted] and rendezvous time. However, when the parasite flew at high altitude, the forecast wind had to be used as there was no way to obtain a better estimate. On one mission the forecast winds were in error about 70 knots. This error emphasized the need for fully automatic navigation equipment capable of determining winds and computing courses for flights over barren terrain or under instrument weather conditions.

(c) Parasite Pilot Briefing:

It was obvious that in combat operations a second navigator familiar with parasite operation will be required to brief the parasite pilot and assist him in computing the parasite route and rendezvous time. The first navigator will be too busy with carrier navigation and establishing the launching point to assist the parasite pilot. (The total required number of navigators is increased to three if the carrier is operating at minimum altitude). (See paragraph 2a(6)(c)2 below).

(d) Missed Launching:

In case of failure to launch the parasite at the established time and location, it was found necessary to execute an orbit and make a second approach to the launching point so that the parasite pilot would only have to adjust the launching time rather than adjust the route and ETE to rendezvous. This orbit also prevented the composite aircraft from penetrating too deeply into the radar surveillance area.

(e) Low Level Navigation:

1. Parasite:

Missions were conducted to investigate the feasibility of parasite navigation at

minimum altitude (tree top height to 100 feet above the terrain) from launching, to the target and return to rendezvous. Missions were flown over the flat terrain of Florida, Alabama, Mississippi, Delaware, and New Jersey. The parasite speed was limited to 312 knots because of inadequate nose probe fairing. No attempt was made to measure the accuracy of the actual run over the target as this was considered outside the scope of this project. However, on missions up to 325 NM range flown by three pilots, it was determined that parasite navigation at minimum altitude during daylight VFR conditions was feasible provided the following items or conditions were available: Accurate maps of the type and scale (1:500,000) of Sectional Aeronautical Charts; an initial check point easily identifiable and selected on the basis of the expected accuracy of the launching point; suitable en route check points sufficient to establish aircraft position within 1 to 2 miles; suitable checkpoints for pre-IP and IP adequate for establishing aircraft position within 1/4 mile. It was essential that the pilot very carefully plan his route, draw the course from checkpoint to checkpoint rather than a single straight line, calculate all ETA's and record them on the map, and adjust the ground speed to make good the calculated ETA's.

NOTE: The technique of low level navigation is being investigated on Project No. APG/TAF/63-A-1, "Determination of the Best Method of Fighter Low Altitude Special Weapons Delivery".

2. Carrier:

Missions were flown to investigate the feasibility of carrier navigation at heights of 200 to 1,000 feet above the terrain for the purpose of launching and retrieving the parasite at 500 feet.

Based on two flights of 675 NM and 513 NM over snow covered terrain in the Northwest Great Lakes area, it was determined that carrier navigation at 200 to 500 feet during daylight VFR conditions was feasible provided the items and conditions noted above for the parasite were available for the carrier. Since the carrier would be operating at slow speeds and on a strict cruise control schedule, adjustment of ground speeds to meet ETA's other than that for the rendezvous point was not considered necessary or practical. In view of these facts, it was also considered necessary to use two navigators at all times during low level operation. During the period of parasite pilot briefing a third navigator would also be required as discussed in paragraph 2a(6)(c) above.

(7) <u>Parasite and Carrier Rendezvous:</u>

(a) The RB-36 AN/ART-13 liaison transmitter was modified to operate at 500-600 kc and was used with the parasite AN/ARN-6 radio compass to provide a limited rendezvous capability, primarily, for the penetration missions discussed in paragraph 2b below. The effective range of this system was considered acceptable for the missions planned for Phase I. However, this system would be unacceptable for operational use due to its short range and lack of security. Since all of the missions requiring rendezvous were flown during VFR daylight conditions, the navigation error was small and the rendezvous problem was simple. On one penetration mission, visibility in the rendezvous area at sea was reduced to less than 3 miles in haze and the radio compass was required to effect the rendezvous.

(b) There is a definite requirement for satisfactory primary and secondary rendezvous gear. The primary equipment should allow the parasite pilot to take the initiative in making rendezvous, should have a usable range of 150 NM to a minimum of 1/4 NM or

less, should provide maximum security to the carrier and parasite, and should be usable with minimum limitations due to line of sight, atmospheric conditions, or aircraft relative position. The secondary equipment should incorporate as many as possible of these same features.

(3) Design Limitations and Malfunctions:

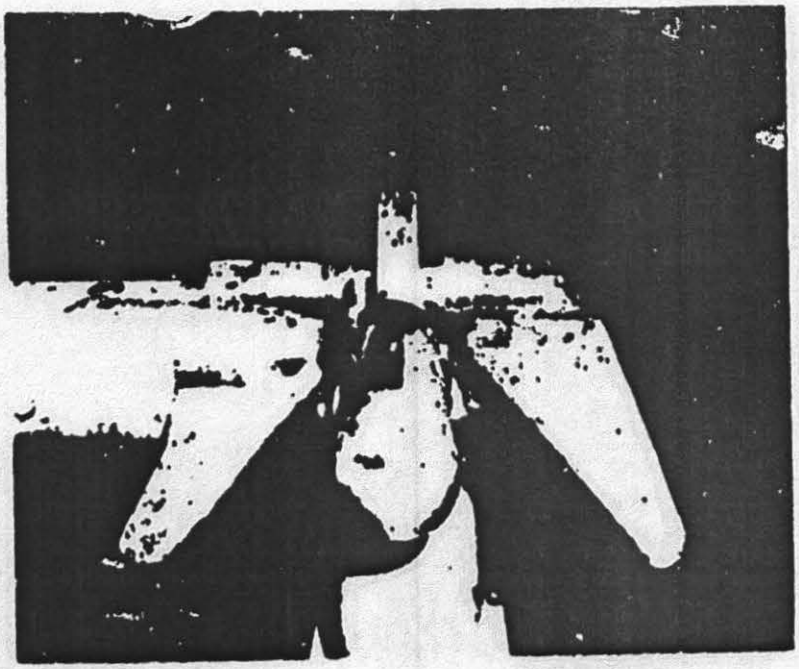
(a) Parasite Accidental Release:

1. When the nose probe "duck-bill" was first installed, functional deficiencies were encountered. The nose latch would accidentally release when the parasite was being lowered from the 3-point to the single point position. This was caused by the relative rotational motions of the "duck-bill" receiver which depressed the nose latch beyond dead center and disengaged the nose probe. Machining and rework of the latch blade and thorough greasing of the coupling area eliminated this problem for smooth air operations.

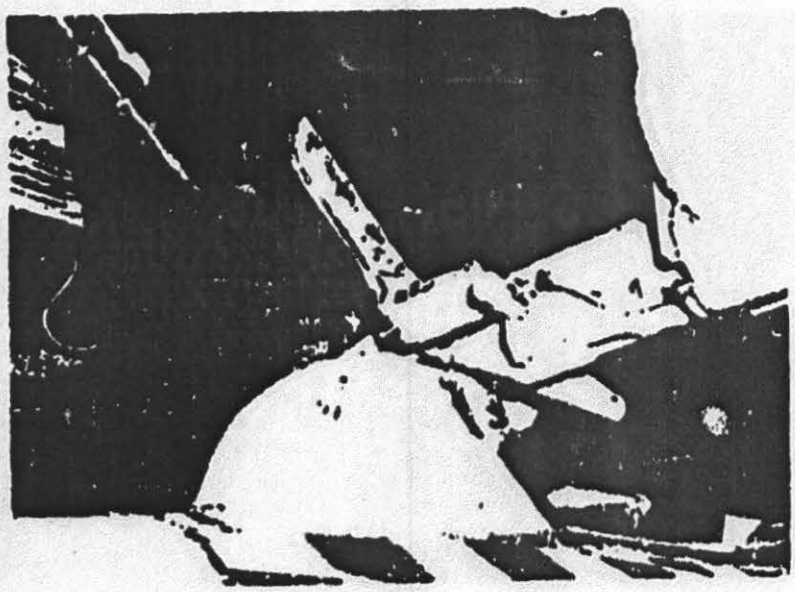
2. However, several accidental releases from the single point position were experienced later during rough air operations. As a consequence, the present nose latch is not considered reliable. It is believed that the parasite yaw and pitch motions in rough air, while in single point attachment, combine to bind the latch blade against the "duck-bill" receiver and create the same relative rotational motions that had been causing the previous accidental releases. Local CONVAIR representatives were unable to provide a fix; therefore, a redesign of the latch is necessary.

(b) Parasite Jettisoning:

Emergency jettisoning of the parasite was not accomplished, as it was reported by the CONVAIR field service representative that development



Rear view of mated "duck-bill" probe and receiver.



Three-quarter front view of mated "duck-bill" probe and receiver.

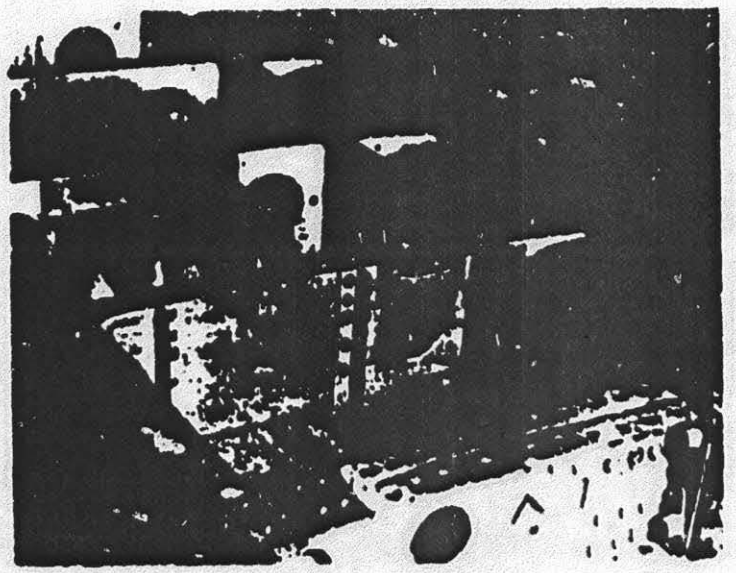
trials had not been completed on the system and it was not considered safe for use with a pilot in the parasite. It was the opinion of APGC personnel that emergency jettisoning of the parasite from any position also presented a hazard to the carrier airplane since there were no provisions to assure the parasite would fall straight down and away from the carrier without damage to the bomb bay, to the No. 3 or 4 propeller, or to the main landing gear, when extended.

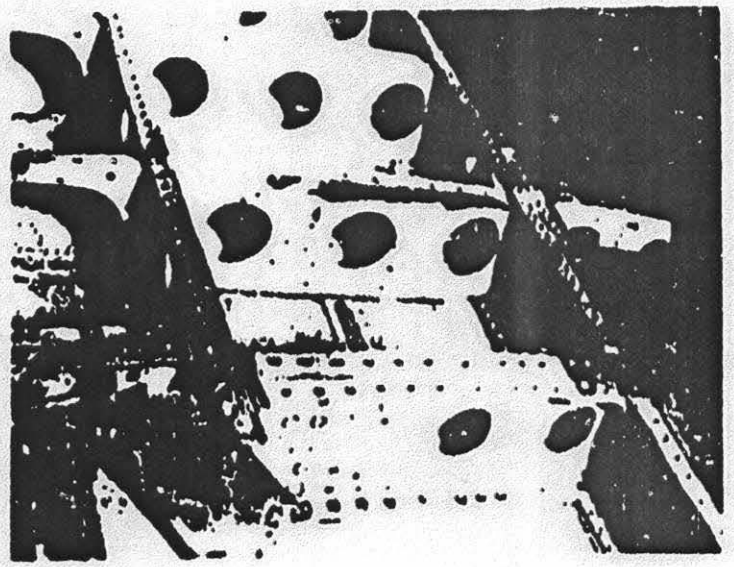
(a) Parasite Tail Vibration:

1. The two bomb bay rubber bumpers, provided to eliminate metal-to-metal contact and to control parasite tail vibration when the parasite was carried in the stowed position, were inadequate and caused damage to the horizontal stabilizer. After 15 hours of stowed flight, part of the top skin and ribs of the stabilizer failed due to constant vibration and buffeting against the bumpers. The turbulence in the bomb bay, due to lack of fairing doors, undoubtedly was a major cause of tail vibration. The redesign of a device to restrain tail vibration, without damage, is required.

