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AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida**

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**FINAL REPORT
ON
OPERATIONAL SUITABILITY TEST
OF THE RB-57A AIRCRAFT**

PROJECT NO. APG/TAS/122-AB

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HEADQUARTERS
AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

20 April 1955

PROJECT NO. APG/TAS/122-AB

OPERATIONAL SUITABILITY TEST
OF THE RB-57A AIRCRAFT

1. This is the Final Report on Project No. APG/TAS/122-AB, Operational Suitability Test of the RB-57A Aircraft. The object of this test was to determine the operational suitability of the RB-57A to accomplish the night reconnaissance mission, day reconnaissance photography, limited day topographic mapping and visual reconnaissance, day and night. (C)

2. The RB-57A Aircraft is not operationally suitable in its present configuration to perform the over-all tactical reconnaissance mission. The limited capability of this aircraft to perform only the medium altitude restricted range night photography mission; and the aircraft's vulnerability to intercept will restrict operational employment. (S)

3. It is recommended, because of the extensive modification required to give the RB-57A a fully effective reconnaissance capability, that consideration be given to the manufacture of a reconnaissance version of the present B-57B production aircraft. This aircraft equipped with navigational and warning radar, a viewfinder and longer focal length night cameras would approach the present operational requirement of the Tactical Air Command. The RB-57A aircraft could then be assigned to a non-tactical mission, such as tow target or training. (S)


DANIEL S. CAMPBELL
Brigadier General, USAF
Commander

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HEADQUARTERS
AIR FORCE OPERATIONAL TEST CENTER
AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

FINAL REPORT

ON

OPERATIONAL SUITABILITY TEST OF THE RB-57A AIRCRAFT

PROJECT NO. APG/TAS/122-AB

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SUMMARY

1. INTRODUCTION:

a. The Operational Suitability Test of the RB-57A Aircraft, Project No. APG/TAS/122-AB, was initiated and conducted under provisions of AFR 80-14, dated 27 August 1954, in accordance with a letter directive from Headquarters, APGC, dated 28 October 1953. (U)

b. An interim report on the accelerated phase of this test (1 April 1954 to 23 June 1954) was published 14 September 1954. Principal items of the interim report are also included in this final report. (C)

c. A climatic hangar test of this aircraft was conducted by WADC and monitored by AFOTC. A copy of the flash report for the climatic hangar test (Flash Report No. 1, "OST of the RB-57A Aircraft," Project No. APG/TAT/122-B) and the comments of the Commander, AMC, regarding the aircraft deficiencies listed in the flash report are included in Appendix I to this report. (U)

d. An arctic test of the RB-57A was not conducted. (U)

e. The RB-57A was not evaluated for low altitude night photography because A-6 and B-4 photoflash cartridge ejectors were not available during the test period. (C)

2. PURPOSE AND DESCRIPTION OF TEST ITEM:

a. The RB-57A aircraft will be used primarily to obtain night photography of specific targets and to perform area or route surveillance with photographic confirmation, when applicable. The aircraft will also be used for limited day mapping and reconnaissance over enemy territory when local air superiority can be maintained for the duration of the mission. The RB-57A aircraft will be assigned to tactical reconnaissance wings under the direct control of the Commander of the Tactical Air Force or Tactical Air Command in a combat theater. (C)

b. The aircraft is manufactured by the Glenn L. Martin Company and is an all-metal, mid-wing, twin-engine, turbojet propelled monoplane with tricycle landing gear. It is 65.5 feet long, has a wing span of 64 feet, and is powered by two J-65-EW-5 axial flow turbojet engines. This aircraft is the USAF version of the British "Canberra" and is equipped with the Martin rotating bomb door which has a capacity of 21 M-120 Photoflash Bombs for night photography. A detailed description of the aircraft is included in Appendix A. (U)

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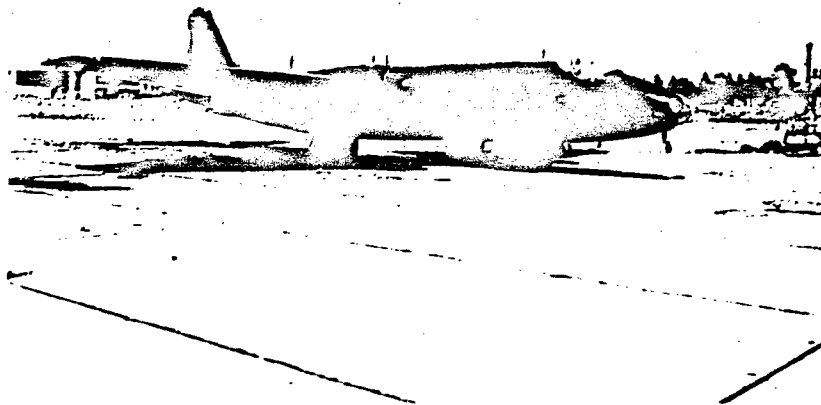


Figure No. 1. RB-57A Aircraft

3. OBJECT:

The object of this test is to determine the operational suitability of the RB-57A aircraft to accomplish the night reconnaissance mission, limited day topographic mapping, and day reconnaissance photography. In general, the following were investigated during the test:

- a. Suitability of the aircraft navigation system.
- b. Suitability of the aircraft photographic system.
- c. Suitability of the aircraft for penetrating radar defended areas.
- d. Vulnerability of the aircraft to day and all-weather fighters.
- e. Maintenance, materiel, and personnel requirements. (C)

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4. CONCLUSIONS:

It is concluded that:

a. The RB-57A aircraft in its present configuration is unsuitable for the overall reconnaissance mission required by the Tactical Air Command RB-57A Operational Plan.

b. The RB-57A is suitable for medium altitude night photographic operations in proper weather conditions when operating within 135 nautical miles from, and using the navigational facilities of, ground radar or Shoran installations. This limitation is due to the following combination of factors:

- (1) The RB-57A navigation system does not provide a precision positioning capability beyond the line-of-sight signal reception range of APW-11A and Shoran. (C)
- (2) The 12-inch focal length of the K-37 night camera restricts the effective operating altitude of this camera to approximately 12,000 feet in order to obtain photography of a satisfactory scale. (U)
- (3) Line-of-sight signal reception range at 12,000 feet is approximately 135 nautical miles. (U)
- (4) The nose position of the RB-57 is unsuitable for effective visual night photographic navigation. (C)

c. The RB-57A is potentially suitable for medium altitude night photographic operations at ranges commensurate with the radius of action of the aircraft (1000 nautical miles, plus). This will, however, require an improved aircraft navigation system to provide a precision positioning capability at such ranges. (C)

d. The nose visual position of the RB-57A is unsuitable because of insufficient working-space, restricted field of vision, and lack of safety provisions in this position. (C)

e. Poor visibility from the pilot's and photo-navigator's positions severely hampers use of the aircraft in visual reconnaissance and visual target search operations. (C)

f. The RB-57A armament and photographic control systems are basically suitable for the photo mission of the aircraft, but modifications are definitely required to achieve the maximum effectiveness from the systems. (See Appendix H, "RB-57A System Deficiencies.") (C)

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- g. The aircraft is suitable from a maintenance standpoint. (C)
- h. Aircraft performance characteristics of the RB-57A are suitable. (C)

i. Detection and tracking of the RB-57A by CPS-6 radar at altitudes of 50,000 feet or above are very poor for head and tail aspects. The detection and tracking characteristics of this radar improve when the RB-57 is in turns or presents a side aspect, but they are much less effective than at lower altitudes within the radar's area of coverage. (NOTE: The CPS-6 is the USAF counterpart of the Russian "Token" radar.) (S)

j. The RB-57A is very vulnerable to both day and all-weather jet interceptor aircraft in its present configuration without suitable tail warning and/or radar warning equipment. (C)

k. RB-57A day camera equipment is suitable for day combat mapping; however, it is only of marginal suitability for day reconnaissance photography because the K-38 camera shutter speed is too slow (1/150 sec.) to produce sharp negatives at jet aircraft speeds and lower altitudes. The camera has no image motion compensation. (C)

l. The RB-57A requires longer focal length night cameras to provide a capability for high altitude night photography. (C)

m. The suitability of the RB-57A for arctic operation has not been determined. (See Climatic Hangar Test Report and AXC Comments, Appendix I.) (C)

5. RECOMMENDATIONS:

It is recommended that:

a. Because of the extensive modifications required to redesign and equip the RB-57A for fully effective night reconnaissance operations, immediate consideration be given to the following alternate course of action: (C)

- (1) Manufacture a reconnaissance version of the present B-57B production aircraft, equipped with search type navigation and warning radar, suitable photo equipment, and a viewfinder, to replace the RB-57A aircraft in the current USAF combat aircraft inventory and. (C)
- (2) When a suitable replacement is available for the present RB-57A, retire these aircraft to some non-tactical mission such as target towing or training. (C)

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b. The following be accomplished if the RB-57A is to remain in the USAF combat aircraft inventory as a reconnaissance system: (C)

- (1) The RB-57A be equipped with a suitable airborne search type radar set to provide a navigational capability beyond the range of APW-11A or Shoran. (C)
- (2) The RB-57A nose section be redesigned to provide the navigator with more comfortable working space, better visibility, and greater safety in this position; or, if this is not feasible, the use of the nose station be discontinued and a viewfinder be installed in the rear navigator position for visual flight line direction in day mapping and day reconnaissance operations. (C)
- (3) VHF omni-range equipment be installed in the RB-57A to improve the radio-navigation capability of the aircraft. (C)
- (4) The deficiencies listed in Appendix H, "RB-57A System Deficiencies," be corrected. (C)

c. Action be expedited to provide a night camera with longer focal length in order to equip the RB-57A and other night reconnaissance aircraft for effective high altitude night photography. (C)

d. Necessary action be taken to develop a checklist that can be used effectively with the red night-lighting system of the RB-57A and other aircraft primarily engaged in night operations. (C)

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DISCUSSION

1. ORGANIZATIONAL IMPACT:

a. Personnel:

The number of personnel authorized by Table of Organization 1-1457P, dated 1 November 1953 is inadequate in that four additional weapon mechanics (two with AFSC 46230 and two with AFSC 46250) and 18 additional aircraft mechanics (AFSC 4315K or 4313K) are needed per reconnaissance squadron. (See "Maintenance and Materiel," Appendix G.) (C)

b. Training:

- (1) **Ground Crews:** Factory training should be available to maintenance supervisors, aircraft crew chiefs and armament personnel prior to receipt of aircraft. All other assigned ground support personnel can be trained through OJT. (C)
- (2) **Flight Crews:**
 - (a) The initial flight training of aircrews poses no serious problem. Pilots (AFSC 1234G) require indoctrination in jet operation and should, if feasible, be currently qualified in both jet and multi-engine aircraft at time of checkout in the RB-57A. Care should be taken during pilot training to insure that the pilot is fully qualified in single-engine operation of twin-engine aircraft. Navigators fully qualified in AFSC 1525G require only normal Mobile Training Unit (MTU) ground school on aircraft systems and emergency systems in order to check out for operational flight training in the aircraft. (C)
 - (b) Operational flight training of aircraft crews should stress the use of Shoran, APW-11A and the T-1 Optical Sighting Head for photoflash bombing. Special attention should also be given to the training of observers during the operational flight training phase to insure that observer crew members are thoroughly proficient in dead reckoning and celestial navigation. (C)

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1. Equipment:

In general, the authorized equipment is adequate to support this type aircraft. For particular deficiencies, see "Maintenance and Material" Appendix G. (C)

1. Facilities:

- (1) A 7000-foot runway, hard surface or PSP, is adequate for normal operation of the RB-57A. Emergency operations, with light landing weights, can be conducted from 5000-foot runways. (C)
- (2) DHF-DF and GCA facilities should be provided to assist in post-strike recovery of aircraft. (C)
- (3) Liquid oxygen must be provided for this aircraft. This item continues to be a primary problem area for logistical support of the RB-57A under combat conditions. It is not limited to this aircraft, however, but applies also to the F-84F, B/RB-66, and all other aircraft programmed to be equipped with the liquid oxygen system. (C)

2. CAPABILITIES:

1. The RB-57A has a radius of action of over 1000 nautical miles from ~~maximum~~ altitude profiles. (C)

2. The RB-57A has a radius of action of over 400 nautical miles from ~~minimum~~ altitude operation. (C)

3. The RB-57A can be effectively flown at altitudes in excess of 50,000 feet. (C)

4. The aircraft can operate from PSP runways 7000 feet in length, and require only film, armament, fuel, and liquid oxygen for emergency ~~combat~~ operation. (C)

5. The RB-57A is very easy to fly and poses no serious training problem for pilot transition from multi-engine conventional aircraft. (C)

6. The T-1 Optical Sighting Head (an unstabilized, reflex type sight, located in the nose section of the aircraft, is sufficiently accurate for day pinpoint photography, day mapping photography, and for night photography of targets that are lighted or that otherwise present identifiable aiming points. (C)

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g. The RB-57A bomb door with a full bomb load can be rotated to the open position without excessive buffeting or pitch-up at indicated airspeeds up to 325 knots and bombs can be dropped from the bomb door at speeds up to the maximum airspeed limitation of this aircraft. (C)

h. The photo system of the RB-57A is easy to operate, uses standard equipment, and is dependable in operation. (C)

i. Cameras for the aircraft may be easily and rapidly installed or removed. (C)

j. The aircraft's precision positioning system (APW-11A and Shoran) provides adequate accuracy for definite fixes and photography of fixed targets required for day and night reconnaissance provided that the desired area coverage is within the line-of-sight range limitations of the positioning equipment. (C)

k. The RB-57A can be employed as a bombardment aircraft by changing the configuration of the bomb door to accommodate different types of bombs. Accuracy with this arrangement will depend on the control method used. Methods available include manual Shoran with oral arc direction, MSQ-1 direction, using APW-11A and APA-90 Indicator Group as desired, and fixed angle bombing using the T-1 Optical Sighting Head. (C)

l. The external stores racks of this aircraft can be used for manual release of different types of bombs, including Napalm. (C)

m. The speed of the RB-57A (.78 Mach) is in a range comparable to speeds of other currently operational USAF jet bomber aircraft. (C)