2. A new stabilizer, with reinforced skin and ribs, was installed by CONVAIR as a temporary fix to allow completion of testing. In accordance with NADC instructions, further composite aircraft flights were conducted with the parasite in the stowed position only long enough to allow pilot access and composite take-offs and landings. Otherwise, the parasite was carried in the three point extended position (as was done on all EADF penetration missions).

3. Three times in the course of the test the cannon plug junction of the coaxial cable and the VHF pickaxe antenna, located in the parasite vertical stabilizer, was found broken. It was finally assumed





Damaged ribs in the F-84G horizontal stabilizer.

that the breakdown was caused by parasite tail vibration when the aircraft was carried in the stowed or three point extended position. A four inch length of #18 insulated wire was installed as a "jumper" to provide a flexible junction between the coaxial cable and the VHF antenna. No further breakdown was encountered.

(d) Parasite Servicing and Deicing:

1. No provisions were available in this prototype system for servicing or deicing the parasite during stowed flight. The need for fuel servicing was emphasized on penetration missions Nos. 1B and 2B where the parasite was retrieved after a separate take-off and later launched with less than a full fuel load. Separate take-offs offer tactical advantages that can not be fully realized unless the parasite can be refueled while stowed.

2. The need for equipment to deice the parasite or prevent ice accretion during stowed flight was apparent. This requirement includes both engine and airframe to insure an air start and satisfactory flight characteristics at launching.

(e) Rate of Trapeze Operation:

The design limitation which required the extension of the trapeze and parasite during retraction or extension of the RB-36 main landing gear was objectionable. Partial power failure immediately after take-off could present a critical situation in which it would be necessary to increase the total drag for about 4 minutes in order to gain an eventual reduction in total drag. Center of gravity requirements of the RB-36 probably will preclude relocation of the trapeze and parasite. It is, therefore, recommended that further development be conducted to increase the rate of trapeze extension and retraction to the maximum possible, to reduce this critical time period.

(f) Trapeze Extension:

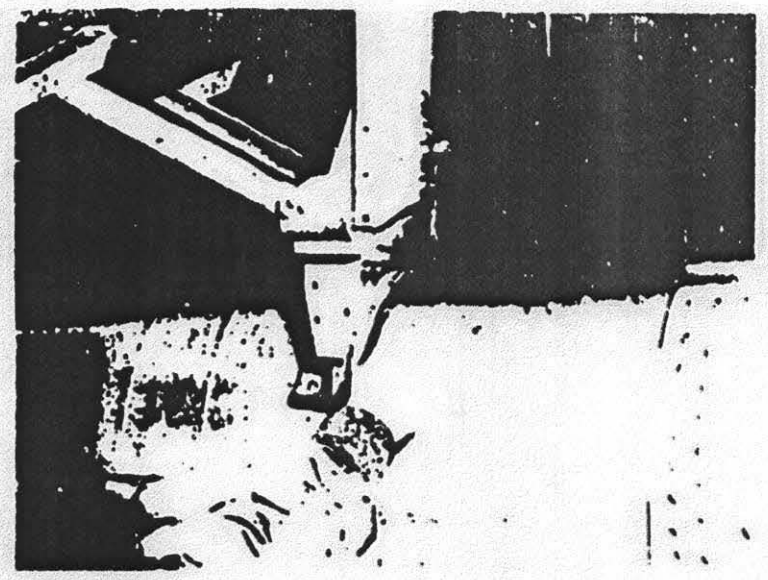
After each of five composite aircraft take-offs at high gross weights (four at 357,000 lbs and one at 313,000 lbs), the trapeze failed to go to the fully extended position when it was actuated to allow landing gear operation. The trapeze would not traverse the last 6 to 8 inches of normal travel; however, RB-36 landing gear operation was possible. This malfunction did not occur on take-offs at lower gross weights, about 260,000 lbs. No cause could be determined. It is recommended the contractor conduct flight tests to investigate this trouble.

(g) Trapeze Boom Movement:

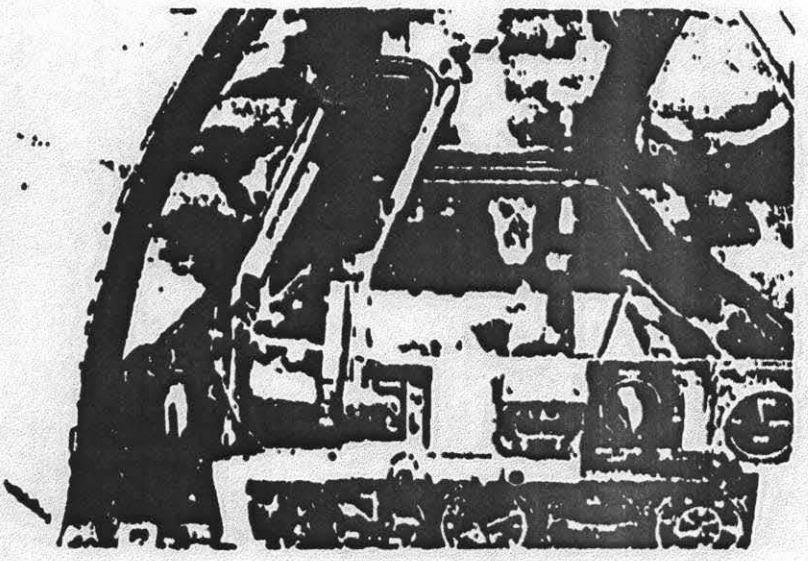
The RB-36 acceleration during the composite aircraft take-offs caused the forward end of the trapeze boom to drop down approximately 1/2 to 3/4 inches from its normal stowed position against the retaining yoke. It was believed that this movement increased the restraining load on the parasite stabilizer and contributed to the eventual failure of the stabilizer. It is recommended that a latch be designed to secure the forward end of the boom against the retaining yoke when the parasite is carried in the stowed position.

(h) Trapeze Emergency Operation:

According to the Utility Flight Handbook, the design of the emergency hydraulic system (hand pump operated) and manual system (hand operated winch and cable) is such that there is no provision for parasite hookup and recovery in case of normal hydraulic system failure. It is stated that the trapeze should not be extended by the emergency hydraulic system because pressure will not be available to keep the trapeze extended and that the trapeze cannot be retracted by the manual system with the parasite attached. It is recommended, therefore, that an emergency system, completely separate from the normal hydraulic system, be installed to provide boom and trapeze operation



View showing extent of trapeze boom down movement during composite aircraft take-off.



View showing how manual release handles for nose probe and aft latches obstruct pilot's view.

sufficient to allow parasite hookup and return to the stowed position.

(i) Rough Air Hookups:

See paragraph 2a(1)(a)2, above, for a discussion of the inadequacy of trapeze installation for rough air hookups.

(j) Night Lighting:

See paragraph 2a(1)(a)4, above, for discussion of the inadequacy of RB-36 external, bomb bay, and trapeze lighting for night hookups.

(k) Restrictions to Forward Vision:

1. The manual release handles for the nose latch and aft latches were located on the top left side of the instrument panel and created an obstruction to the parasite pilot's forward vision. It is recommended that the release handles be relocated to a readily available position, not where they obstruct the pilot's view.

2. The parasite nose probe partially blocks the pilot's forward vision and will pose a problem for later installation of a sight for weapon delivery. It is recommended that the nose probe be made retractable.

b. Penetration Missions:

(1) General:

Six penetration missions were flown against the Eastern Air Defense Force network to investigate various tactics and techniques for employment of the parasite aircraft system. The procedures outlined in paragraph 2b of Appendix C, were used. Results of the six missions were determined from reports of the ADC and EADF and from the APCC flight crews. The actual routes flown, results, and general mission situations are discussed below and are shown in Appendix H.

(2) Mission 1A, 14 January 1953; Figure 1, Appendix H:

(a) The composite RB-36F/F-84E airplane approached the launching point at 500 feet from a turning point about 133 NM at sea, southeast of Atlantic City, New Jersey. However, due to an atmospheric temperature inversion that existed at that time, normal radar detection capability was decidedly increased and the RB-36 at 5,000 feet was tracked by GCI station "K" while 160 NM out. Tracking was continuous after descent to 500 feet and while inbound to the launching point. One F-94 from New Castle Air Force Base successfully intercepted the composite aircraft about 100 NM at sea, and before the launching point was reached. The RB-36 was tracked continuously for 53 minutes before parasite launching. The parasite was launched about 73 NM at sea for a minimum altitude approach and attack on Annapolis, Maryland, then withdrew at minimum altitude to rendezvous about 70 NM at sea. The parasite route of 280 NM was flown at an average G.S. of 312 KTS. The parasite was not reported by GCI radar or ground observers but was observed by the F-94 at launching. It is assumed that no air defense action was taken against the parasite since the carrier was intercepted before launching. This mission was not affected by any GCI radar being out of commission.

(b) After rendezvous the RB-36 proceeded to Dover Air Force Base, Maryland to refuel the parasite in preparation for Mission No. 1B.

(3) Mission 1B, 14 January 1953; Figure 2, Appendix H:

The composite RB-36F/F-84E airplane approached the launching point at 500 feet from a turning point 100 NM at sea, east of Atlantic City, New Jersey. The parasite was launched about 39 NM at sea for a minimum altitude approach and attack on New Castle, Delaware, then withdrew at minimum altitude to rendezvous about 65 NM at sea. The parasite route of 251 NM was flown at an average G.S. of 312 KTS. Neither aircraft was reported. GCI station "F" was operating but GCI station "K" was

out of commission during this mission. Since neither aircraft was detected during the approach to target, it is improbable that they would have been intercepted on withdrawal, in the short time available, even if station "X" had been operating. This would be particularly so if initial detection had not been made prior to parasite withdrawal out to sea.

(4) Mission No. 2A, 30 January 1953; Figure 3 Appendix H:

The composite aircraft approached the launching point at 500 feet altitude from a turning point about 125 NM at sea, east of Atlantic City, New Jersey. The parasite was launched about 43 NM at sea for a climb to 30,000 feet and a high altitude dive bombing attack on Lewistown, Pennsylvania. The lowest altitude over target was 10,000 feet. The parasite withdrew at 30,000 feet and letdown to be at minimum altitude over the coastline for a minimum altitude run at 312 KTS to rendezvous about 58 NM at sea. The parasite total route was about 431 NM (See Figure 3 for average G.S.). The parasite was not reported or tracked. The RB-36 was tracked by GCI station "X", after rendezvous and end of mission about 36 NM at sea, and was intercepted by 2 F-94's from Dover Air Force Base while enroute to Dover Air Force Base to refuel the parasite. This mission was not affected by any GCI radar being out of commission.

(5) Mission No. 2B, 30 January 1953; Figure 4, Appendix H:

The composite aircraft approached the launching point at 500 feet from a turning point about 110 NM at sea, southeast of Long Island. The parasite was launched about 61 NM at sea for a climb to 30,000 feet and a high altitude dive bombing attack on Albany Airport, New York. The lowest altitude over target was 13,000 feet. The parasite withdrew at 30,000 feet and letdown to be at minimum altitude over the coastline for a minimum altitude run at 312 KTS to rendezvous about 48 NM at sea. The parasite total route was about 423 NM (See Figure 4 for G.S.). Neither the parasite nor carrier was reported. GCI station "D" was out of commission during this mission. However, since the previous GCI stations "H" and "J" had not reported the

parasite or carrier, it is improbable that station "T", even if operating, would have been able to accomplish an interception in the short time available, since the parasite ground speed on withdrawal was about 520 KTS.