3. LIMITATIONS:

a. The RB-57A has no self-contained navigation system suitable for night photography beyond range of MSQ-1 or Shoran. (C)

b. Use of the nose visual station requires that the navigator leave his ejection seat, remove his seat-type parachute, and take a very uncomfortable position lying on the catwalk leading to the nose position. This position has no safety belt, restraining straps, or suitable emergency escape hatch. It is, in addition, so cramped and uncomfortable that it can be used continuously for only short periods of time. (C)

c. Use of the bomb door system with a full load of M-120 bombs at higher indicated airspeeds (above 350 knots) is accompanied by turbulence and aircraft pitch-up during bomb door rotation that increases in intensity with indicated airspeed. This results in a pronounced buffet and pitch-up at 400 knots IAS and a severe pitch-up at 450 knots IAS. (C)

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d. Changes in configuration of the RB-57A bomb door to accommodate different ordnance loads takes excessive time to accomplish (approximately 2½ hours). (C)

e. The pylons for external stores must be equipped with "kick-off" braces in order to drop Napalm bombs. (C)

f. The present starting procedure for the RB-57A specifies the use of an auxiliary power unit for all starts except in emergency. This requirement detracts from the mobility characteristics of the aircraft. (See Appendix H.) (C)

g. The RB-57A requires liquid oxygen. This type of oxygen cannot, at the present time, be effectively stockpiled. It must be manufactured and delivered in special oxygen carts to the aircraft. This requirement also detracts from the mobility characteristics of the RB-57A. (C)

h. Visibility is very restricted in the RB-57A. There is no rearward visibility past the leading edge of the wing from any crew station in the aircraft, and visibility from the pilot's station is restricted for almost all maneuvers except taxiing and landing. (C)

i. Operation of the RB-57A at altitudes above 45,000 feet requires the use of T-1 partial pressure suits for crew members. The RB-57A does not have a face plate heater electrical outlet for the T-1 suit, the AIC-10 interphone system must be equipped with an adapter in order to accommodate the T-1 suit headset and microphone plug, and the ejection seat of the RB-57A is not designed to accommodate the C-1 bottle assembly of the partial pressure suit. (C)

j. The RB-57A has no effective anti-icing or de-icing systems. (C)

k. The RB-57A Shoran equipment is currently limited for pressurized operation at 45,000 feet or below and the AFN-11A installation has been tested for explosion proofing only up to 40,000 feet altitude. (C)

4. TACTICS AND TECHNIQUES:

a. Night Photography with MSQ-1 or Shoran:

The tactics and techniques that afford the most favorable probability of effectively accomplishing the night photo mission are those associated with MSQ-1 direction and Shoran navigation. The RB-57A Shoran installation does not constitute an MA-1 system and has no

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APA-54A Shoran recorder. Details concerning employment of these methods of control are included in the "Operating Procedures," Appendix F of this report. Specific techniques that pertain to each, however, are as follows: (C)

- (1) AN/APN-84 Shoran: The Shoran equipment of the RB-57A does not include a comparator unit or PDI. This places a great deal of emphasis on crew coordination in order to achieve effective results from oral arc direction. The following procedure was used to good advantage to assist the pilot in flying the Shoran arc during this test: (C)
 - (a) The navigator preplanned the entry point on the Shoran arc and computed the Shoran arc heading at that point. (C)
 - (b) The navigator also preplanned the "bombs away" point on the arc and compared the heading for this point with that of the entry point on the arc. The difference in headings was then correlated with the planned time to fly between the two given points to produce a preplanned rate of turn necessary to stay on the Shoran arc. (C)
 - (c) The above steps finally provided the pilot with:
 1. Initial heading upon intercepting arc.
 2. Degrees per minute change expected while on arc.
 3. Final heading for bombs away. (C)
- (2) AFW-11A:
 - (a) It must be stressed to ground controllers of MSQ-1 sites that the location of the aircraft, at the moment of flash bomb explosion, is very important and that small corrections may be made even after bombs away, depending on the bomb fuze setting, in order to bring the aircraft over the target as the bomb explodes. (C)
 - (b) Day mapping: Very accurate mapping results may be obtained using AFW-11A, the APA-90 Indicator Group, and an MSQ-1 ground radar installation with a skilled controller. The following, however, will do much to increase the probability for an effective, satisfactory mission: (C)

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1. The MSQ-1 site should be sufficiently close to the mapping area (within 100 NM) to insure that the APN-11A receiver antenna will not be shielded excessively during maneuvers. (C)
2. Flight lines should be planned with ample maneuvering areas prior to the point designated to start cameras. The aircraft should be on the correct heading for the flight line when the cameras begin operating and only minor direction changes should be required throughout the flight line run. (C)
3. All corrections indicated by the APA-90 should be made smoothly, accurately, and as soon as camera operation will permit. Headings should be held as accurately as possible. (C)
4. The navigator should inform the pilot immediately as each exposure is made in order that the pilot may make required corrections while cameras are not operating. (C)

b. Night Photography Beyond Range of MSQ-1 or Shoran:

Night photography of targets beyond the range of MSQ-1 or Shoran is comparatively ineffective, since en route navigation must be accomplished by dead reckoning and/or celestial methods, and photo navigation must be accomplished by pilotage or dead reckoning navigation. These methods leave much to be desired in this aircraft. However, optimum results will be obtained for this type mission if the mission can be scheduled on nights with a half-moon or more and good visibility exists to aid in dead-reckoning route navigation, drift determination, and initial point or distinctive terrain identification. Navigation aspects of the mission should be carefully preplanned and should use the most accurate and latest wind data available. The nose visual station must be used for drift determination. An IP-target photo run should be accomplished for this type of mission and care should be taken to preplan an IP that is easily recognizable and within two minutes range of the target, if possible. The nose position must be used for the IP-target run, and the bomb release point should be planned both on a time-distance and pilotage basis, if feasible. Photo system operation should be accomplished in accordance with night photo operating procedures included in the "Operating Procedures," Appendix F of this report. (C)

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c. Day Photo Operations:

The RB-57A should be accompanied by fighter escort when operating in areas where daylight interception can be expected. This is required to give the RB-57A warning as well as protection, since rear visibility is very poor in this aircraft and no tail warning device is provided. The mission should be carefully preplanned if it includes use of the nose station as the navigator will not have access to instruments or room for computation. (C)

d. Night and All-Weather Operation:

- (1) Icing areas should be avoided. (C)
- (2) UHF/DF facilities should be used to augment the limited capability of the aircraft radio compass for recovery of the aircraft upon completion of the mission. (C)
- (3) Consideration should be given to low altitude operation if the target lies within the low altitude operating range of the aircraft, and especially if it is known the enemy is utilizing all-weather interceptors in the area. Night and all-weather en route flying should be accomplished at the maximum effective operating altitude of the aircraft for targets beyond the low altitude operating range of the RB-57A. (C)

e. Day Fighter Escape and Evasion:

The RB-57A has very good maneuverability, but has a slower rate of roll than the average fighter aircraft. It has light wing loading and has a very favorable high "G" limitation (approximately $2\frac{1}{2}$ "G" at 40,000 feet), but it cannot out-turn or out-climb a MIG-15 at any altitude, according to performance tests of that aircraft obtained on another APGC project. The maximum airspeed of the RB-57A is much slower than that of the average day fighter. Finally, the rear visibility from the RB-57A is very poor and the aircraft has no tail warning device. In view of these limitations, engagement with enemy fighters should be avoided if possible. Optimum tactics and techniques to be followed in the event of interception will vary with conditions and must be formulated by the RB-57A pilot for each individual situation so as to exploit the advantages of his aircraft and capitalize on any mistakes made by the fighter pilot. Cloud cover should be used if it is readily available. Consideration should be also given to immediately descending to minimum altitude to eliminate enemy dive and fly-through attacks, provided that this can be done while avoiding enemy attacks. This also

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serves to decrease enemy GCI coverage of the RB-57 and shorten the individual fighter endurance because of increased fuel consumption. It works against the RB-57A fuel supply as well, however, and this must be considered in any decision regarding use of this maneuver. (C)

f. All-Weather Interceptor Escape and Evasion:

Test results indicated escape and evasion capability from all-weather interceptors depends primarily on a warning device to detect the intercepting aircraft. However, a sharp, high "G," climbing turn should be made into the direction from which the interceptor is attacking if the location of the interceptor is known. The climbing turn should be made when the interceptor is closing to firing range. This is approximately 1500 feet with current systems, and the turn should thus be executed when the interceptor is approximately 5000 feet from the RB-57A, if this range can be determined. The maneuver should be made after the interceptor is committed to a pass and too late for the interceptor to follow the evasive maneuver effectively. A series of climbing and descending turns, varying altitude 500 feet or more and heading 30 degrees or more, is an effective maneuver against all-weather interceptors if the interceptor can be detected at ranges of three miles or more. (S)

5. COLLECTIVE ANALYSIS:

a. The RB-57A is intended to accomplish the night reconnaissance mission for Tactical Air Command and replace the RB-26 aircraft currently used in this role. The RB-26 was the primary night tactical reconnaissance aircraft during the Korean Conflict, but its capability was quite limited and use of the aircraft did not consistently produce results that compared favorably with the support effort involved. The importance of night reconnaissance, however, was accentuated during this period when our day air superiority forced the enemy to perform the majority of his resupply activities at night. Effective night reconnaissance would have been extremely valuable during the Korean Conflict, but could not be satisfactorily accomplished due to the limitations of the RB-26 weapon system. (C)

b. The limitations of the RB-26 aircraft most evident in Korean operations were those associated with the navigation system. It is also limited in airspeed, operational ceiling, and radius of action, but these were not critical factors in Korea due to the relatively light opposition encountered and the restricted area of combat operations. The many inherent shortcomings of the RB-26 rendered it virtually obsolete for a modern war, and a replacement was urgently needed for this aircraft, even during the Korean action. It is certain that this requirement for an effective night reconnaissance aircraft still exists

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since the USAF continually faces the possibility of limited offensives, if not an all-out war, against the same enemy that demonstrated an ability to perform troop movement and major resupply activities under cover of darkness. The RB-57A was tested to determine its suitability to provide the improved night reconnaissance capability that is required. (C)

c. To accomplish the night reconnaissance mission, the Tactical Air Command Operational Plan for the RB-57A specifies that this aircraft will operate over the tactical area between the main line of resistance and the operational range of the aircraft. This operational plan indicates that a combat radius of action of 900 nautical miles or more is required for RB-57A night photo operations at altitudes of 10,000-12,000 feet over the target. The plan also specifies that the aircraft have a capability for limited day mapping and day reconnaissance over enemy territory when local air superiority can be maintained for the duration of the mission. It further includes a requirement for area or route surveillance with photographic confirmation when applicable. (S)

d. A comparison of the capabilities of the RB-57A with the requirements set forth by the using organization shows that the RB-57A cannot effectively accomplish the night reconnaissance mission over the complete area between the main line of resistance and the operational range of the aircraft. The maximum effective radius of action for night photography with the RB-57A is less than 15% of the 900 nautical miles radius desired by Tactical Air Command. The comparison also shows that the aircraft is marginally suitable for its secondary mission of limited day mapping and day reconnaissance because of its dependence on an unsuitable nose station. These activities, however, must be accomplished with fighter escort or complete local air superiority due to the vulnerability of the aircraft to tail attacks. Finally, the comparison between capabilities and limitations shows that the RB-57A is also unsuitable for the area or route surveillance mission because of the limited visibility from the normal crew positions in the aircraft and the lack of working space, comfort, and safety in the nose position. (S)

e. The RB-57A is prevented from being fully suitable for the night reconnaissance requirements of the Tactical Air Command Operational Plan by two simple, but formidable, factors. One is that the aircraft has no suitable navigation system for night photography except Shoran and APN-11A. The other is the poor visibility from the aircraft due to the design of the aircraft crew compartment. Improvement of the RB-57A aircraft to correct these limitations will undoubtedly require extensive modification. Questions that must be answered by planning personnel are: First, will the end product of modification be worth

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time, effort, and expense involved? And, second, how can the aircraft be best utilized if it is not modified? The answers to these questions may be more clearly arrived at if the advantages of the basic RB-57A airframe are considered. (S)

f. The advantages of ease and simplicity of operation, suitable maintenance characteristics, and excellent aircraft performance attributes make the RB-57A almost ideal as a basic airframe for tactical operations. The mobility characteristics of the aircraft are exceptionally attractive, and the aircraft can operate from relatively short PSP runways or staging areas without extensive logistical support. The simplicity and ease of maintenance of the RB-57A aircraft systems are also very desirable features in view of the current USAF personnel situation. Considerable difficulty is being experienced in retaining skilled maintenance and ground support personnel in the service. The RB-57A, however, adapts to this situation without serious impact. (C)

g. In summation, the RB-57A is an aircraft that has many exceptionally favorable and suitable features that would be of great benefit in night reconnaissance operations. However, these features cannot be fully exploited nor can the entire night tactical reconnaissance mission be performed with the aircraft in its present configuration. This aircraft will require extensive modification in order to fully provide a suitable capability for its required mission, and it is questionable if this would be feasible in view of the time, effort, expense and the limited number of aircraft involved. A better course of action to be followed with this aircraft would probably be one of the following: (C)

- (1) Manufacture additional B-57 type aircraft that conform to the requirements of night tactical reconnaissance in view of the advantages of the basic RB-57 airframe and retire the present RB-57A inventory to tow-target, transition training, or other non-tactical missions. Modification of these aircraft to tow-target requirements would be especially appropriate since the Glenn L. Martin Company is preparing to manufacture a number of B-57B type tow-target aircraft at the present time. (C)
- (2) Retain the RB-57A in reconnaissance organizations for an interim period and only until a suitable re-

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placement aircraft is available, and then assign these aircraft to some non-tactical mission. (C)