(6) Mission No. 3, 9 February 1953; Figure 5, Appendix H:

The composite aircraft penetrated for 359 NM from the Canadian border to launch the parasite at 500 feet for a minimum altitude approach and attack on Selfridge Air Force Base, Michigan. The parasite withdrew at minimum altitude. The composite aircraft withdrew about 229 NM northwest from rendezvous to end of problem. The parasite route of 292 NM was flown at an average G.S. of 312 KTS. The carrier route of 675 NM was flown at heights from minimum to 1,000 feet about the terrain (See Figure 5 for G.S.). Two F-86's were scrambled from Oscoda Air Force Base on radar plots from GCI station "T" when the RB-36 crossed Lake Superior from the Canadian border. Two more F-86's were scrambled from Oscoda Air Force Base on ground observer plots of the RB-36 southeast of GCI station "T". Finally, two F-86's were scrambled from O'Hare Air Force Base after Selfridge Air Force Base control tower reported that, the parasite F-84E was over the airfield. No interceptions were completed because the tracks faded prior to intercept. The composite aircraft was also reported by ground observers northwest of GCI station "AB" just prior to the end of the problem; however, no interceptors were directed against it. This mission was not affected by any GCI radar being out of commission.

(7) Mission No. 4, 16 February 1953; Figure 6, Appendix H:

The composite aircraft penetrated for 215 NM from the Canadian border to launch the parasite at 500 feet, 244 NM from the target, Selfridge Air Force Base, Michigan. The parasite climbed to 30,000 feet for approach then descended for a 60 NM run at 312 KTS to target at minimum height for the first 44 NM, then climbed to 30,000 feet, and let down to rendezvous at 500 foot. The composite aircraft withdrew 147 NM to end of problem. The parasite total route was 491 NM. The carrier route of 513 NM was flown at heights of 200 to 1,000 foot

above the terrain (See Figure 6 for G.S.). Two F-86's were scrambled from Oscoda Air Force Base on radar plots from GCI station "T" when the RB-36 crossed Lake Superior from the Canadian border. Two more F-86's were scrambled from Oscoda Air Force Base on ground observer plots of the RB-36 north of GCI station "Y". Interception was not accomplished because the track faded prior to intercept. At this time GCI station "Y" was out of commission and thus failed to maintain tracking continuity on the RB-36 and provide initial detection of the parasite after launching and during climb. This probably denied interception of the RB-36, and very probably denied interception of the parasite by F-86's already airborne from Oscoda Air Force Base. The parasite was later tracked by GCI station "M", and two F-51's already airborne from Selfridge Air Force Base were diverted to the track. These reported "tally-ho" (accepted as a successful interception) on the parasite at minimum height about 20 NM before target.

(5) Summary:

(a) Of six attempted penetrations, only two (Mission Nos. 1A and 4) were successfully intercepted.

(b) A single GCI radar out of commission on two penetrations (Mission Nos. 1B and 2B) did not materially account for the failure to intercept.

(c) Disregarding Mission No. 1A (See Note), the relative immunity of a single jet fighter to satisfactory tracking by ground observers and/or GCI radars was demonstrated on four out of five penetrations.

(NOTE: It is assumed that no air defense action was taken against the parasite on Mission No. 1A since interception was completed before launching.)

(d) Even though the RB-36 was not intercepted on the two overland penetrations (Mission Nos. 3 and 4), it should not be concluded that carrier penetrations at minimum altitude are safe from interception. It is an opinion

that carrier operation at minimum altitude will reduce the enemy's tracking capability so as to enable the parasite to be launched, and in some cases retrieved, at points closer to the target than could be done if the carrier were operated at higher altitudes. But it is questionable whether the very large and slow flying RB-36 carrier could be expected to avoid interception for long in an area where fighters were being vectored on the basis of current and frequent ground observer plots.

(a) The need for an airborne video detection equipment in the carrier was apparent on Mission No. 1A. Since atmospheric temperature inversions and their effects on radar performance cannot be readily forecast, an airborne video detection equipment could be used to warn the carrier that it is approaching an area of abnormal radar surveillance, which will enable it to avoid penetrating too deeply.

3. Ground Phase:

a. Parasite Ground Loading Equipment:

(1) The F-84E was ground loaded into the RB-36F using the basic procedures outlined in the Utility Flight Handbook. A team of 16 men required about 2 1/2 hours to load the parasite into the RB-36 and 2 hours to unload it. The procedure consisted of raising the RB-36 main landing gear, loading the parasite on to the dolly, moving the dolly and parasite under the bomb bay, and stowing the parasite on the trapeze. The reverse procedure was used for unloading.

(2) The handbook procedure for raising the RB-36 main gear was modified by using two inclined wood ramps and two Coleman tractors, instead of fifty-ton jacks and supports, to get the main gear up on the wooden shoring blocks, 20 inches high. The tractors with tow bars pushed the RB-36 backwards up the ramps and on to the shoring blocks. This modified procedure was found to be simpler, safer, and reduced the time to raise the main gear from an estimated 4 to 6 hours to about 1/2 hour.

(3) The meager 20 inches of height provided by the wooden shoring blocks was insufficient to raise the aft end of the bomb bay enough to permit the parasite and dolly to approach from dead astern. Entry to the bomb bay area had to be made from the side in order to allow clearance for the parasite vertical stabilizer. This required a careful and undesirable turn at a critical stage in the process. It is recommended that shoring blocks for loading a future parasite be of sufficient height to allow parasite entry to the bomb bay from dead astern without a final turn.

(4) The parasite ground loading dolly was found to be unsatisfactory for the following reasons. The many separate components that had to be assembled around the fighter were difficult to mate. The connecting joints and cross members did not establish a rigid framework, which made the dolly difficult to steer and which created the additional hazard of possibly dropping the parasite. The dolly had to be steered from three points. A new design, preferably a single unit, using a minimum number of wheels, and providing single point steering is essential to easy ground loading. (It was reported by the CONVAIR field representative that the SK 2250 ground loading dolly was considered unsatisfactory for efficient loading and that the contractor was working on an improved design.)

b. Maintenance:

(1) Procedures:

At the time of this test there were no published technical orders for maintenance of the trapeze and parasite installations. Three contractor employees were on hand throughout the test to assist Air Force personnel. The maintenance procedures used were considered normal and acceptable for service use. The extent of maintenance required on the test installations was considered very reasonable and within the capability of an operational squadron.

(2) Special Tools:

No special tools were required during the test.

(3) Inspection Times:

Approximate inspection times were noted as follows:

(a) Carrier Trapeze Installation:

Preflight - 2 men, 1 hour each.
Postflight - 2 men, 1/2 hour each.

(b) Parasite Installation:

Preflight - 1 man, 1/2 hour.
Postflight - 1 man, 1/2 hour.

(4) Damages and Repairs:

The following Table I is a summary of damages and repairs to the RB-36F/F-84E prototype system resulting from test operations. Other malfunctions and design limitations are noted in paragraphs 2a(8) and 3a above. One trapeze malfunction encountered at high altitude is included. Initial adjustment and machining of the "duck-bill" nose probe latch are not included nor are difficulties that would be common to the operation of a normal RB-36F or F-84E aircraft.

TABLE I

ITEM	TROUBLE, PROBABLE CAUSE, OCCURRENCE	CORRECTIVE ACTION
Interphone contact point in "duck-bill" receiver.	Damaged by repeated strikes during retrieving. Occurred once.	Replace part - 4 man hrs. 1 ea, 36F25155-15, contact, interphone (Convair).
Seals in trapeze main jack.	Leaking hydraulic fluid. Worn. Occurred once.	Replaced parts - 126 man hrs. 1 ea, AN 6246-72 "O" ring seal, inner. 2 ea, AN 6227-72, packing, leather, inner. 2 ea, AN 6232C25-9/16, packing, felt, inner. 1 ea, AN 6246-74, "O" ring seal, outer. 2 ea, AN 6227-74, packing, leather, outer. 2 ea, AN6232C19-4, packing felt, outer.
Rivets in trapeze aft latch.	Broken, assume caused by excessive parasite motion in rough air hookup. Occurred once.	Replaced parts - 15 man hrs. 4 ea, AN 427M4, rivets, pickup existing.
Flexible high pressure hydraulic line to trapeze unlatch cylinder.	Leaking. Worn. Occurred once.	Replaced part - ½ man hr. 1 ea, AN-H-24, hose assembly, hydraulic, detachable end fitting type.

TABLE I (Cont'd)

ITEM	TROUBLE, PROBABLE CAUSE, OCCURRENCE	CORRECTIVE ACTION
High pressure air filler valve.	Leaking. Worn. Occurred once.	Replaced part - ¼ man hr. 1 ea, AN 6287-1, filler valve, high pressure air.
Parco swivels in hydraulic lines on trapeze.	Leaking. Worn. Occurred once.	Replaced parts - 2½ man hrs. 4 ea, SK 3950. (Convair)
Cannon plug junction of coaxial cable and VHF antenna in parasite vertical stabilizer.	Broken. Assume caused by parasite tail vibration when carried in the stowed or 3 pt. extended position. See paragraph 2a(8)(c).	Installed a 4 inch length of #18 insulated wire to provide a flexible junction between center pin of coaxial cable and antenna. (Temporary fix.) 6 man hrs.
Parasite horizontal stabilizer.	Skin and ribs damaged by contact with bomb bay rubber bumpers. Caused by excessive tail vibration when carried in the stowed position. See paragraph 2a(8)(c).	New stabilizer with "beefed-up" ribs and skin installed by Convair as a temporary fix.
Trapeze and boom. (malfunction)	Boom would not lock in up position and trapeze would not retract from loading position to stowed position at 35,000 feet altitude, 46°C I.O.A.T Assume malfunction due to low temperatures. Occurred once.	None.

INITIAL TRAINING

The following table is an estimate of initial training required to bring carrier and parasite flight and ground crews to satisfactory proficiency standards for unit exercises (not combat missions). By using mobile training units all ground training could be accomplished at squadron level.

NOTE: It is assumed that each crew member is fully proficient in his primary specialty and need only be trained in the new aspects of parasite operation.

Type Training	Hours Duration	Personnel in Attendance	Subject Matter
Ground	8	Parasite Pilot	Operation and maintenance of trapeze installation.
	8	Carrier Pilot	
	20	Trapeze Operator	
	40	Trapeze Gnd Crew	
Ground	2	Parasite Pilot	Operation and maintenance of parasite aircraft launching and retrieving components.
	2	Trapeze Operator	
	8	Parasite Gnd Crew	
Ground	5	Parasite Pilot	Procedures for parasite inflight servicing.
	5	Trapeze Operator	
Ground	10	Trapeze Gnd Crew	Parasite ground loading into the carrier.
	10	Parasite Gnd Crew	
Flight	13 (Approx.	Parasite Pilot	Parasite retrieving and launching under various conditions of daylight, night, weather, turbulence and altitudes. Parasite inflight servicing.
	10 5	Carrier Pilot	
	10 flights)	Trapeze Operator	

Type Training	Hours Duration	Personnel in Attendance	Subject Matter
Flight	30 (Approx. 30 6 30 flights)	Parasite Pilot Carrier Pilot Carrier Navigator	High and minimum altitude navigation and rendezvous.

NOTE: The following list was presented at a WADC Conference on 29 and 30 January 1953.

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CAMERA AND RELATED EQUIPMENT FOR THE RF-84F
PER SQUADRON OF 18 AIRPLANES

BODY ASSEMBLIES		CONE ASSEMBLIES		MAGAZINES		PER A/C	BASIS OF ISSUE
No.	TYPE	No.	TYPE	No.	TYPE		
18	K-38	18	36" lens	18	A-8B	1	263
36	K-22A	36	12" lens	36	A-9A	2	263
18	K-17C	18	6" metrogon			1	263
54	B-9A Intervalometer					4	263
18	K-38	18	24" lens	9	A-8B	1	ECL.
6	K-22A	9	24" lens	36	A-9A	1/3	ECL.
36	K-17C	36	6" metrogon	18	A-18	2	ECL.
6	T-11 cameras complete					1/3	ECL.
6	S(type)	6	6" lens single			1/3	ECL.
With controls		6	7" lens stereo				ECL.
		6	80mm stereo				ECL.
6	K-37 modified with capping shutter					1/3	ECL.

Ejectors, Photoflash Cartridges (pods)			
No.	TYPE		QTE
18	Controls for Cartridge Ejectors	1	263
12	A-5/6	2/3	ECL.
12	B-4	2/3	ECL.

This list has been prepared with the assistance of the RF-84F Project Officer, AMC, and has been coordinated with the Director of Operations.