W. B. Putnam
W. B. PUTNAM
Colonel, USAF
Commander

APPENDICES

- A. Detailed Description of the Equipment
- B. Related Tests
- C. Test Procedure
- D. Test Results
- E. Selected RB-57A Photography
- F. Operating Procedures
- G. Maintenance and Materiel
- H. RB-57A Systems Deficiencies
- I. Climatic Hangar Test Report and ALC Comments
- J. Flash Reports

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time, effort, and expense involved? And, second, how can the aircraft be best utilized if it is not modified? The answers to these questions may be more clearly arrived at if the advantages of the basic RB-57A airframe are considered. (S)

f. The advantages of ease and simplicity of operation, suitable maintenance characteristics, and excellent aircraft performance attributes make the RB-57A almost ideal as a basic airframe for tactical operations. The mobility characteristics of the aircraft are exceptionally attractive, and the aircraft can operate from relatively short PSP runways or staging areas without extensive logistical support. The simplicity and ease of maintenance of the RB-57A aircraft systems are also very desirable features in view of the current USAF personnel situation. Considerable difficulty is being experienced in retaining skilled maintenance and ground support personnel in the service. The RB-57A, however, adapts to this situation without serious impact. (C)

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- (2) Retain the RB-57A in reconnaissance organizations for an interim period and only until a suitable re-

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DETAILED DESCRIPTION OF THE EQUIPMENT

1. THE AIRCRAFT:

a. The RB-57A, built by the Glenn L. Martin Company, is an all metal, mid-wing, twin-engine, turbo-jet propelled monoplane with retractable tricycle landing gear, and a rotary bomb door for carrying illuminants. The most distinguishing feature for aerial identification of the aircraft is the chord of the wings from the root to the engine nacelles and the extremely low aspect ratio of the aircraft wing. The fuselage is semi-monocoque with a pressurized cabin for the crew of two. The nose section provides for a pilot with the necessary flight and auxiliary controls and for a photo-navigator behind and to the right of the pilot, with navigation and camera controls. A visual observation station in the form of a transparent nose is located in the nose section forward of the pilot station for the photo-navigator. This station includes interphone and oxygen provisions and a camera control for initiation of photography. (U)

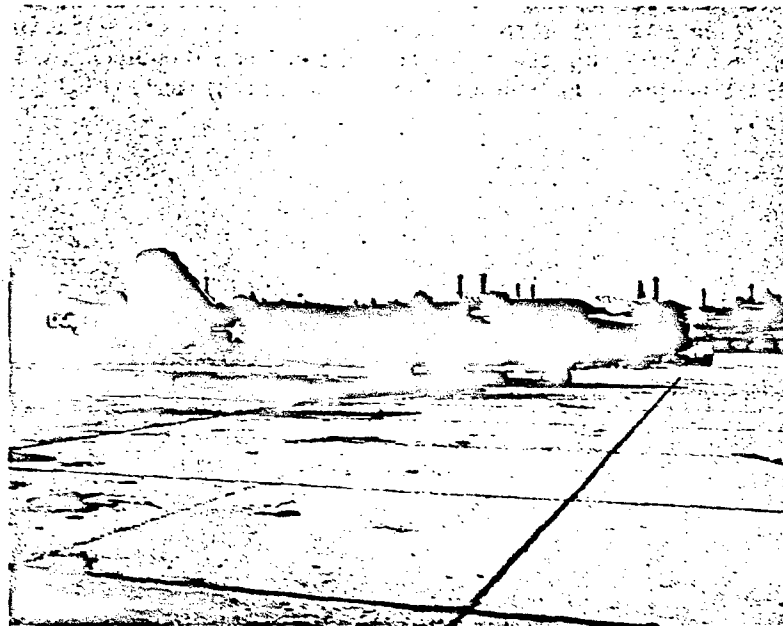


Figure No. 2. RB-57A Aircraft, Side View

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b. The canopy and fuselage crown structure above the pilot and photo-navigator are jettisonable to provide emergency exits for the crew by means of ejection seats. These seats are equipped with Stanley automatic release type safety belts and are designed for seat type parachutes. The fuselage center section contains the main fuel tanks, the removable rotating bomb door, battery compartment for the single aircraft battery, electronic equipment and the aircraft cameras. The aircraft aft section consists of the fuselage section, variable incidence horizontal stabilizer, two interconnected elevators, a single vertical stabilizer with a swept-back leading edge, a metal covered rudder and tabs on both the elevators and rudder. Shoran, APW-11A, AFN-22, and other electronic equipment and antennas are located in the aft fuselage section in addition to stowage facilities for miscellaneous ground handling equipment. A stationary tail bumper is installed beneath the aft section to prevent damage to the rear of the aircraft during nose high landings. The aircraft wing is of full cantilever design, with leading edge fuel tanks, inboard and outboard split type flaps, finger type dive brakes, beak type ailerons and provisions for jettisonable wing tip tanks and photo-flash cartridge ejectors. Provisions for two bomb pylons are located on the lower surface of each wing on which may be mounted stores of various types. The aircraft is equipped with the AN/ANH-2 sound recorder to record visual observations for ground playback. The basic design of this aircraft adheres closely to that of the Canberra B5/57 design (B22/48 wing), and no changes from the Canberra design were made for the express purpose of meeting the requirements of the Handbook of Instructions for Aircraft Designers and subsidiary specifications. (U)



Figure No. 3. RB-57A Aircraft, Head-on View
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c. Approximate overall dimensions of the RB-57A are as follows:

Length	65.50 feet
Wing span	64.00 feet
Height (to top fin)	14.80 feet. (U)

2. THE ENGINES:

a. The engines installed in the RB-57A are two J-65-EW-5 axial flow turbo jets, manufactured by the Curtiss-Wright Aeronautical Corporation. Each engine is rated at 7200 pounds thrust for take-off and military power. It is rated at 6400 pounds thrust for continuous normal power. (U)

b. This engine has 13 compressor stages, a static sea level pressure ratio of 7:1, a two-stage turbine and a single annular combustion chamber with an external diameter of 37 3/4 inches. The engine weighs approximately 2600 pounds and is 130.66 inches long. It is equipped with a General Electric cartridge starter. (U)

c. The fuel control for this engine is the Bendix TJ-L1-6. This fuel control has an emergency feature to provide manual control of fuel metering in the event of failure of the normal fuel control system. The emergency fuel control can be operated manually by moving the emergency fuel control switch to "Emergency" position. The emergency system will also operate when this switch is in "Take-Off" position and throttle is retarded to cause the fuel flow to fall below that required for 80% thrust at sea level on a 38°C day. This will also occur at approximately 6000 feet altitude if the switch is not returned to the "Off" position before reaching that altitude after take-off. (U)

d. This engine is designed to use MIL-5-5624A-JP-4 fuel and MIL-L-7808 oil. The oil tank is mounted on the engine and has a usable capacity of 2.88 U.S. gallons per engine. The total usable internal fuel capacity of the aircraft is 2832 gallons. An additional 640 gallons may be carried in tip tanks. Each engine is equipped with an engine driven fuel pump. (U)

e. Overheat warning is provided by a system of nine overheat detectors located aft of the engine firewall. Fire warning is provided by nine detectors located in areas forward of the engine firewall. The circuit requires 28-volt DC power. Circuit and indicator lights may be tested separately during aircraft preflight operations. (U)

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3. THE ARMAMENT SYSTEM:

a. The internal bomb carrying capability for the RB-57 is provided by a horizontal rotary type, bomb carrier door. This door rotates 180 degrees to expose the bombs to the aircraft slipstream before being dropped. This rotation seals off the bomb bay cavity and is intended to decrease the turbulence normally encountered in conventional bomb bays when bomb doors are opened at high speeds. The door will carry 21 M-120 photoflash bombs and can be fitted to carry other types of bombs. Normal bomb drops are controlled through the aircraft camera control system. (U)



Figure No. 4. RB-57A Bomb Door Half-Opened

b. The bomb door can be removed from the aircraft by employing four portable AN-Mark 8, Model O bomb hoists. Preloaded bomb doors can be stored in different bomb configurations and used as required. Bombs can be released from the pilot's, navigator's, or visual observation position if the camera control panel is set up to provide the desired operation. The bombs can also be jettisoned in emergencies by actuating

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a switch at the pilot's position. This action automatically opens the bomb door before bombs are dropped. Two external bomb pylons may be installed under each wing for carrying external stores. (U)

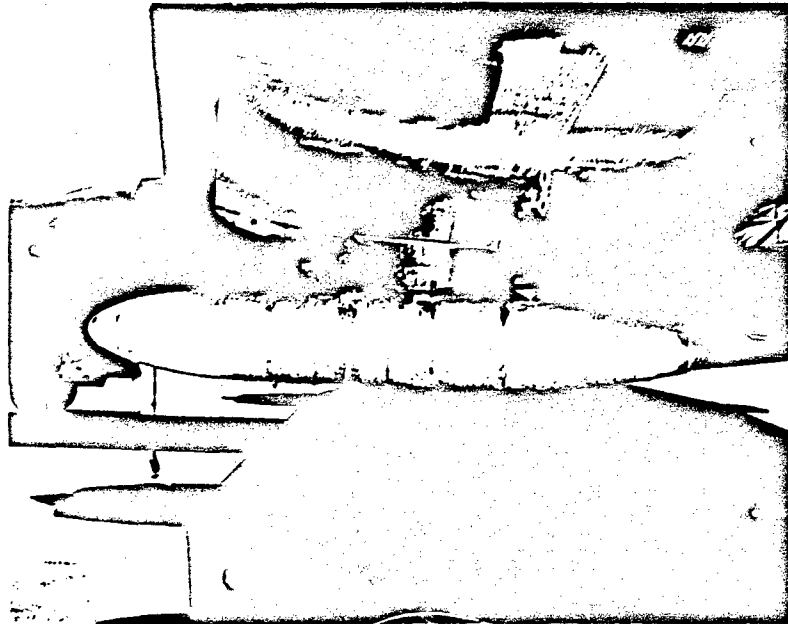


Figure No. 5. Napalm Bomb on RB-57A External Store Rack (with kick-off brace)

c. A complete electric control system is provided to arm and release, or jettison, the external stores and bombs from the door. A master armament switch, located at the pilot's position, controls power for all normal armament. Indicator lights are installed at the pilot's position to indicate bombs remaining on the bomb door when the master armament switch is ON. (U)

d. Provisions have been made for installing A-6 and/or B-4 photoflash cartridge ejectors to provide illumination for low altitude night photography when this equipment becomes available. Two ejectors will be installed in each wing of the aircraft. The A-6 ejector has a capacity of 52 M-112 photoflash cartridges and the B-4 ejector has a

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capacity of 20 cartridges each. Cartridge ejection will be remotely controlled through the aircraft photo control system. (U)

4. THE PHOTOGRAPHIC SYSTEM:

a. The photographic system of this aircraft consists of two tandem camera stations located in an air-conditioned camera compartment aft of the rotary bomb door. The camera stations are remotely controlled from a photo control panel located on the right side of the crew compartment adjacent to the aft photo-navigator's position. (U)

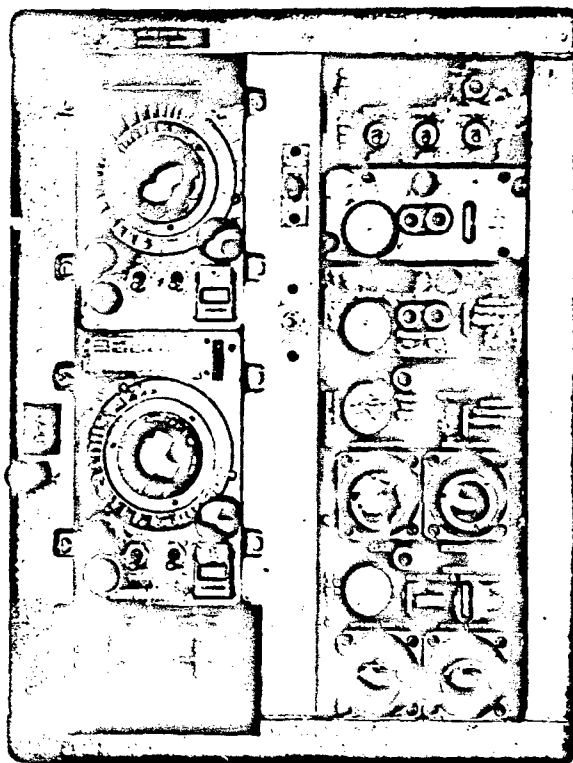


Figure No. 6. RB-57A Camera Control Panel

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b. The forward station contains a split-vertical installation of two K-37 cameras for low altitude night photography with photoflash cartridge illumination or a split-vertical installation of two 24-inch focal length K-38 cameras for supplemental day photography. The aft camera station contains a vertical installation of one K-37 camera for medium and high altitude night photography with M-120 photoflash bomb illumination or one T-11 camera with 6-inch focal length of day topographic mapping photography. All K-37 cameras are equipped with A-18 Image Motion Compensating (IMC) magazines controlled by C-4 control units installed on the camera control panel. (U)

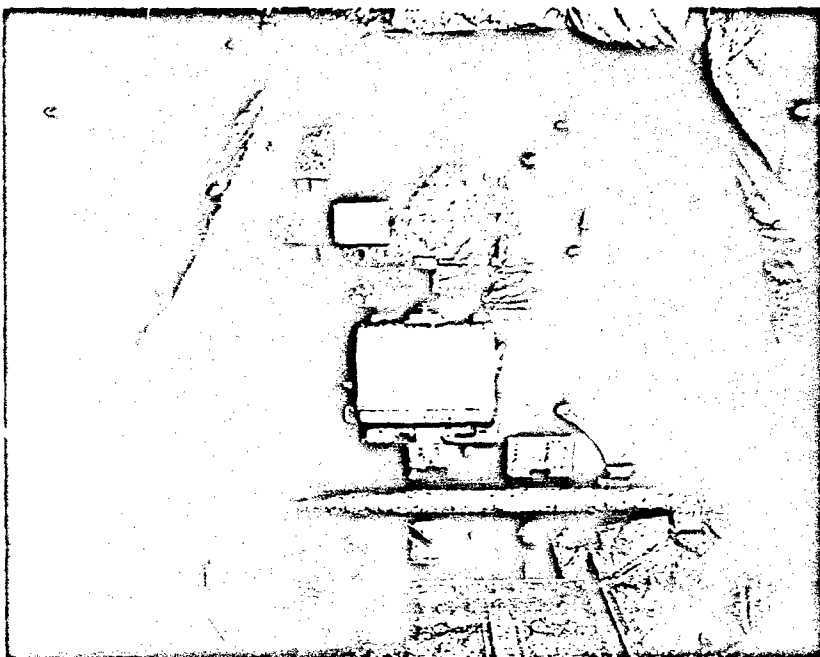


Figure No. 7. RB-57A Camera Compartment
(Night K-37 Camera Configuration)