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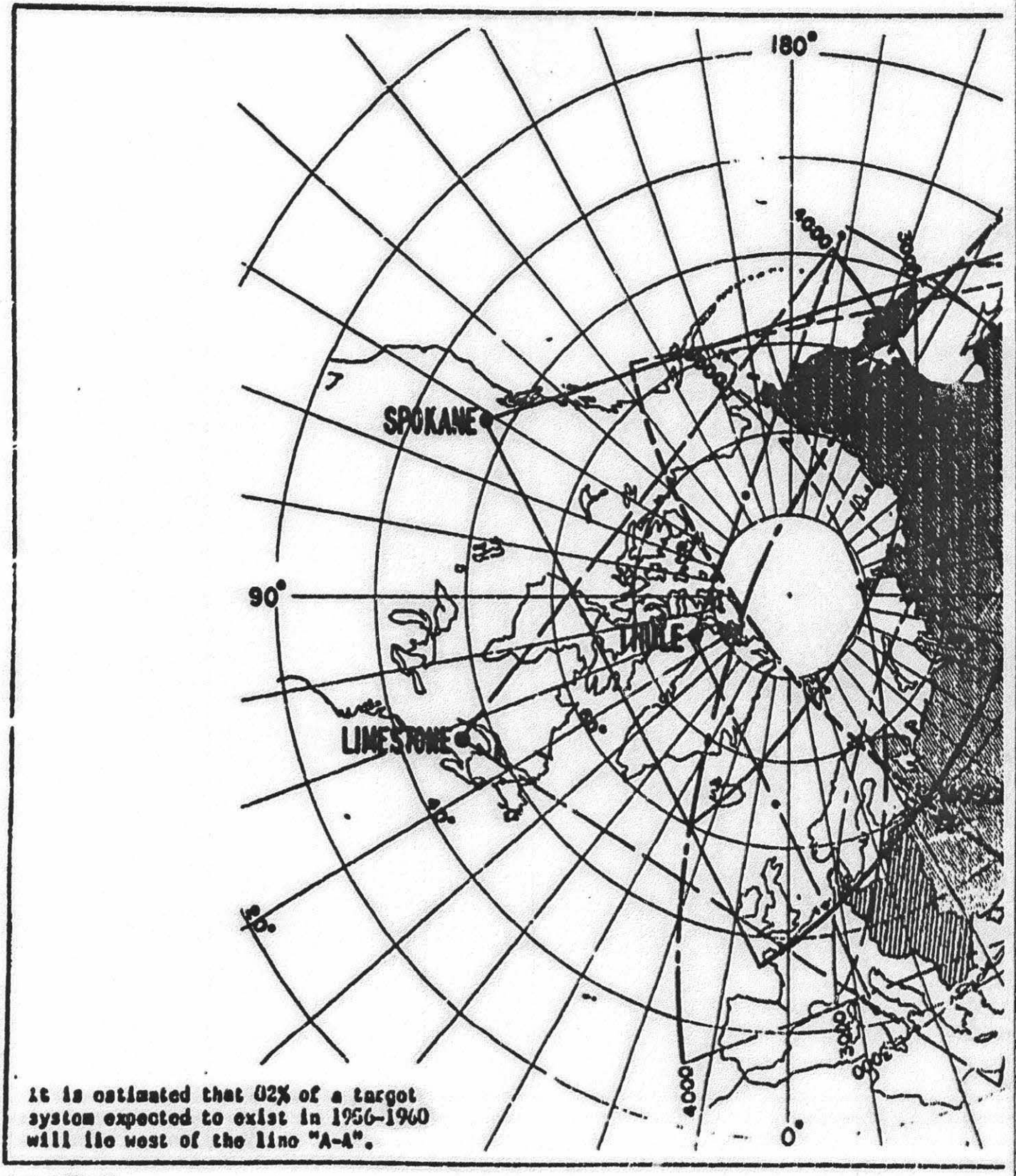
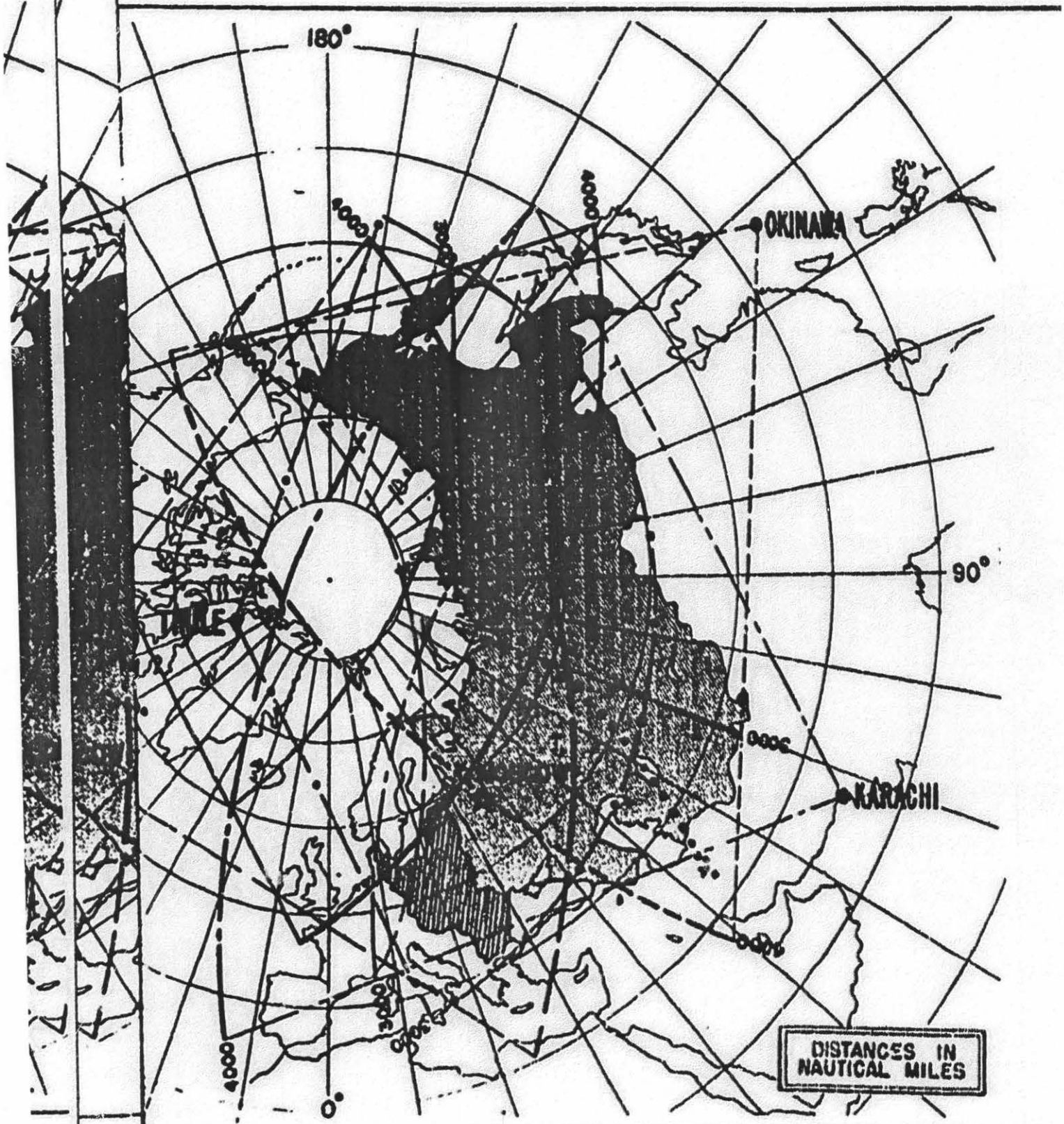


It is estimated that 02% of a target system expected to exist in 1956-1960 will lie west of the line "A-A".

Appendix G
Page 1 of 1



Project No. A
Page

MISSION 1A

Summary of Results:

The RB-36F/F-84E composite aircraft was intercepted before launching by one F-94 out of New Castle, Air Force Base.

LEGEND

MISSION 1-A TARGET : ANNAPOLIS

////// FICON A/C UNDER RADAR SURVEILLANCE

═══ RB-36F/F-84E COMPOSITE A/C

---- RB-36F SEPARATE A/C

—— F-84E SEPARATE A/C

FIGHTER INTERCEPTOR AIR BASE

● GCI RADAR STATION

NOTE : GROUND SPEEDS ARE AVERAGE VALUES.

NOTE 1: PROBLEM ENDED AT RENDEZVOUS. RB-36 PROCEEDED TO DOVER AFB TO REFUEL PARASITE.

NOTE 2: TEMPERATURE INVERSION AT TIME OF MISSION PROBABLY ASSISTED "K" GCI RADAR STATION IN OBTAINING PLOTS AT THESE LONG RANGES.