5. THE NAVIGATION SYSTEM:

a. The RB-57 is presently equipped for the following navigation methods:

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- (1) Dead reckoning navigation.
- (2) Radio compass navigation (ARN-6).
- (3) Shoran navigation (AN/APN-84).
- (4) Ground controlled flight path by MSQ-1 ground radar with APW-11A radar beacon.
- (5) Celestial navigation. (C)

b. The aircraft is equipped with the following navigation equipment:

- (1) Nose visual observation position:
T-1 Optical Sighting Head for drift reading. (No other instrument in nose position.) (U)
- (2) Rear navigation station:
 - (a) True Airspeed Meter
 - (b) Free Air Temperature Gage
 - (c) Pressure Altimeter
 - (d) J-2 Compass Remote Indicator
 - (e) Radio Compass (AN/ARN-6) Control Box and Indicator
 - (f) AN/APN-84 Shoran Indicator
 - (g) Periscopic Sextant Mount (C)
- (3) Pilot's position:
 - (a) J-2 Compass Master Indicator
 - (b) Pressure Altimeter
 - (c) AN/APN-22 Radar Altimeter
 - (d) Radio Compass (AN/ARN-6) Control Box and Indicator

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(e) AN/APN-11A Radar Beacon with AN/APA-90 Indicating
Group (U)



Figure No. 8. Nose Visual Station Showing
T-1 Optical Sighting Head

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RELATED TESTS

1. The following reports were consulted during this test for information pertaining to each referenced subject: (U)

a. AF Technical Report No. AFFTC 54-20, Phase IV Stability and Control Tests of the B-57A Airplane.

b. AF Technical Report No. AFFTC 54-23, Phase VI Test of the RB-57A Aircraft.

c. APG Project No. 8-45-17, Tactical Suitability Test of the A-26 Aircraft for Night Photography.

d. Project No. APG/TAB/4-A, Operational Suitability Test of the RB-45 Aircraft.

e. Project No. APG/TAE/88-AB, Operational Suitability Test of the AN/AFN-22 Radar Altimeter.

f. Project No. APG/SSB/34-AB, Operational Suitability Test of the K-38 Camera and the A-8B Magazine.

g. Project No. APG/SSB/222-AB, Operational Suitability Test of the A-18 Magazine.

h. Project No. APG/SSB/8-AB, Operational Suitability Test of the K-37 Camera.

i. Project No. APG/SSB/149-AB, Operational Suitability Test of the T-11 Mapping Camera.

j. Project No. APG/TAE/31-A, Operational Suitability Test of the MSQ-1 and AFN-11.

k. Project No. APG/TAB/75-A-2, Letter Report on Detection and Tracking of F-84 and B-45 Aircraft at High Altitudes by AN/FPS-3 Radar.

l. AIIR IR-181-54, British Night Photographic Trials of F.24 Camera and 4.5-Inch Photoflash Bombs.

m. AIIR IR-2283-53, British Night Photo Trials with the Canberra PR-3.

n. AIIR IR-211-54, British Trials of 16 1/2-inch Photo Flash in Canberra PR Mk 3.

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o. AIIR IR-105-54, British Clearance of 4.5-Inch Flash Bomb
on Canberra.

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TEST PROCEDURES

1. TEST PROGRAM:

a. The test program for the operational suitability test of the RB-57A was divided into nine categories as follows:

- (1) Equipment checkout
- (2) Day mapping
- (3) Pinpoint photography
- (4) Medium and high altitude night photography
- (5) Low altitude night photography
- (6) Navigational procedures
- (7) Visual reconnaissance
- (8) Evasion and escape
- (9) Penetration of, and withdrawal from, radar defended areas. (C)

b. The above categories were accomplished in the order listed to the extent that test facilities and aircraft availability permitted. However, many categories were, of necessity, conducted concurrently in order to insure maximum aircraft and test facility utilization. (U)

2. MISSION RECORDS:

a. Data recording methods were individually planned for each mission as specified by the test program. This data was reduced by the project test team or the 3206th Test Wing (Technical Support), as required. (U)

b. Records were compiled for each test sortie scheduled and/or flown during this test. Each sortie record included the following information:

- (1) Date scheduled
- (2) Mission number
- (3) Aircraft number

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- (4) Scheduled take-off and landing time
- (5) Actual take-off and landing time
- (6) Total flying time for mission
- (7) Crew flying sortie
- (8) Description of mission
- (9) Remarks to include:
 - (a) Percentage of effectiveness of sortie
 - (b) Reason for late take-off, if applicable
 - (c) Reason for cancellation, if applicable. (U)

c. A special flight report was completed by each crew for each test sortie flown during the test. The report included:

- (1) All information pertaining to system malfunction or operating difficulties encountered.
- (2) Photo configuration used.
- (3) Type of illuminants used with notes of the number dropped and results attained.
- (4) Navigational method employed.
- (5) Altitude, TAS, fuze settings of bombs, and trail plate configuration.
- (6) Mission results.
- (7) Mission resume to include pilot's and photo-navigator's comments.
- (8) Project officer's evaluation of the mission results. (U)

3. PHOTOGRAPHIC TESTS:

a. Resolution Tests: The resolution target at Baldsiefen Field, Auxiliary #8 was photographed at various altitudes utilizing all of the aircraft's positioning methods on day and night sorties. The resolution was then computed from the negatives of the photographs taken. (U)

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b. Mosaic Photography: A separate photo overlay was prepared from the photographs of each mission. Each photograph was analyzed for:

- (1) Film quality
- (2) Photo scale for altitude variation
- (3) Photo overlap
- (4) Flight line side-lap

Flight lines were controlled by the T-1 Optical Sighting Head or APX-11A with APA-90 Indicator and MSQ-1 ground radar. (C)

c. Night Photography: All film for night photo missions was marked with three "signature shots" immediately before take-off and were made by actuating the cameras three times while holding a flashlight beneath the lens. The shots were processed and were not cut from the film roll. This procedure eliminated the question of faulty processing when camera malfunctions occurred during the test. Mission reports were prepared for all photo missions to record all photographic malfunctions and/or system shortcomings noted during each mission. (U)

4. NAVIGATION TESTS:

a. Navigation errors were computed from photo plots whenever possible. Night time navigation errors, however, were determined by visual fixing procedures. Such missions were planned to terminate at, or in close proximity to, a lighted city to make this method as effective as possible. Day navigation missions were used primarily to establish errors to be expected from each system. Night missions were flown primarily to determine if night operations introduced any additional operating difficulties. The one outstanding exception to this procedure was the celestial navigation missions. Here, the day missions were for the utilization of sun line type navigation while the night missions used star fixes. (C)

b. Shoran navigation missions during daylight hours were conducted under simulated night conditions with the observer's compartment completely blacked out. (U)

5. APX-11A CONTROL SYSTEM TESTS:

a. The APX-11A system was tested for control effectiveness during climbs and descents of 1500 feet per minute and in left and right turns with 30° of bank. This test was conducted for all ranges up to and including 200 nautical miles from the MSQ-1 ground station.

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The track of the aircraft was recorded at the ground station, and all areas of intermittent or no contact were designated. (C)

b. The system was also employed for control in mosaic mapping and in night photoflash bomb photography at altitudes up to 40,000 feet. Suitability of the system for such operations was determined from photographic results and from the malfunctions and difficulties noted during each mission. (C)

6. AIRCRAFT PERFORMANCE TEST:

a. Performance testing was held to a minimum by maximum use of research and development test results when these were available. Data Boxes and Pilot's Data Cards were used to gather aircraft performance information. One test aircraft, RB-57A serial number 52-1432, was equipped with a Data Box and a camera installation to record readings of the following instruments:

- (1) Airspeed Indicator
- (2) Tachometers
- (3) Fuel Flow Meters
- (4) Fuel Quantity-Gage
- (5) Exhaust Gas Temperature Gages
- (6) Altimeter
- (7) Machmeter
- (8) Free Air Temperature Gage. (U)

b. Take-off and landing distances were measured by means of phototheodolites and Vinten Take-off Cameras. Wind and atmospheric conditions were recorded at time of each operation, and distances were later reduced to no-wind NACA Standard Day data. (U)

c. Bomb Door System Test:

- (1) Fuzes and arming wires: The RB-57A bomb door was loaded with 21 M-120A1 Photoflash Bombs equipped with inert M-146 fuzes. The bomb door was exposed to the aircraft slipstream at 5000 feet altitude for five minutes at each of the following indicated airspeeds:

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- (a) 250 knots
- (b) 325 knots
- (c) 400 knots
- (d) 450 knots.

The bomb door was closed and the aircraft was landed. Fuzes were carefully examined and photographs taken of any bending or other malfunction. (C)

- (2) Bomb Drops: 21 M-120A1 Photoflash Bombs with inert M-146 Fuzes were dropped by single release from the bomb door at each of the following indicated airspeeds at 5000 feet altitude:

- (a) 250 knots
- (b) 325 knots
- (c) 400 knots
- (d) 450 knots.

All bomb drops were photographed from a T-33 or F-89 type chase aircraft. The photography was examined to determine the dropaway characteristics of the bomb. The pilot for each flight reported on the aircraft handling characteristics during bomb door rotation and during bomb drops. (C)

7. RADAR VULNERABILITY EVALUATION:

a. Radar Net Penetration Evaluation:

- (1) Missions were flown against targets within the Knoxville, Minneapolis, and Traverse City ADIZ areas. These missions were flown in accordance with ADC Regulation 51-6 dated 17 September 1952. (U)
- (2) The Air Defense Command was alerted prior to each sortie flown against ADIZ areas, and was given complete flight planning information and encouraged to intercept the RB-57A throughout its flight. (This action is required by ADC Regulation 51-6.) (U)
- (3) Specific information on all interceptions attempted and accomplished was provided by Air Defense Command. (S)

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b. Radar Tracking Evaluation:

- (1) Missions were flown from Eglin to evaluate the radar detection and tracking capabilities by FPS-3 and CPS-6 type radar equipment. The CPS-6 site was located at Tyndall AFB, and was included within the evaluation since this set has the same characteristics as the USSR "Token" radar. Missions were flown at 30,000, 40,000, and 50,000 feet. The test mission at 50,000 feet was flown using the T-1 Partial Pressure Suit. (S)
- (2) Procedures used for each mission were as follows:
 - (a) Control of the aircraft was assumed by the FPS-3 radar site when the test aircraft was at altitude over the radar site. (S)
 - (b) APX-6 IFF was used by the test aircraft to facilitate tracking. (S)
 - (c) Two separate scopes were used at each site. One scope showed the aircraft and APX-6 IFF while the other showed only the "skin paint" of the test aircraft without IFF. (S)
 - (d) The flight path of the aircraft was controlled by the controller on the scope showing the IFF return. (S)
 - (e) All radar return and tracking data was logged from the scope showing only the skin return. This information included:
 1. Time
 2. Azimuth
 3. Distance
 4. Type of paint (good, poor, or null)
 5. Altitude. (S)
 - (f) Coordination between the controller at the FPS-3 site and the operator at the CPS-6 site was by telephone "hot line" when possible. At other

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times this coordination was accomplished by UHF air-to-ground communications. (S)

- (g) It must be stressed that this procedure was designed to produce optimum conditions with the scope observer knowing exactly where to concentrate his attention in order to track the aircraft. This was done in order to simulate conditions to be expected in a well coordinated radar net with the aircraft position detected by one site and its path projected by dead reckoning methods. (S)

8. INTERCEPTION TESTS:

a. Collision course interceptions were performed with F-94C and F-89 type interceptors. The RB-57A and the interceptor aircraft were GCI directed to accomplish the maximum number of interceptions per sortie. These missions were flown with no attempts to evade or escape since the RB-57A is not equipped with any tail or radar warning devices. The following information was noted for each pass made by the interceptor:

- (1) Type of detection (Visual or GCI)
- (2) Tallyho position to RB-57
- (3) Altitude and Range
- (4) Airspeed
- (5) Radar detection range
- (6) Airborne radar lock-on range
- (7) Type and results of each pass. (C)

b. Visual interception with day fighter type interceptors was limited to operations with F-86F type aircraft. Various types of breaks were attempted by the RB-57A when the interceptor had closed on a pass to within approximately 3000 feet. Since the RB-57A has no tail warning equipment and very poor visibility to the rear, the pilot of the F-86 notified the pilot of the RB-57 verbally when he was closing to within 3000 feet distance. Evasive action was taken at this time. The pilot of the interceptor noted:

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- (1) Tallyho position to RB-57
- (2) Altitude
- (3) Range
- (4) Airspeed
- (5) Type of pass
- (6) Results, including ability to track the RB-57 during maneuvers, were noted. (C)

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TEST RESULTS

1. PHOTO RESULTS:

a. Day Mapping:

- (1) The T-1 Optical Sighting Head proved to be a suitable instrument for flight line control, but the compartment in which it is installed afforded little comfort or safety. (C)
- (2) Five flight lines were flown with the T-1 Optical Sighting Head at 30,000 feet with acceptable coverage on four. Figure No. 9 shows a photo overlay of a mission of four flight lines. Notice that the control of three of the flight lines produced acceptable side-lap of 27 per cent to 48 per cent. (C)
- (3) Five flight lines were flown at an altitude of 15,840 feet. With the exception of 40 per cent of one flight line, all produced acceptable side-lap. Figure No. 10 shows the photo overlay for this mission. Here again the T-1 Optical Sighting Head was used for flight line control. (C)
- (4) Two sorties were flown using APW-11A with APA-90 and MSQ-1 for flight line control. The camera magazine failed after approximately 50 exposures on both sorties. By plotting these photographs and analyzing the ground controller's plot, the overlay shown in Figure No. 11 was prepared. This method of control produces excellent results provided that:
 - (a) The MSQ-1 Site is close enough to the mapping area so that the APW-11A antenna will not blank out excessively during maneuvers. (C)
 - (b) The flight lines are planned with ample maneuvering area prior to operating the cameras. (C)
 - (c) All corrections are made smoothly, accurately, and as rapidly as possible after indications are received. (C)

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MOSAIC OVERLAY

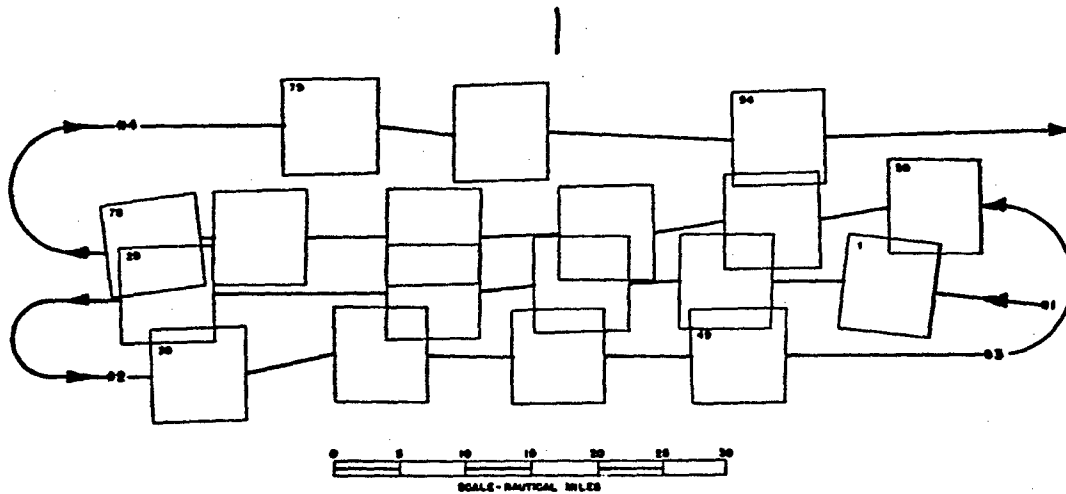
RB-57A

UNCONTROLLED — EGLIN RESERVATION

T-11 CAMERA 6" F/L — ALTITUDE 30,000 FT

19 APRIL 1954

FLIGHT LINE CONTROL - T-1 OPTICAL SIGHTHEAD



SUMMARY

FLIGHT LINE 4 (PRINTS 79 THRU 94)

UNACCEPTABLE DUE TO INSUFFICIENT SIDE LAP.

FLIGHT LINES 1, 2, & 3 ACCEPTABLE FOR

MOSAIC PURPOSES WITH SIDE LAP CONSTANT

FROM 27% TO 48%. OVER LAP CONSTANT

FROM 67% TO 73%. PHOTO QUALITY

EXCELLENT. TIP AND TILT NOT ANALYZED.

Figure No. 9. Mosaic Overlay

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MOSAIC OVERLAY

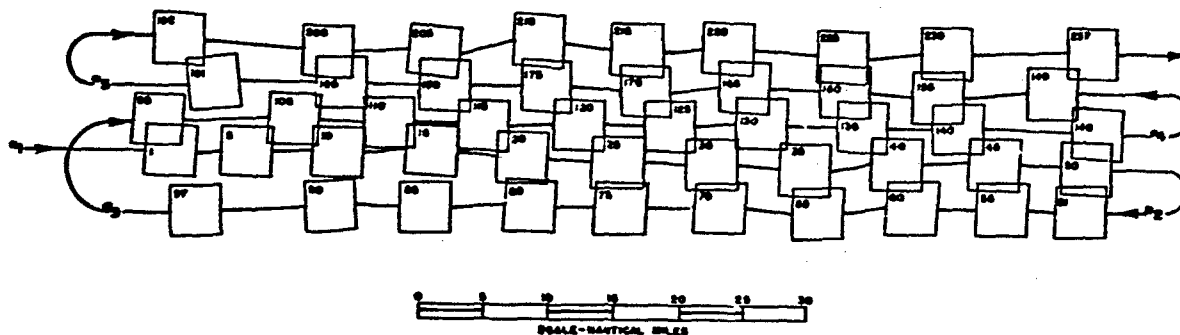
RB-57A

UNCONTROLLED — EGLIN A.F.B. AREA

T-11 CAMERA 6" F/L — ALTITUDE 15,840 FT

12 MAY 1954 — PHOTO SCALE 1 : 31,680

FLIGHT LINE CONTROL: T-1 OPTICAL SIGHTHEAD



SUMMARY

FLIGHT LINES 1,3,4,5 ACCEPTABLE FOR MOSAIC PURPOSES.

40% OF FLIGHT LINE 2 (PRINTS 80-97) UNACCEPTABLE

DUE TO HOLIDAY IN SIDE-LAP. SIDE-LAP (OVERALL)

VARIES FROM 10% TO 35% (ACCEPTABLE IN REMAINDER OF

MISSION, EXCEPT PRINTS MENTIONED). OVERLAP CONSTANT

FROM 59% TO 64% (ACCEPTABLE). SCALE CONSTANT

FROM 31,250 TO 31,420 (ACCEPTABLE). TIP AND TILT NOT ANALYZED.

Figure No. 10. Mosaic Overlay

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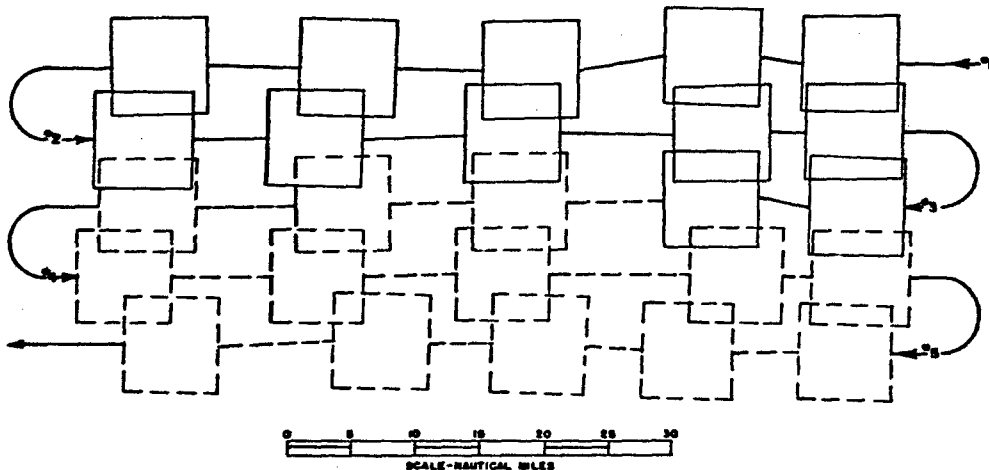
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MOSAIC OVERLAY

RB-57A
UNCONTROLLED — EGLIN RESERVATION
T-11 CAMERA 6" F/L — ALTITUDE 30,000 FT
24 SEPT 1954 — PHOTO SCALE 1:60,000
FLIGHT LINE CONTROL: APW-11A WITH APA-90 & MSQ-1



NOTE

BROKEN LINES INDICATE PROBABLE PHOTO COVERAGE ONLY. CAMERA MALFUNCTION OCCURRED ON FLIGHT LINE #3.
PHOTO POSITIONS (BROKEN LINES) BASED ON MSQ-1
GROUND CONTROLLER'S OVERLAY OF FLIGHT PATH OF AIRCRAFT.

Figure No. 11. Mosaic Overlay

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- (5) A photo warning system to warn the pilot when camera operation can be expected would have been of great assistance in flying the mapping missions. The pilot would then be able to make course corrections between exposures and be certain the aircraft was level during all camera operations. (C)
- (6) A need was noted for a remote controlled camera mount to compensate for drift and eliminate the present requirement of planning the direction of flight to minimize drift. (C)
- (7) The operating instructions for the day camera system are contained in Operating Instructions, Appendix F. (U)

b. Day Reconnaissance Photography:

- (1) K-38 cameras of the aircraft were tested on nine sorties for a total of 36 exposures. The K-38 produced acceptable resolution (5.28 to 8.58 lines per mm) at altitudes of 22,000 feet and above. The resolution of photography computed "with line of flight" deteriorated at lower altitudes and produced resolution of 1.86 to 2.34 lines per mm at 6000 feet altitude. The resolution "across line of flight" remained constant at 5.34 lines per mm at 6000 feet altitude. (C)
- (2) This result was expected in view of the fact that the K-38 has no image motion compensation magazine. The problem introduced by use of this camera at lower altitudes and jet aircraft speeds can be illustrated by a flight that was made at 22,000 feet and an indicated airspeed of approximately 300 knots. This airspeed produced a relative ground movement of almost 700 feet per second. This, in turn, produced a blur of approximately $4\frac{1}{2}$ feet ground coverage for all photography accomplished with a shutter speed of 1/150 second. This ground coverage blur remains constant with altitude, but is much more detrimental to resolution "with line of flight" at lower altitudes because of the larger scale of the photography obtained. (C)

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c. Night Photography:

- (1) A total of 21 sorties were flown utilizing 35.3 flying hours. All photographs taken by the K-37, 12-inch camera were illuminated with the M-120A1 Photoflash Bomb. The bursting altitude was one-half of the release altitude with a trail plate configuration to produce 30 degrees of trail. The methods of aircraft control were APW-11A, Shoran, and visual. Operational instructions for the night photo system are contained in the Operating Instructions, Appendix F. (C)
- (2) The resolution qualities of the night photography are illustrated in Figure No. 12. (U)
- (3) Photoflash bombing with the T-1 Optical Sighting Head was very successful in producing target coverage. However, the target was marked with a lighted T and could easily be seen through the sighting head reticle. The use of this sighting head for photoflash bombing is limited to aiming points that are lighted, or that can be identified through the reticle because of some other feature. (C)
- (4) Shoran controlled night photography was attempted on nine sorties. Two sorties were aborted because of airborne Shoran equipment malfunction and one because of ground station malfunctions. Full target coverage was made on all successful sorties. It was determined that:
 - (a) Oral arc flying at high speeds was suitable only when a high degree of crew coordination and individual skill existed. (C)
 - (b) Suitable Comparator and FDI units are considered very desirable for high speed arc flying. (C)
 - (c) There was no AC Voltmeter or manual inverter adjustment in the test aircraft to allow the operator to monitor the voltage applied to the equipment. It is not known, therefore, if voltage fluctuation was a factor in any of the airborne malfunctions. (C)

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AVERAGE* RESOLVING POWER (LINES PER MILLIMETER) OF K-37 CAMERA
PRIME VERTICAL INSTALLATION IN RB-57A

ALTITUDE	WITH FLIGHT PATH	ACROSS FLIGHT PATH	WITH & ACROSS	BASED ON (NO. OF NEGATIVES)
6,000	3.4	3.4	3.4	10
8,000	4.75	4.85	4.8	12
14,000	5.3	5.1	5.2	19
22,000	4.9	5.05	5.0	24
30-40,000	6.0	6.0	6.0	9
AVERAGE FOR (ALL ALTITUDES)	4.95	4.95	4.95	74

* RESOLUTION OF 50% OF NEGATIVES WAS AS GOOD OR BETTER THAN SHOWN IN TABLE.

Figure No. 12. K-37 Camera Resolution Chart

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- (d) Preflight Calibration Procedures are contained in the Operating Instructions, Appendix F. (U)
- (5) The APN-11A and APA-90 were used on 28 photo runs resulting in 20 photographs. Target coverage was complete on 19 of the plots. Operation procedures used are contained in Operating Instructions, Appendix F. Radar contact was frequently lost by the ground station when the aircraft was in banks of 15-20 degrees or more. This was attributed to the location of the antennas on the aircraft. A series of flight patterns was flown to determine more accurately the reception characteristics of the equipment. The results of these sorties were the subject of Flash Report No. 2, which is included in Appendix J. To better illustrate the results of these sorties, Figure Nos. 13, 14, and 15 pictorially present the reception characteristics of the equipment as installed in the RB-57A. A study of these plots shows: (C)
 - (a) The range of reliable reception of APN-11A in the RB-57A is approximately 100 nautical miles. (C)
 - (b) When operating at ranges greater than 100 nautical miles, reception will be lost during maneuvers that place the bottom of the aircraft away from the ground station. (C)
- (6) Since certain units of the APN-84 Shoran and the APN-11A are located in the unpressurized section of the aircraft, information concerning the altitude limitations and the explosion proof characteristics were requested from Headquarters, WADC. This agency advised that:
 - (a) A large number of production APN-11A sets were operationally tested at a simulated altitude of 50,000 feet prior to Air Force acceptance. Operation of the APN-11A above this altitude was not recommended unless installed in a pressurized compartment, as such operation may result in Modulator, RT-122, or Transmitter breakdown and/or Dynamotor, DY-99, deterioration. The sample sets did comply satisfactorily with the explosion proof test requirements of MIL-E-5272 to a maximum altitude of 40,000 feet. Explosion proof

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APW-11A ANTENNA TEST PATTERN