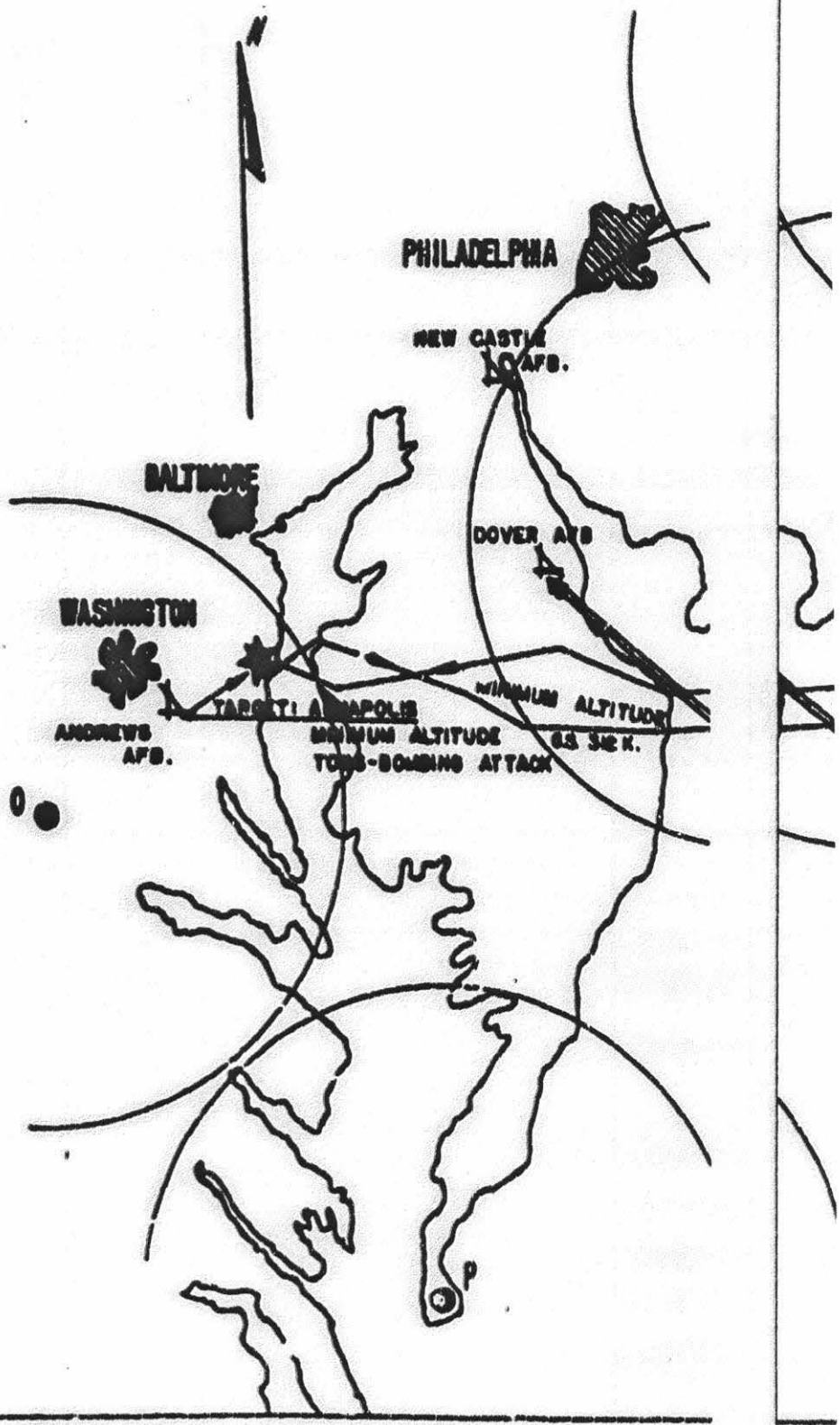
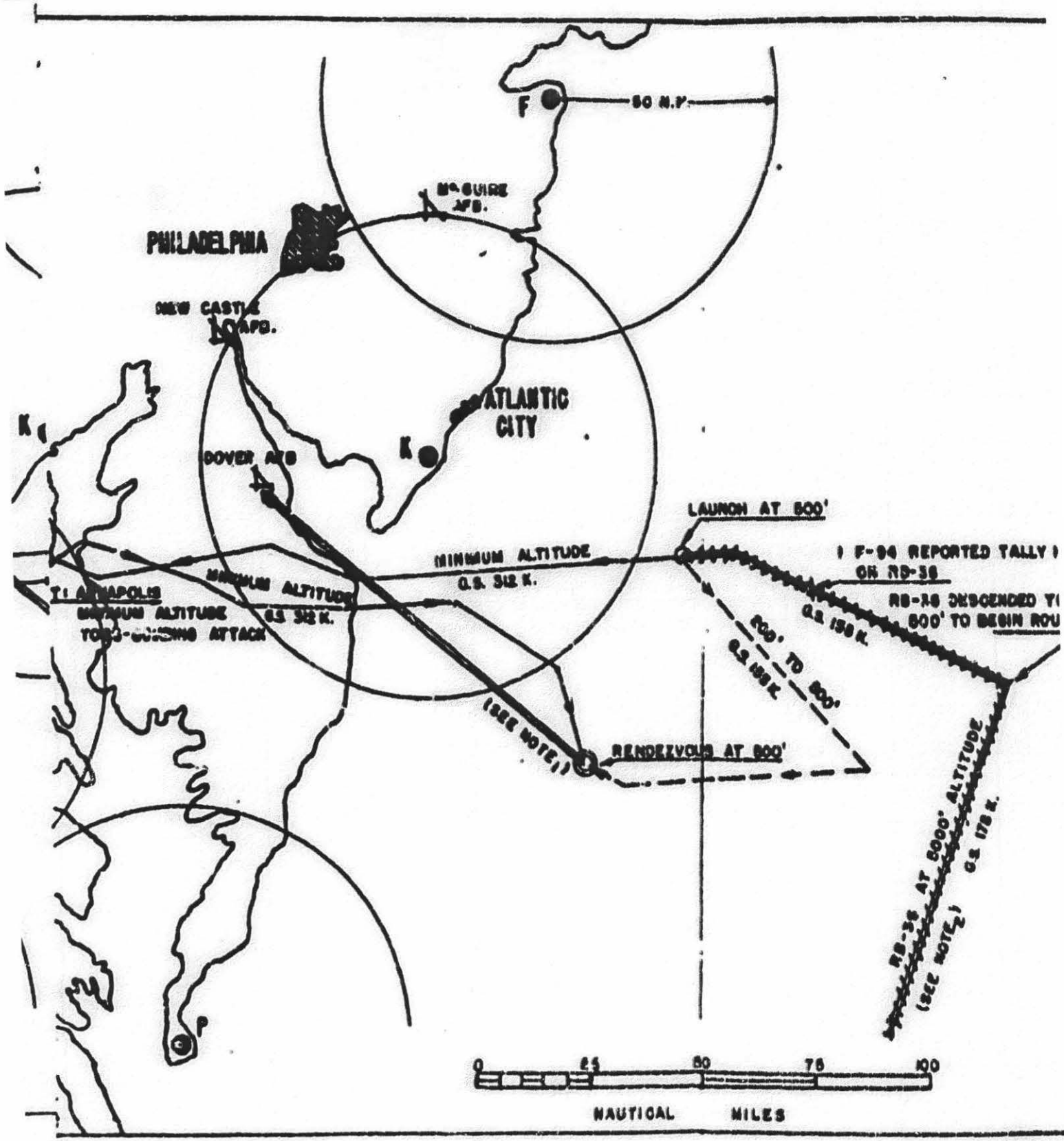


Figure 1
Appendix II
Page 2 of 12


F
50 N.M.
MCGUIRE AFB.
PHILADELPHIA
NEW CASTLE AFLD.
ATLANTIC CITY
K
K
DOVER AFB
LAUNCH AT 800'
MINIMUM ALTITUDE
G.S. 312 K.
F-94 REPORTED TALLY
ON RB-36
RB-36 DESCENDED TO
800' TO BEGIN ROU
G.S. 158 K.
800' TO 800'
G.S. 158 K.
(SEE NOTE 1)
RENDEZVOUS AT 800'
RB-36 AT 8000' ALTITUDE
(SEE NOTE 2)
G.S. 178 K.
0
25
50
75
100
NAUTICAL MILES

MISSION 1B

Summary of Results:

There was no reported detection of the RB-36F carrier or F-84E parasite.

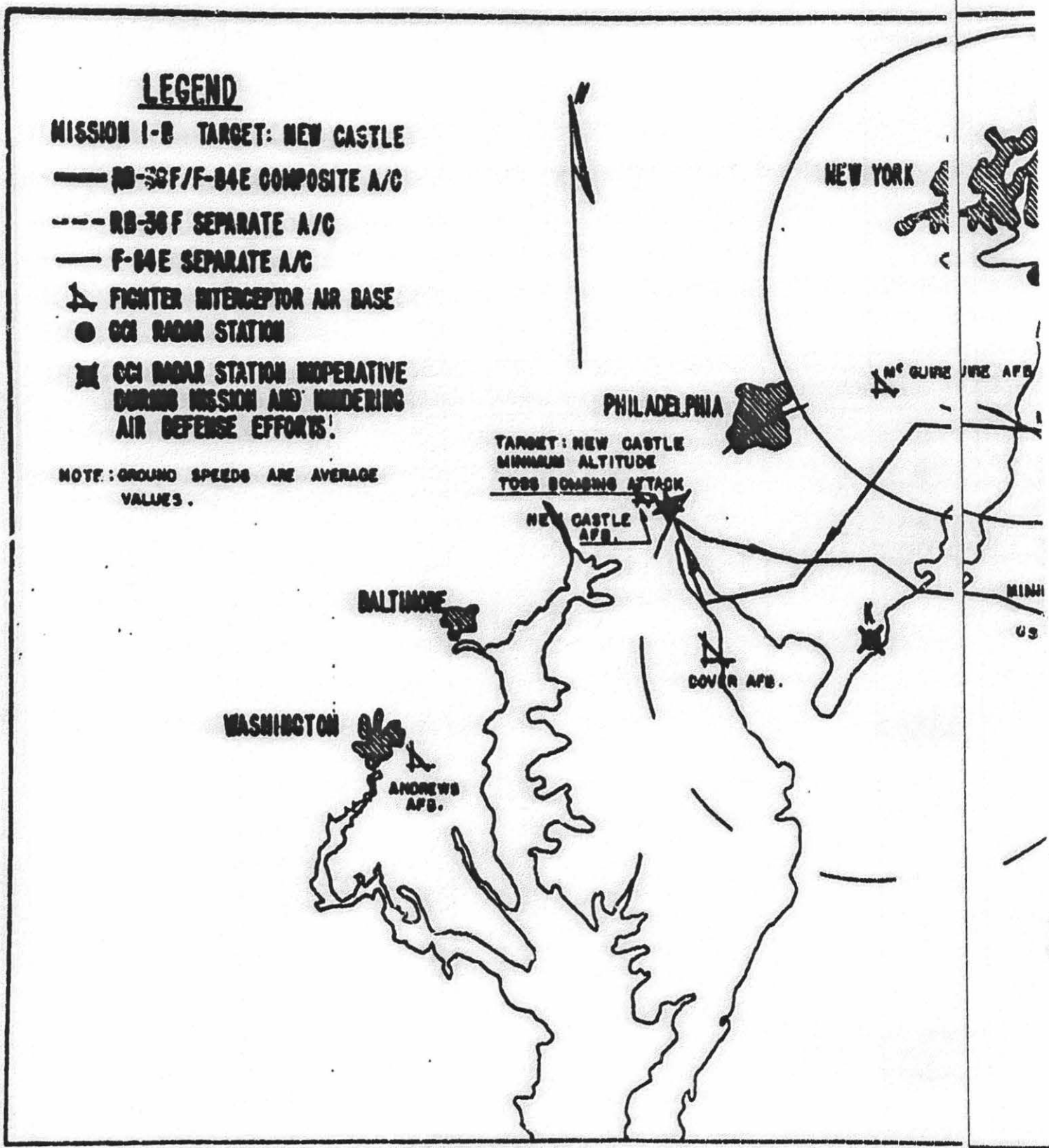
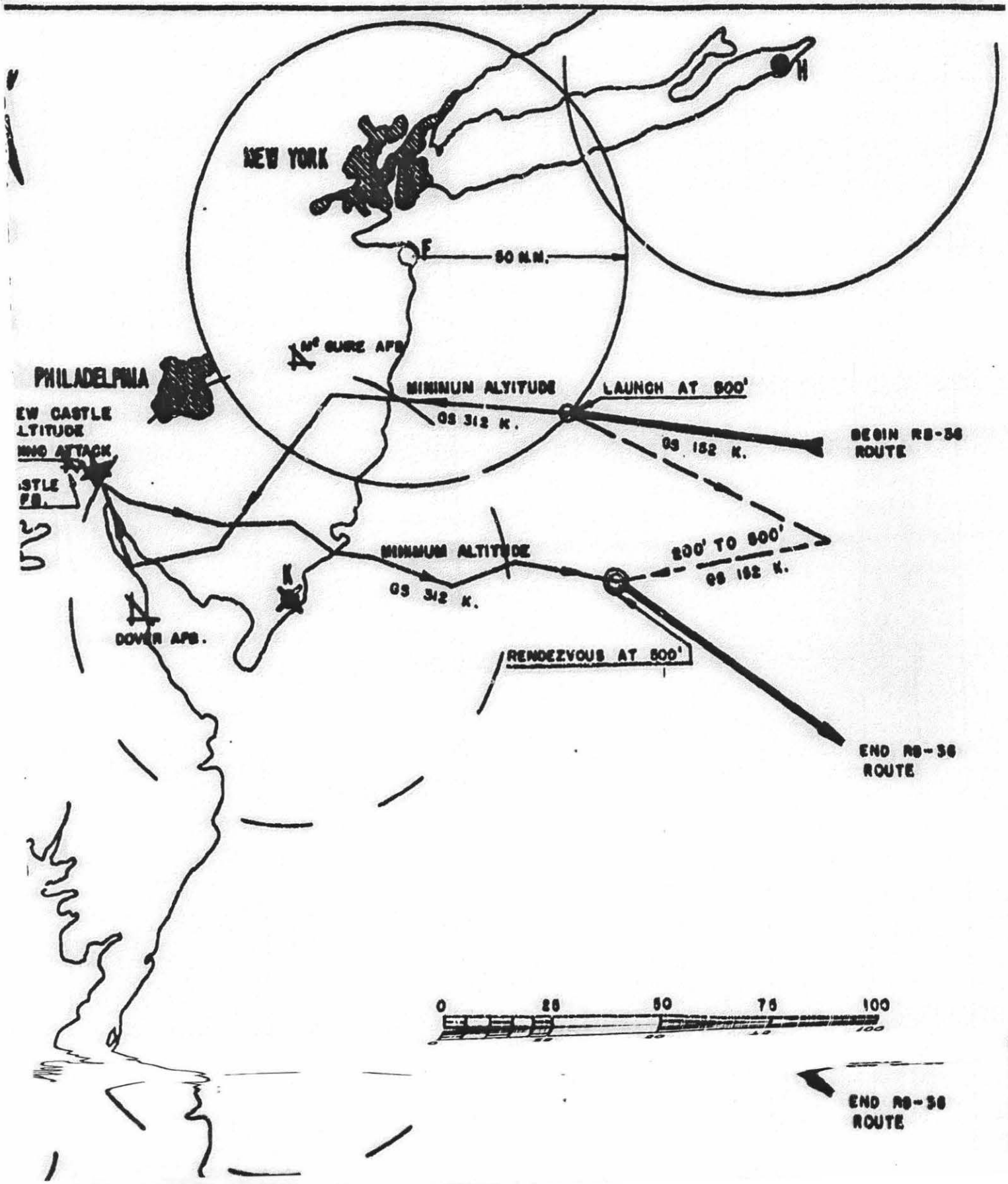


Figure 2
Appendix H
Page 4 of 12


NEW YORK
H
F
50 N.M.
PHILADELPHIA
MINIMUM ALTITUDE
LAUNCH AT 500'
09 312 K.
09 152 K.
BEGIN RB-36 ROUTE
800' TO 800'
09 152 K.
MINIMUM ALTITUDE
09 312 K.
K
DOVER AFB.
RENDEZVOUS AT 500'
END RB-36 ROUTE
0
25
50
75
100
END RB-36 ROUTE

MISSION 2A

Summary of Results:

1. There was no reported detection of the F-84E parasite.

2. The RB-36F/F-84E composite aircraft was intercepted after rendezvous, while enroute to Dover Air Force Base, by two F-94's from Dover Air Force Base.

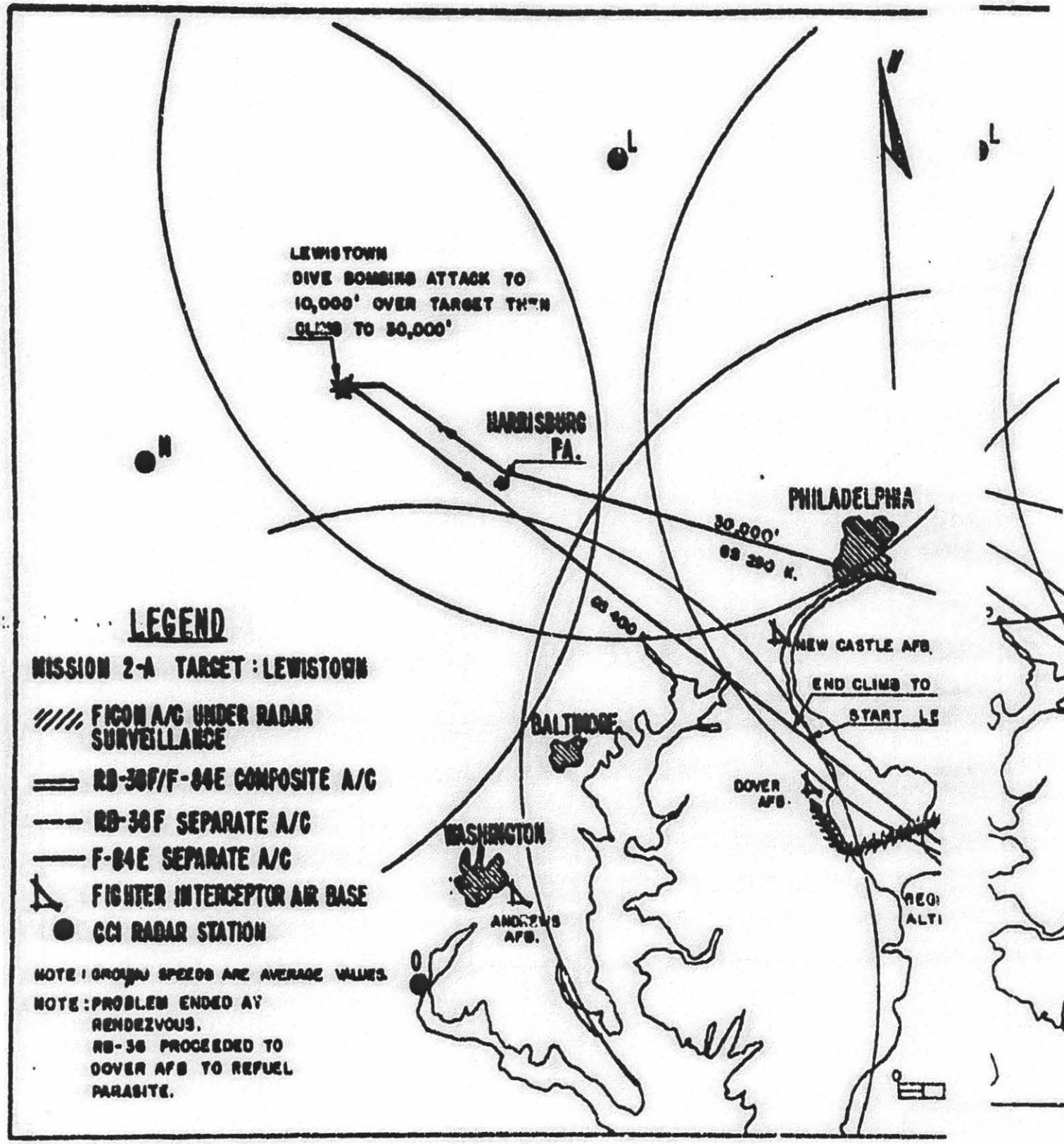
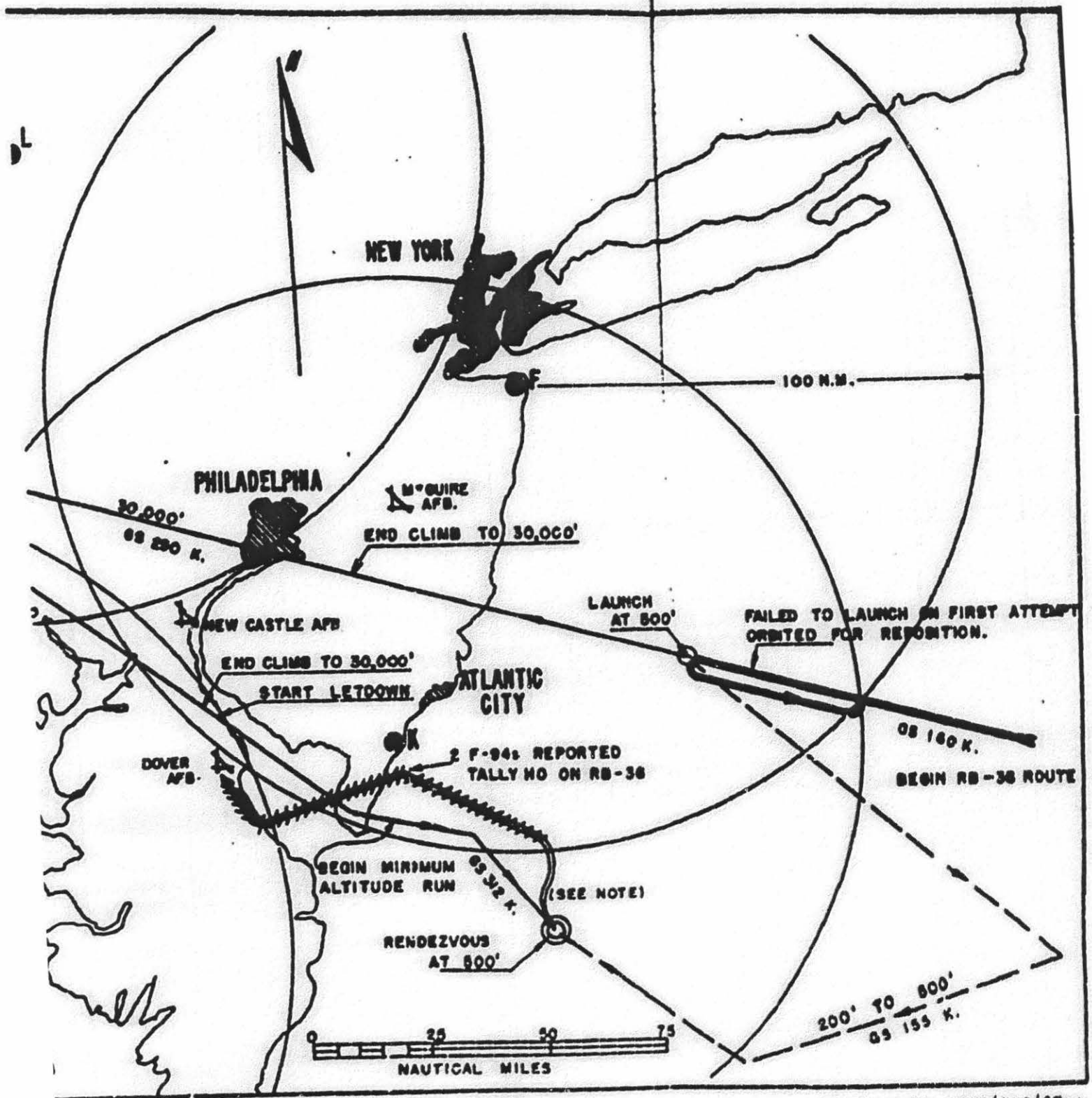


Figure 3
Appendix II
Page 6 of 12


NEW YORK
100 N.M.
PHILADELPHIA
McGUIRE AFB.
30,000'
GS 280 K.
END CLIMB TO 30,000'
NEW CASTLE AFB
END CLIMB TO 30,000'
START LETDOWN
ATLANTIC CITY
LAUNCH AT 800'
FAILED TO LAUNCH ON FIRST ATTEMPT
ORBITED FOR REPOSITION.
GS 160 K.
BEGIN RB-36 ROUTE
2 F-94s REPORTED
TALLY HO ON RB-36
DOVER AFB.
BEGIN MINIMUM
ALTITUDE RUN
GS 312 K.
(SEE NOTE)
RENDEZVOUS
AT 800'
200' TO 800'
GS 155 K.
0
25
50
75
NAUTICAL MILES

MISSION 2B

Summary of Results

There was no reported detection of the RB-36F carrier or F-84E parasite.