RB-57A NO. 52-1433
2 SEPT 54

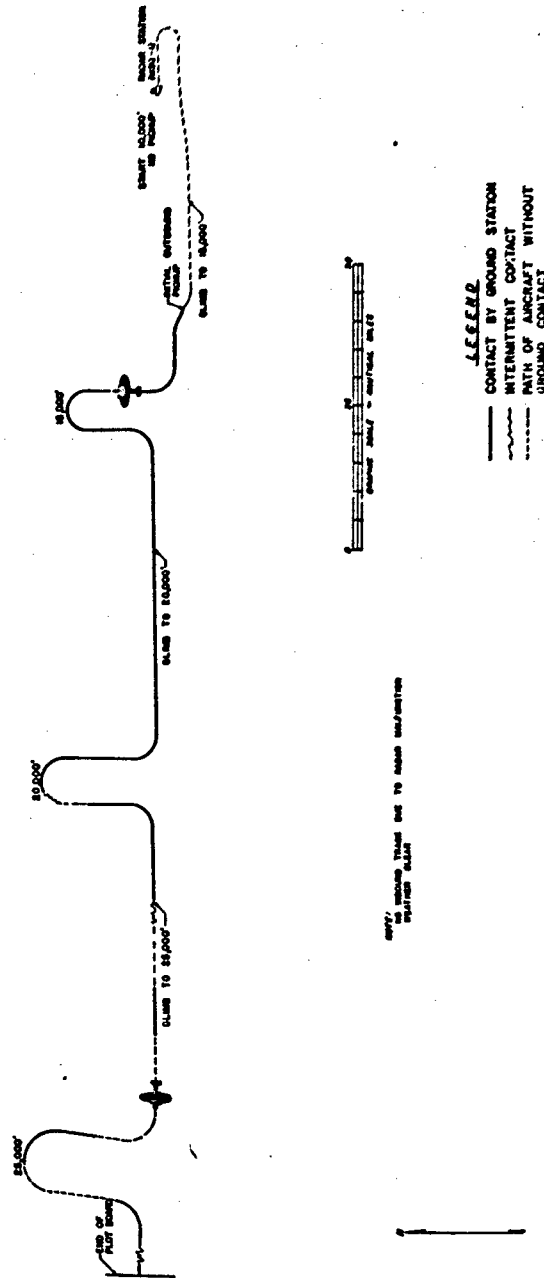


Figure No. 14. APW-11A Antenna Test Pattern

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APW-11A ANTENNA TEST PATTERN

RB-57A NO. 52-1433
14 OCT 54

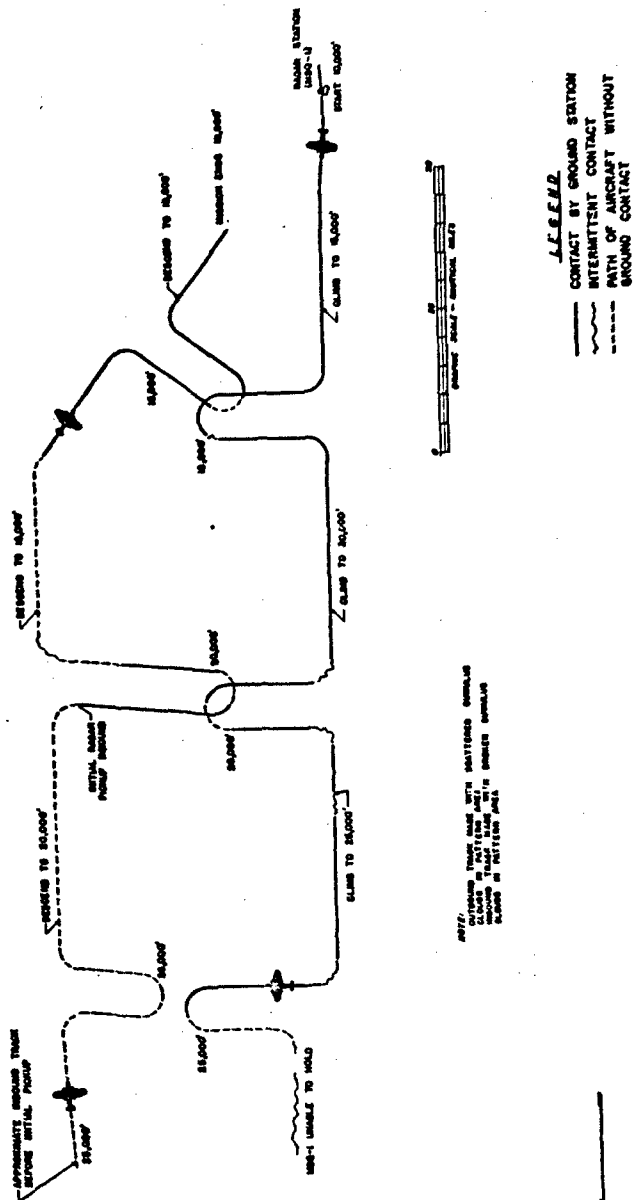


Figure No. 15. APW-11A Antenna Test Pattern

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tests were not conducted above 40,000 feet due to difficulties in obtaining an explosive mixture within the chamber at higher altitudes. (U)

- (b) The components of the S-4 Shoran Bombing System were tested for explosion proof characteristics in accordance with MIL-E-5272, Procedure 1. The maximum test altitude specified was 40,000 feet. The system was considered to be explosion proof at this altitude. The tests did not include high voltage flashovers which would occur at altitudes in excess of 40,000 feet. Actual tests show that flashovers occur in Indicator IP-186 at altitudes in excess of 40,000 feet, and in Transmitter T-342 at altitudes in excess of 46,000 feet, and in the Amplifier unit of the K-4 at altitudes in excess of 45,000 feet. (U)
- (c) It was advised that Transmitters T-342 serial number 397 and above are equipped with a K-110 frequency switch relay manufactured by Sperti Faraday, Inc. When transmitter is tuned to the higher frequencies such as 260 megacycles, flashovers occur between the plate assembly of the 4C28 oscillator tubes and the frame of the relay at altitudes in excess of 30,000 feet. ECP number VD-CRV-9 provides for Insulator, RCA, Part Number 8901862, which rectifies the problem of flashovers with the Sperti relay. This change became effective with serial number 625. Sets with serial numbers 397 through 624 are being modified via retrofit program. (U)
- (d) Since components of the S-4 Shoran Bombing System are in the pressurized portion of the RB-57A, except the transmitter T-342, unit operation of this equipment on pressurized flights at altitudes of 45,000 feet or less are not considered to be a flight safety hazard. However, installations which contain Transmitters T-342 serial numbers 397 through 624 are excepted from this consideration until they have been modified as indicated by the presence of modification symbol Mod 2. (U)

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2. NAVIGATION RESULTS:

a. Dead Reckoning and Map Reading:

- (1) Seven day and five night sorties were flown utilizing 23.6 flying hours. (C)
- (2) The following table shows a breakdown of the sorties with the accuracy found:

SORTIE	ALTITUDE (FEET)	DISTANCE (NM)	ERROR (NM)	PER CENT ERROR	METHOD FOR DETER- MINING ERROR
1	15,000 (day)	500	15	3.0	Photo
2	15,000 (day)	600	18	3.0	Photo
3	10,000 (day)	680	7	3.3	Visual
4	5,000 (day)	330	6	1.8	Photo
5	40,000 (day)	600	20	3.3	Visual
6	25,000 (day)	300	3	1.0	Photo
7	10,000 (night)	350	2	0.6	Visual
8	15,000 (night)	648	9	1.4	Visual
9	25,000 (night)	648	14	2.2	Visual
10	30,000 (night)	360	12	3.3	Visual
11	40,000 (night)	740	35	4.7	Visual
12	40,000 (night)	780	21	2.7	Visual (C)

- (3) The corrections set forth in Technical Order No. 1B-57(R)A-1 for Airspeed Installation Correction are more accurately tabulated in table illustrated in Figure No. 16 and should be combined with the corrections for heat of friction and compressibility for accurate preflight planning. (C)
- (4) Drift readings from the T-1 Optical Sighting Head were accurate and easily determined at altitudes below 20,000 feet. At altitudes above 20,000 feet

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AIRSPEED INSTALLATION CORRECTION TABLE						
CORRECTION TO BE ADDED (KNOTS) GEAR AND FLAPS UP						
GROSS WEIGHT LBS	IAS (KNOTS)					
	150	200	250	300	350	400
40,000	0	-1	-3	-5	-7	-9
						450
						-11

Figure No. 16. Airspeed Installation
Correction Table

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drift was difficult to determine due to the slow apparent motion of the ground through the sighting head reticle. (C)

- (5) Map reading at night from the rear navigation station was limited to abnormally prominent check points, such as large lakes, coastline features, large lighted cities, etc. Vision from this station is limited to the view from the right side of the aircraft and line-of-sight angle of 20-30 degrees from vertical. (C)
- (6) Map reading in the nose visual station was very fatiguing after periods of approximately 25 minutes. Downward visibility was good, while visibility to right and left was difficult and tiring. The lack of sufficient room prevents log keeping and computer operations while at this station. Maps of a size larger than 18x24 inches were not effective and could not be used in the nose position. (C)

b. Shoran Navigation:

- (1) Six day sorties were flown utilizing 11.9 flying hours. The navigator's compartment was blacked out. (C)
- (2) Interpolation of the indicator on the 10-mile setting and adding this figure to the miles dials proved to be a suitable method of determining Shoran ranges during Shoran-assisted navigation. This method also saved considerable time. (C)

c. Celestial Navigation:

- (1) Two day and three night sorties were flown utilizing 14.1 flying hours. (C)
- (2) The day sorties were of the speed line landfall type, and were planned for a cruise at 30,000 feet on a course that would position the aircraft to the right or left of destination a distance equal to approximately 30 minutes of flying time. Metro winds were used to determine the drift angle, so that when combined with the sun observation, a most probable position could be assumed. All LOP's were derived from a single two-minute observation. Precomputations were not used on the day sorties. (C)

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- (3) The night sorties were over a course of three legs totaling 1000 nautical miles. A combination of single LOP's and three star fixes was used. Precomputations were necessary so that the star could be positioned in the bubble type sextant field of view by setting in the computed altitude and azimuth. Star location is very difficult unless this method is used. (C)
- (4) No attempt was made to determine the accuracy of each observation or fix. However, the error at destination was noted in all cases. Following is a table showing these errors:

SORTIES	ALTITUDE (FEET)	DISTANCE (NM)	ERROR AT DESTINATION		ERROR DETERMINED BY
			(NM)	(%)	
Day	40,000	350	13	3.7	Visual
Day	30,000	600	0	0	Photo
Day	30,000	600	8	1.3	Photo
Night	30,000	1000	7	0.7	Visual
Night	30,000	1000	23	2.3	Visual (C)

- (5) Celestial navigation in this aircraft required considerable movement on the part of the navigator. Some observations were made with the navigator squatting with his feet in the seat, some while sitting on either of the two arm rests, and others while stooping immediately in front of the seat. Since the aircraft will accommodate only the seat type parachute, the navigator was required to remove this during celestial work. (C)
- (6) With the navigator moving in and around his ejection seat so frequently, the ejection controls were a cause for great concern to avoid accidental actuation. The navigator's desk must be stowed during any observation, and those observations having relative bearings of 60-120 degrees and 240-300 degrees could not be made while wearing the helmet and mask. This placed an altitude limitation upon this type of navigation.

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gation. All these factors distracted from a smooth prescheduled working procedure and made the entire mission a fight.

- (7) Considerable difficulty was encountered in making three 2-minute observations within the planned 10-minute period. (C)
- (8) Off-the-wing observations were made with extreme care as the aircraft has a high degree of roll during cruise at altitude. This is especially noticeable when tip tanks were being utilized. The uneven feeding of these tanks was apparently the cause. Only small amounts of motion were noticed during on-the-nose and on-the-tail observations. (C)
- (9) The Sextant was left extended in the mount during all sorties. It was noticed on only one sortie that this caused the eyepiece of the sextant to fog on the inside. It was considered necessary that the sextant be withdrawn from the extended position and the shield closed when sextant is not being used. This does not require that the sextant be removed from the mount. (C)
- (10) The periscopic sextant mount, because of its installation to the right of the centerline of the aircraft's fuselage along a laterally depressed surface, will not travel the entire 15 degrees of the gimbal's designed limits. This limitation applied only to those observations to the right of the aircraft. The exact amount of travel was not determined since no difficulty was encountered in testing. However, all flights were made in clear smooth air. Using organizations should be made aware that the mount installation presents a potential problem for observations to the right of the aircraft during flights in rough air where an excessive left wing high condition could exist during collimation. (C)

3. AIRCRAFT PERFORMANCE:

a. Aircraft Check Out:

Fifteen pilots were checked out in the RB-57A during the course of this test. Each was current in jet type aircraft at time of checkout and had flown 1800 hours total time, or more. Checkout for each consisted of filling out an RB-57A questionnaire, performing a cockpit check, and accomplishing eight landings and five hours flying

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time in the RB-57A during a 30-day period. No difficulty was encountered in checking out pilots of high experience level in this manner. (C)

b. Flying Characteristics:

During testing of the aircraft, there were no flying characteristics encountered that interfered with successful accomplishment of any mission. However, the following characteristics were noted during normal test flying of the aircraft:

- (1) All pilots flying the RB-57A during this test were favorably impressed by the simplicity and ease of operation of the aircraft. (C)
- (2) Flying this aircraft requires concentrated and careful application of trim. However, the aircraft could easily be held within one degree of any desired heading at all altitudes under normal flying conditions. (C)
- (3) Altimeter and vertical speed indicator gave erratic indications when the aircraft was placed in a skid. (C)
- (4) The altimeter error becomes excessive at higher indicated airspeeds. It is noted that the Flight Handbook does not mention this fact. The chart shown in Figure No. 17 was prepared from data obtained during this test. (C)
- (5) Descents from 40,000 feet to 10,000 feet with idle power and airspeed of .76 Mach caused aileron snatch similar to that encountered in stalls. The reason for this was not determined. (C)
- (6) Flight at 50,000 feet and above (53,000 feet was maximum altitude flown during testing) was accomplished without difficulty except that the T-1 suit restricted visibility both for cockpit instruments and through the aircraft canopy. These flights were flown at indicated airspeeds required to remain within the .78 Mach limitation. No difficulty was encountered in maintaining control of the aircraft and flying a specific heading. (C)