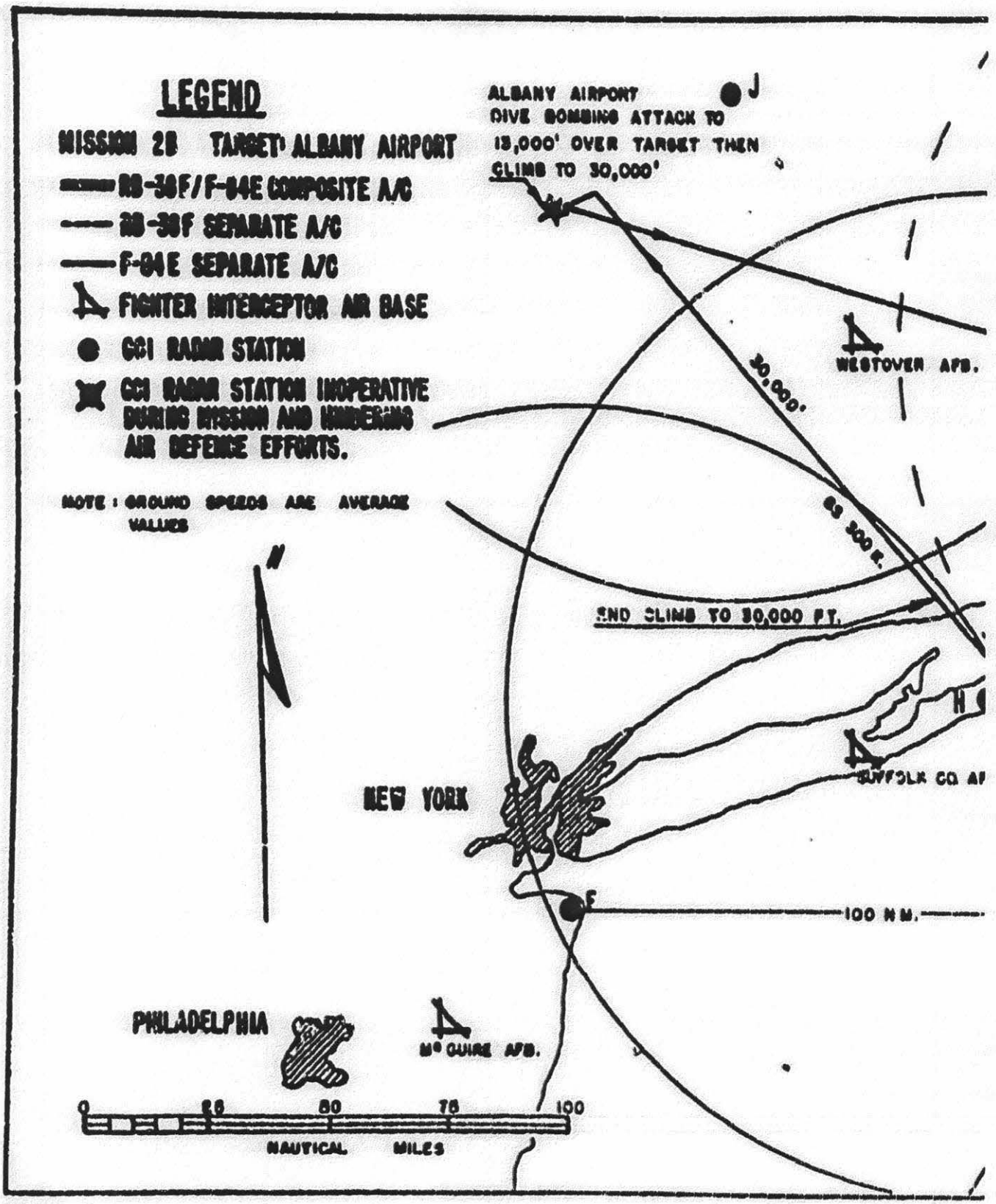


Figure 4
Appendix H
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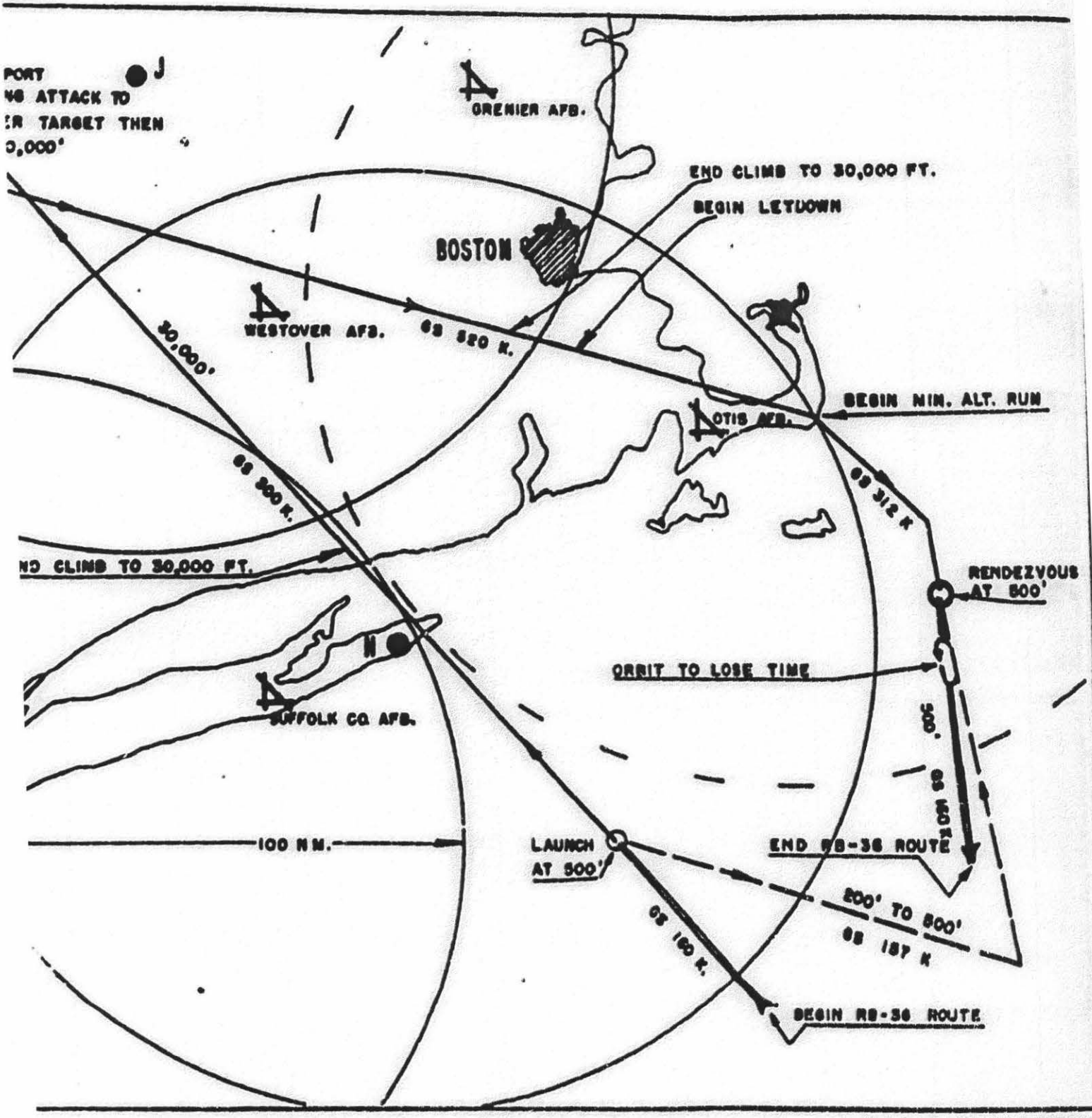

PORT
AB ATTACK TO
ER TARGET THEN
0,000'
GRENIER AFB.
END CLIMB TO 30,000 FT.
BEGIN LETDOWN
BOSTON
WESTOVER AFB.
GS 320 K.
30,000'
BEGIN MIN. ALT. RUN
OTIS AFB.
GS 300 K.
GS 312 K
ND CLIMB TO 30,000 FT.
RENDEZVOUS AT 500'
ORBIT TO LOSE TIME
SUFFOLK CO AFB.
50'
GS 150 K
100 N.M.
LAUNCH AT 500'
END RB-36 ROUTE
500' TO 800'
GS 187 K
GS 160 K.
BEGIN RB-36 ROUTE

MISSION NO. 3

Summary of Results:

1. There was no interception of RB-36F or F-84E as all tracks faded prior to intercept.

2. Two F-86's were scrambled from Oscoda Air Force Base on radar plots from Station "T".

3. Two F-86's were scrambled from Oscoda Air Force Base on ground observer plots southeast of Station "T".

4. Two F-86's were scrambled from O'Hare Air Force Base on a visual report from the control tower at Selfridge Air Force Base.

5. No fighters were scrambled on the ground observer plot northwest of Station "AB".

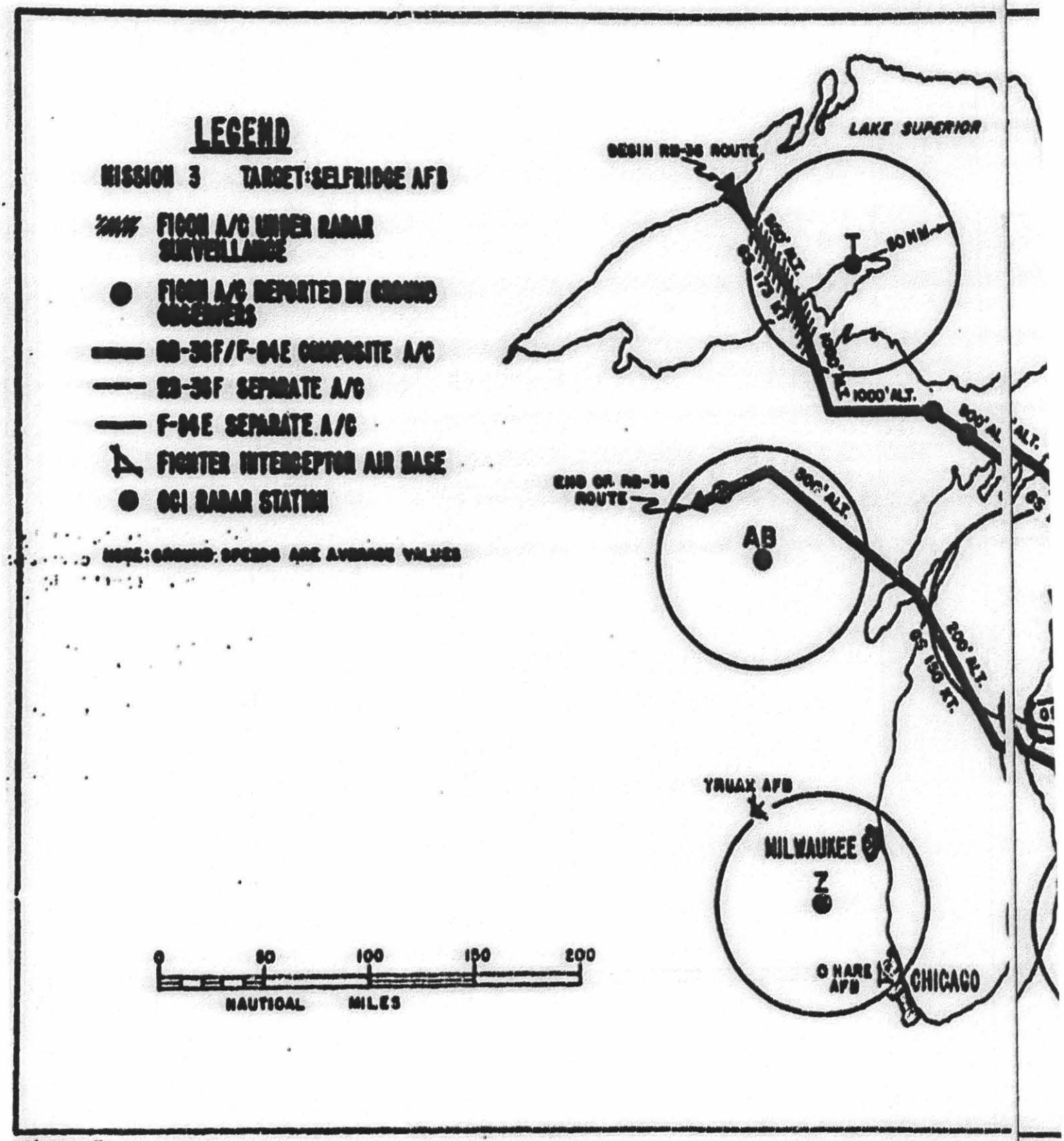
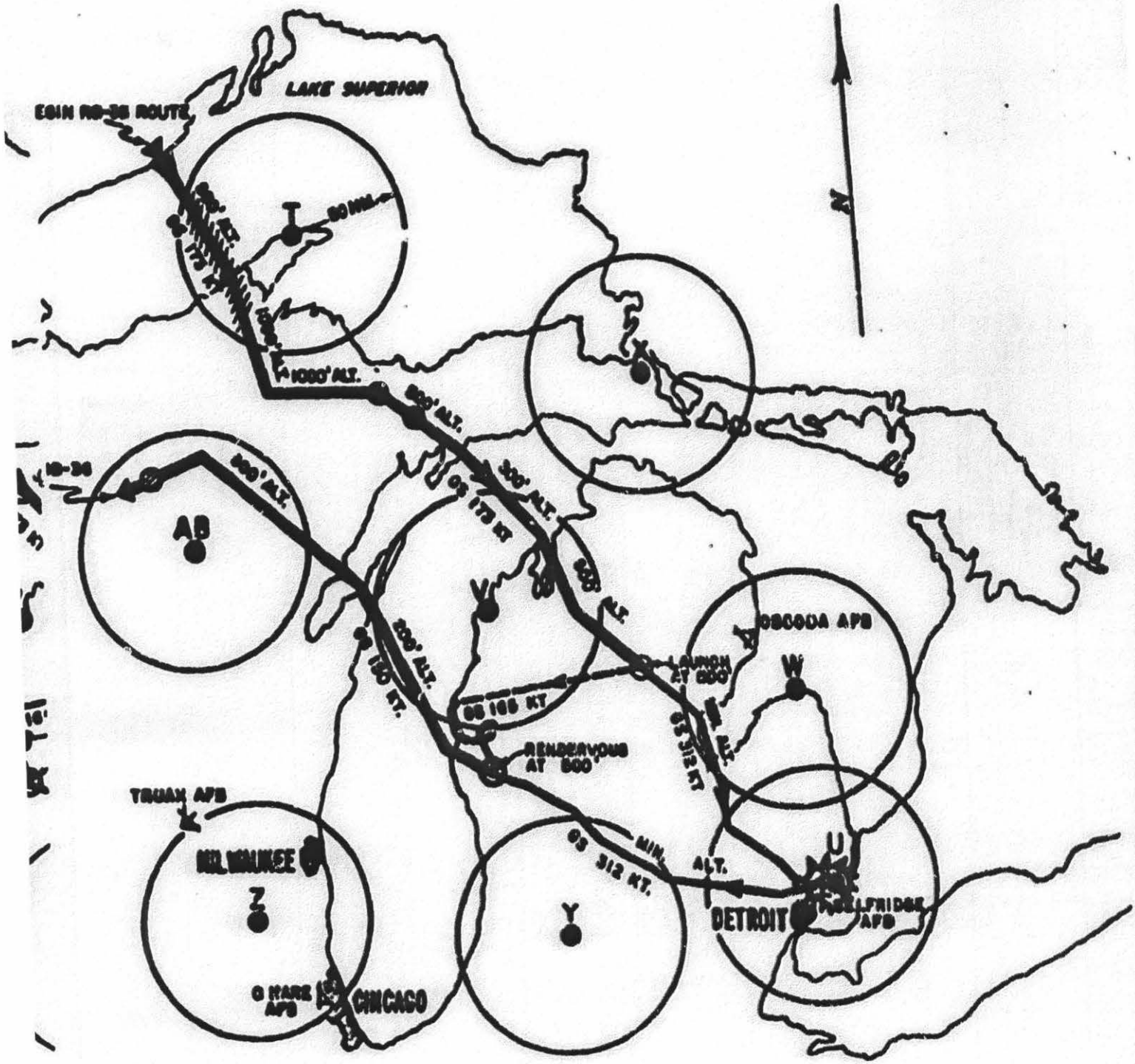