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ALTIMETER INSTALLATION CORRECTION TABLE							
GROSS WEIGHT 40,000 LBS, GEAR AND FLAPS UP							
CORRECTED INDICATED PRESSURE ALTITUDE	CIAS						
	200	250	300	350	400	450	
SEA LEVEL	-25	-75	-150	-250	-375	-550	
5,000	-25	-100	-175	-300	-450	-650	
10,000	-25	-100	-200	-350	-525	-750	
15,000	-50	-125	-250	-425	-600	-900	
20,000	-50	-150	-300	-475	-725		
25,000	-75	-200	-350	-600	-850		
30,000	-75	-225	-425	-700			
35,000	-100	-275	-525	-850			
40,000	-125	-350	-650				
45,000	-150	-450	-850				
50,000	-200	-550					

Figure No. 17. Altimeter Installation
Correction Table

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c. PSP Take-Off and Landing:

No difficulty was encountered in PSP operations with fully loaded aircraft with and without full tip tanks. A chart is presented in Figure No. 18 that shows take-off distance required for PSP operations at various loads and under varying conditions. The average landing roll during PSP testing was 4400 feet with full internal fuel and 5100 feet with full internal fuel plus full tip tanks. (C)

d. Radius of Action:

Radius of action missions were flown to obtain the maximum radius for various profiles. These profiles include 1000# of fuel in reserve when the aircraft enters the traffic pattern upon return to home base. A resume of the profiles flown and radius of action for each is contained in Figure No. 19. Individual profiles are illustrated by Figure Nos. 20, 21, 22, 23, and 24. (U)

e. Bomb Door System Test:

- (1) **Fuzes and Arming Wires:** Eight sorties were flown exposing a full load of M-120 Photoflash Bombs and inert fuzes to aircraft slipstream for five minutes at indicated airspeeds of 250, 325, 400, and 434 knots. Results indicated that arming wires of the front bombs were bent as much as 90° when exposed to airspeeds of 400 knots or above. (C)
- (2) **Bomb Drops:** Four sorties were flown with the full load of M-120 Photoflash Bombs to determine release characteristics of bombs from the RB-57A bomb door. Bombs were dropped singly and in train at indicated airspeeds of 250, 270, 325, 400, and 450 knots. Results indicated no difficulties except that bombs dropped at the highest airspeed from the forward upper station (No. 21) hesitated slightly in leaving the bomb door and had a tail-first tendency during release. (C)
- (3) **Aircraft Behavior During Bomb Door Rotation:** Flying characteristics during bomb door rotation varied from slight pitch-up at 250 knots IAS to a severe pitch-up encountered at 450 knots IAS. It was noted that no trim change was required after bomb door rotation at 250 and 325 knots IAS. A nose-heavy condition developed after bomb door rotation at 400 knots IAS and

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TAKE-OFF DISTANCE - (1000 ft)

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RB-57A RADIUS OF ACTION

USA STANDARD DAY

TWO 320 GAL WING TIP TANKS - FUEL DENSITY 6.5 LBS/GAL

TIP TANKS RETAINED

MISSION	CRUISE ALT/ACH. NR		TARGET			RADIUS OF ACTION (NAUTICAL MILES)
	IN	OUT	TIME	ALTITUDE	IAS	
HIGH ALTITUDE NIGHT PHOTO	40,000' / .75	45,000' / .75	10 MIN.	30,000'	280	1050
MEDIUM ALTITUDE NIGHT PHOTO	40,000' / .75	45,000' / .75	10 MIN.	10,000'	350	1020
LOW ALTITUDE NIGHT PHOTO	40,000' / .75	45,000' / .75	10 MIN.	3,500'	350	1005
MEDIUM ALTITUDE NIGHT PHOTO MINIMUM ALTITUDE CRUISE	2,500' / .51	2,500' / .51	10 MIN.	10,000'	350	420
VISUAL RECONNAISSANCE	40,000' / .75	45,000' / .75	30 MIN.	5,000'	350	865

Figure No. 19. RB-57A Radius of Action

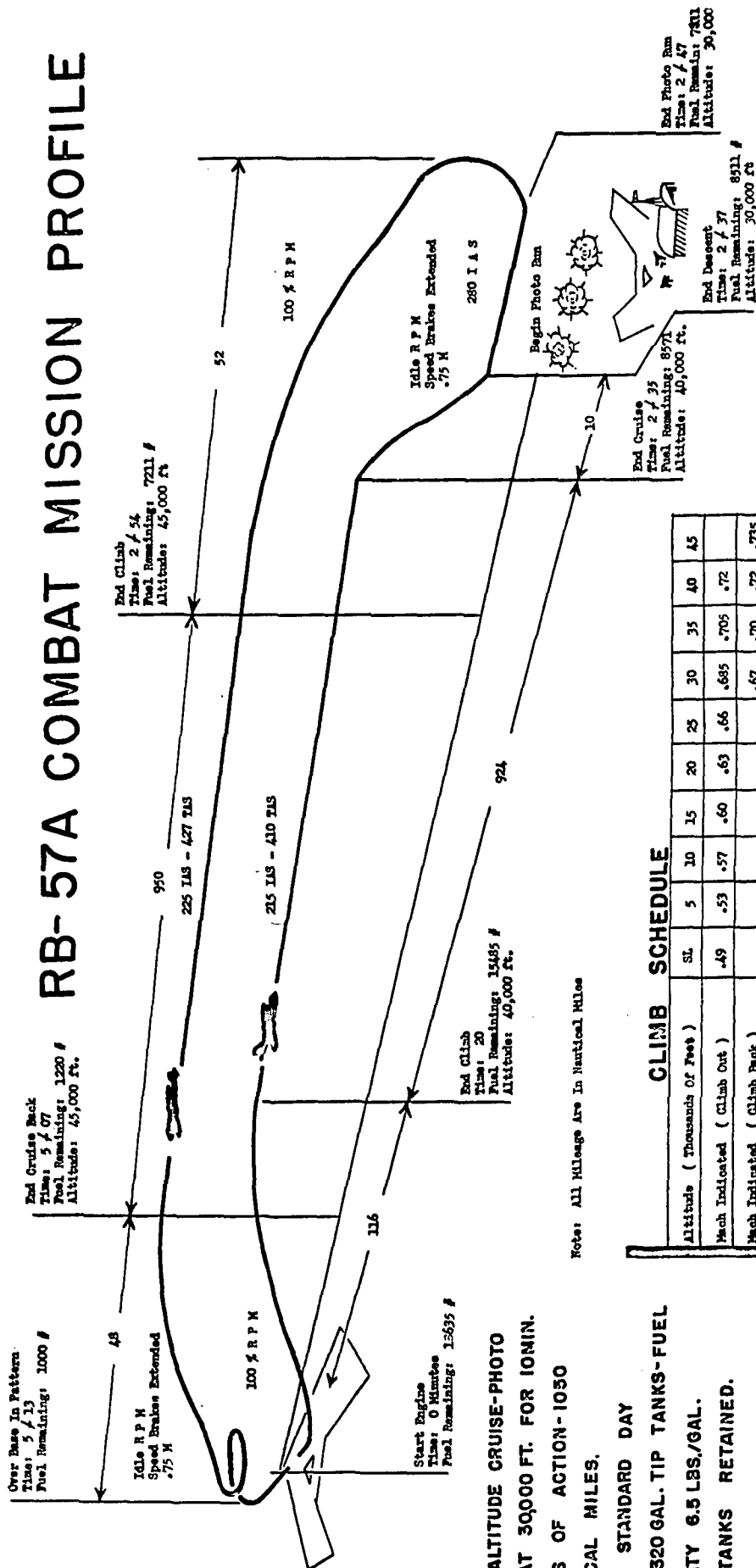
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RB-57A COMBAT MISSION PROFILE



CLIMB SCHEDULE

Altitude (Thousands Of Feet)	SL	5	10	15	20	25	30	35	40	45
Mach Indicated (Climb Out)	.49	.53	.57	.60	.63	.66	.685	.705	.72	
Mach Indicated (Climb Back)							.67	.70	.72	.735

Note: All Mileage Are In Nautical Miles

HIGH ALTITUDE CRUISE-PHOTO
 RUN AT 30000 FT. FOR 10MIN.
 RADIUS OF ACTION-1050
 NAUTICAL MILES.
 NACA STANDARD DAY
 TWO 320 GAL. TIP TANKS-FUEL
 DENSITY 6.5 LBS./GAL.
 TIP TANKS RETAINED.

Figure No. 20. RB-57A Combat Mission Profile

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RB-57A COMBAT MISSION PROFILE

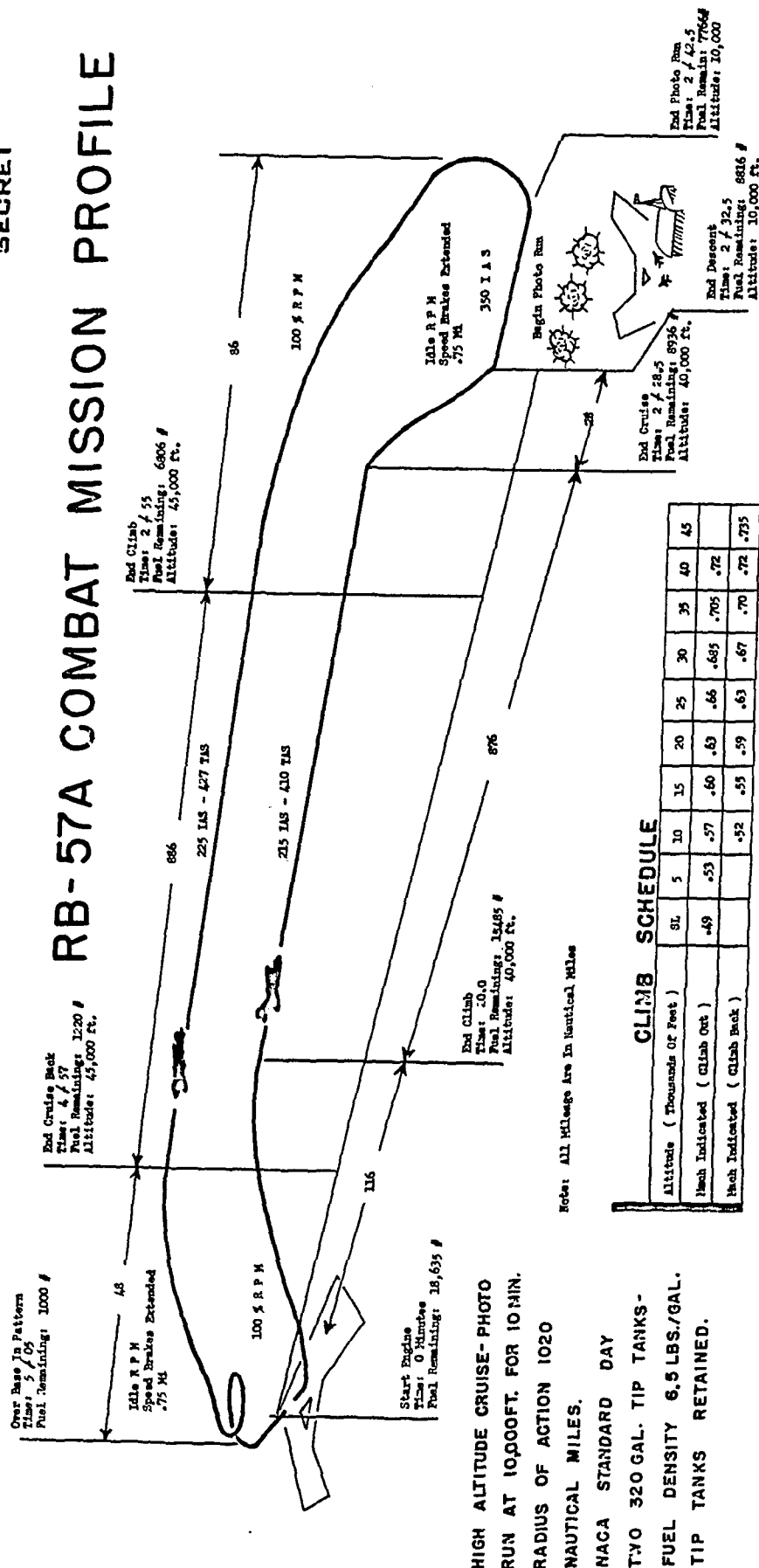
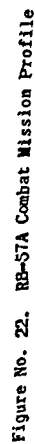