Figure 5
Appendix H
Page 10 of 12


LAKE SUPERIOR
EGIN RB-36 ROUTE
1000' ALT.
300' ALT.
300' ALT.
300' ALT.
300' ALT.
300' ALT.
AB
OSCODA AFB
LAUNCH AT 600
RENDEZVOUS AT 600
TRUAX AFB
MILWAUKEE
Z
Y
U
DETROIT
MINN. ALT.
O'HARE APB
CHICAGO

MISSION NO. 4

Summary of Results:

1. The F-84E parasite was intercepted 20 NM before target by two F-51's from Selfridge Air Force Base. The F-51's were diverted from another mission to intercept the parasite track reported by Station "M".

2. There was no interception of the RB-36F carrier or the F-84E parasite by F-86's as tracks faded prior to intercept.

a. Two F-86's were scrambled from Oscoda Air Force Base on radar plots from Station "I".

b. Two F-86's were scrambled from Oscoda Air Force Base on ground observer plots north of Station "V".

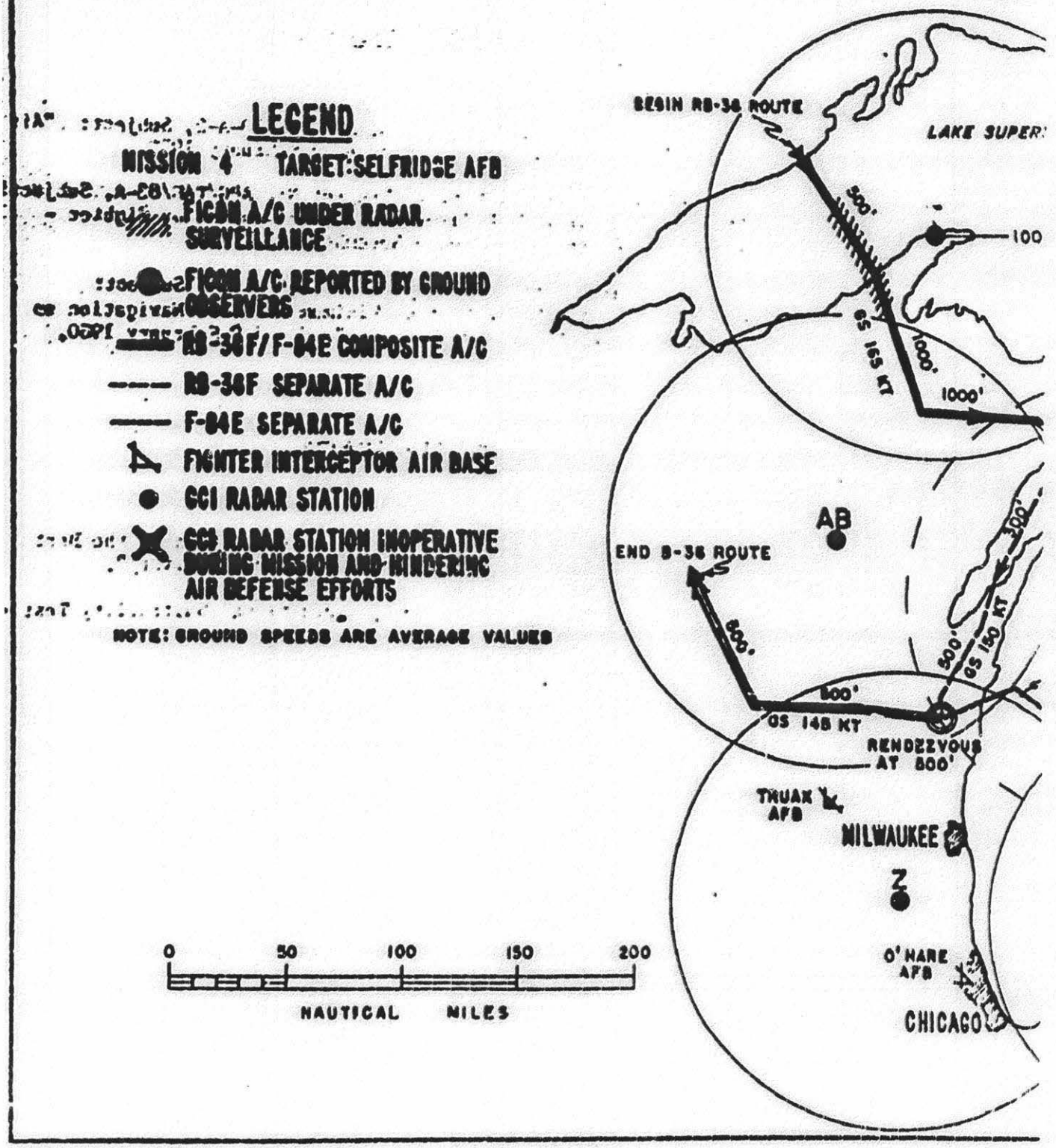
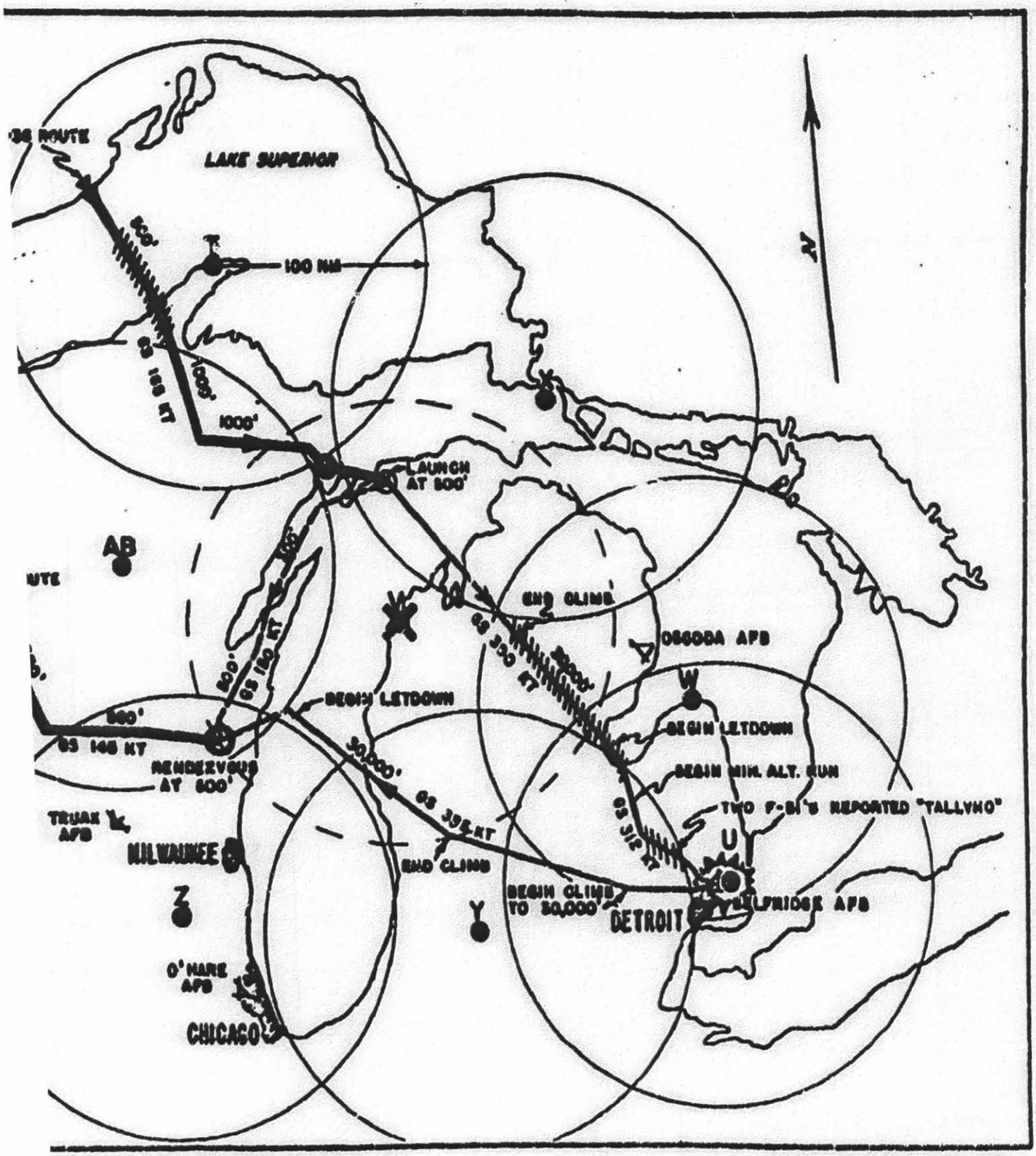


Figure 6
Appendix II
Page 12 of 12


LAKE SUPERIOR
100 NM
1000'
LAUNCH AT 500'
END CLIMB
OSCODA AFB
BEGIN LETDOWN
BEGIN MIN. ALT. RUN
TWO F-81'S REPORTED "TALLYHO"
RENDEZVOUS AT 500'
TRUAX AFB
MILWAUKEE
END CLIMB
BEGIN CLIMB TO 30,000'
DETROIT
O'HARE AFB
CHICAGO
AB
U
Y
Z

RELATED REPORTS

1. Final Report, Project No. APG/TAT/80-A-2, Subject: "Air Support Development, Phase II", dated 3 February 1953.

2. Interim Letter Report, Project No. APG/TAB/83-A, Subject: "(SECRET) Low Altitude Delivery of Atomic Weapons by Fighter - Bomber Type Aircraft", dated 6 November 1952.

3. Final Report, APG Project No. 1496——5, Subject: "Investigation and Evaluation of Minimum Altitude Navigation on Strategic and Tactical Type Missions", dated 9 February 1950.

RELATED PROJECTS

1. Project No. APG/TAT/83-A-1, "Determination of the Best Method of Fighter Low Altitude Special Weapons Delivery".

2. Project No. APG/TAT/93-A, "Operational Suitability Test of the BT-9 Toss Bombing Computer".

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