Figure No. 21. RB-57A Combat Mission Profile

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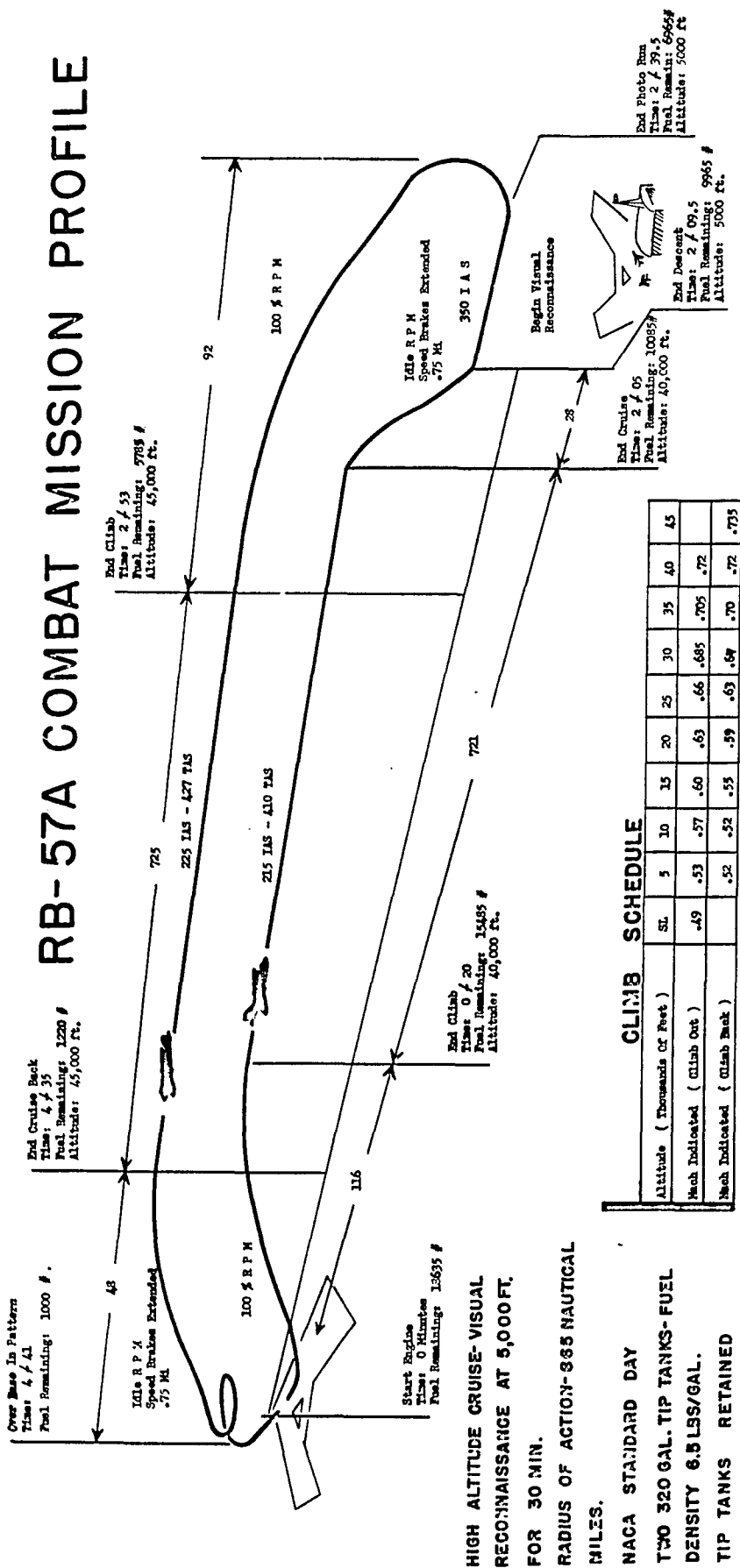
RB-57A COMBAT MISSION PROFILE

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RB-57A COMBAT MISSION PROFILE



CLIMB SCHEDULE

Altitude (Thousands of Feet)	SL	5	10	15	20	25	30	35	40	45
Mean Indicated (Climb Out)	.49	.53	.57	.60	.63	.66	.68	.70	.72	
Mean Indicated (Climb Back)		.52	.52	.55	.59	.63	.67	.70	.72	.73

Figure No. 24. RB-57A Combat Mission Profile

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above. Maximum pitch-up tendency occurred when the bomb door was rotated approximately 90 degrees. (C)

4. RADAR VULNERABILITY RESULTS:

a. Penetration of ADIZ:

- (1) Sortie No. 1 consisted of a cruise at 40,000 feet to within 200 nautical miles of Knoxville ADIZ, a penetration at 2500 feet, a photo run at 10,000 feet, and a withdrawal at 2500 feet. No interception was encountered. (S)
- (2) Sortie No. 2 consisted of a cruise at 40,000 feet to the target within the Knoxville ADIZ, a photo run at 10,000 feet, and withdrawal at 2500 feet. No interception was encountered. (S)
- (3) Sortie No. 3 consisted of a cruise to the target within the Traverse City ADIZ at 2500 feet, a photo run at 7500 feet, and withdrawal at 2500 feet. This flight was conducted during marginal VFR weather. No interception was encountered. (S)
- (4) Sortie No. 4 consisted of a cruise to the target within the Traverse City ADIZ at 2800 feet, a photo run at 6500 feet, and withdrawal at 2500 feet. This flight was conducted during marginal VFR weather. One F-89 type aircraft pulled alongside the test aircraft approximately 120 nautical miles after the target. No abeam attacks were observed. (S)
- (5) Sortie No. 5 consisted of a cruise at 40,000 feet to the target within the Minneapolis ADIZ, a photo run at 10,000 feet, and a withdrawal at 45,000 feet. The interceptions on this sortie were: (S)
 - (a) One flight of two F-86D type aircraft intercepted the test aircraft when approximately one-half the distance to the target. Several simulated attacks were made that appeared to be successful. (S)
 - (b) One flight of four F-86D aircraft intercepted the test aircraft immediately after the photo run. Again several simulated attacks were made that appeared to be successful. (S)

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- (c) At approximately 275 nautical miles after the target, while cruising at 45,000 feet, the test crew sighted one F-86 type aircraft (model unknown) attempting what appeared to be an attack. This was considered to be unsuccessful because the attack was low and behind the test aircraft. (S)
- (d) The last of the interceptions occurred approximately 400 nautical miles after the target and involved a flight of three F-86D aircraft. These aircraft were observed circling at near flight altitude some 15 minutes before actual interception occurred. Several simulated attacks were made that appeared to be successful. (S)
- (6) No reports were received from ADC concerning Sorties 1, 2, 3, and 4. It is not known, therefore, if interception was attempted on these sorties. (S)

b. Radar Skin Track Results:

- (1) Five sorties were flown against the radar sets of the Eglin-Tyndall area at altitudes of 30,000, 40,000 and 50,000 feet. Testing was too limited to arrive at valid detection probabilities and should not be used for detection probability estimates. NOTE: Specific detection probabilities for B-57 type aircraft by FPS-3 type radar will be included in Project No. AFG/TAE/145-A when that project is completed. (S)
- (2) The results of these flights are presented in Figure Nos. 25, 26, 27, 28, 29, and 30. It should be understood that these results were derived under ideal conditions for the radar operator, in that he could refer to the position of the test aircraft by its APX-6 beacon response which limited his area of search for a skin paint to approximately 1/4 square inch, and therefore would know where to search for skin paint conditions. However, this does not lessen the validity of the results, but provides the best possible detection conditions. (S)
- (3) Upon study of the radar tracking illustrations (Figure Nos. 25 through 30), consideration should be given the following:

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RADAR TRACKING ON RS-57A
 FDS-3 RADAR
 25 JANUARY 1955
 ALTITUDE 30,000'
 NOTE: OPERATOR HAD KNOWLEDGE OF AIRCRAFT'S
 POSITION BY APX-6 REFERENCE

TARGET PAINT
 NO PAINT

150
 100
 50
 NAUTICAL MILES
 START
 END

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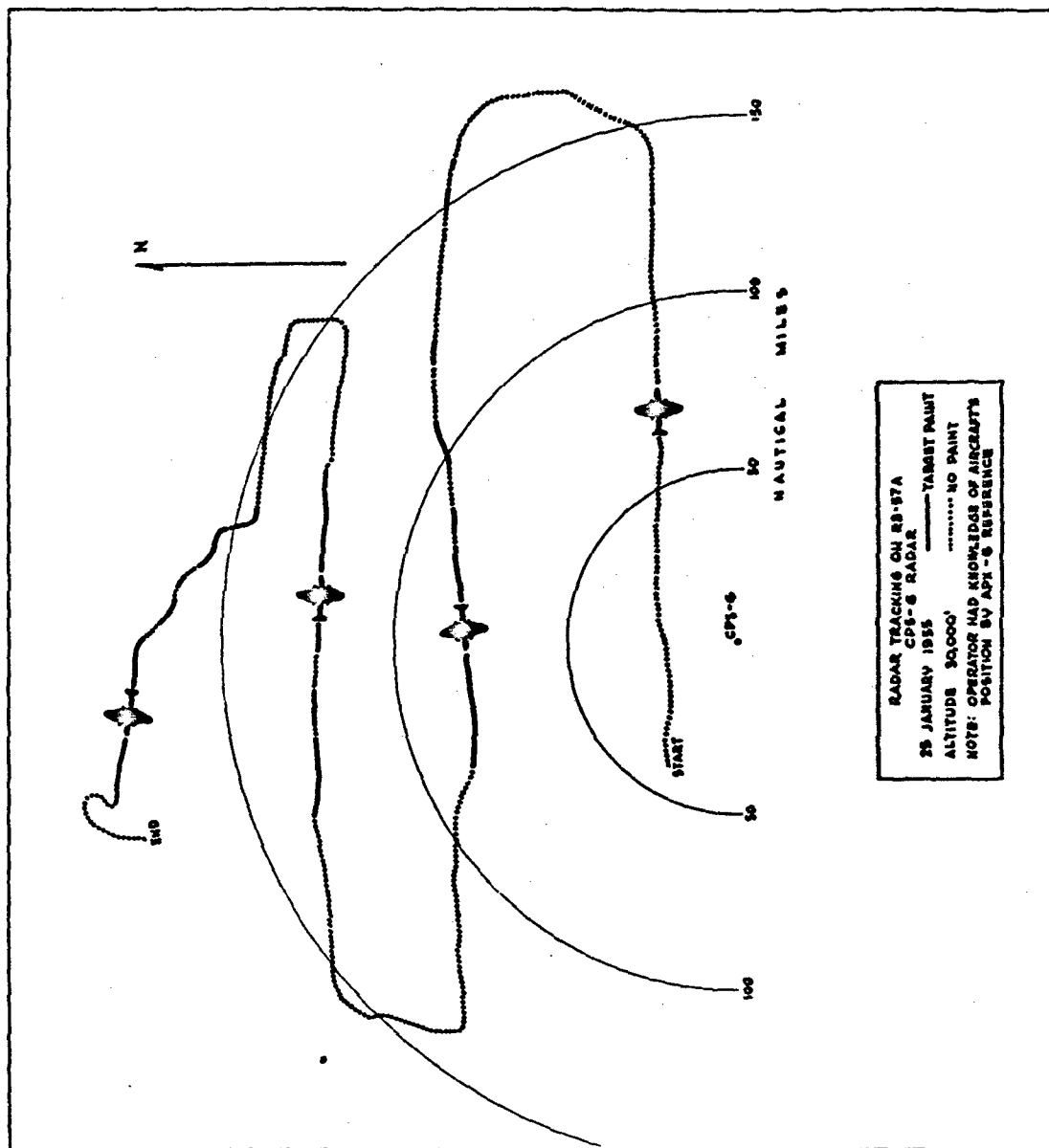


Figure No. 26. CPS-6 Radar Tracking RB-57A (30,000 feet)

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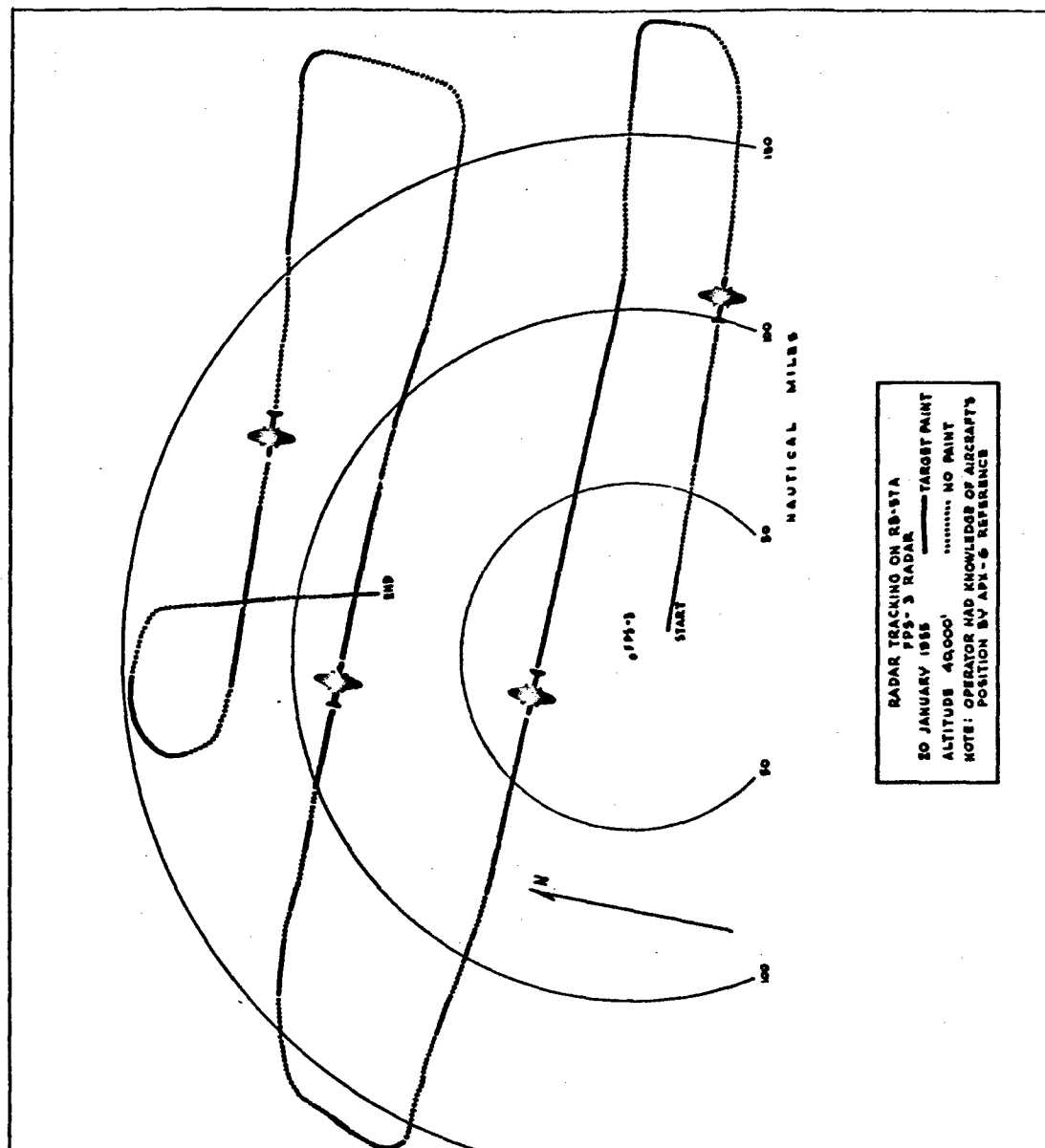


Figure No. 27. FPS-3 Radar Tracking RB-57A (40,000 feet)

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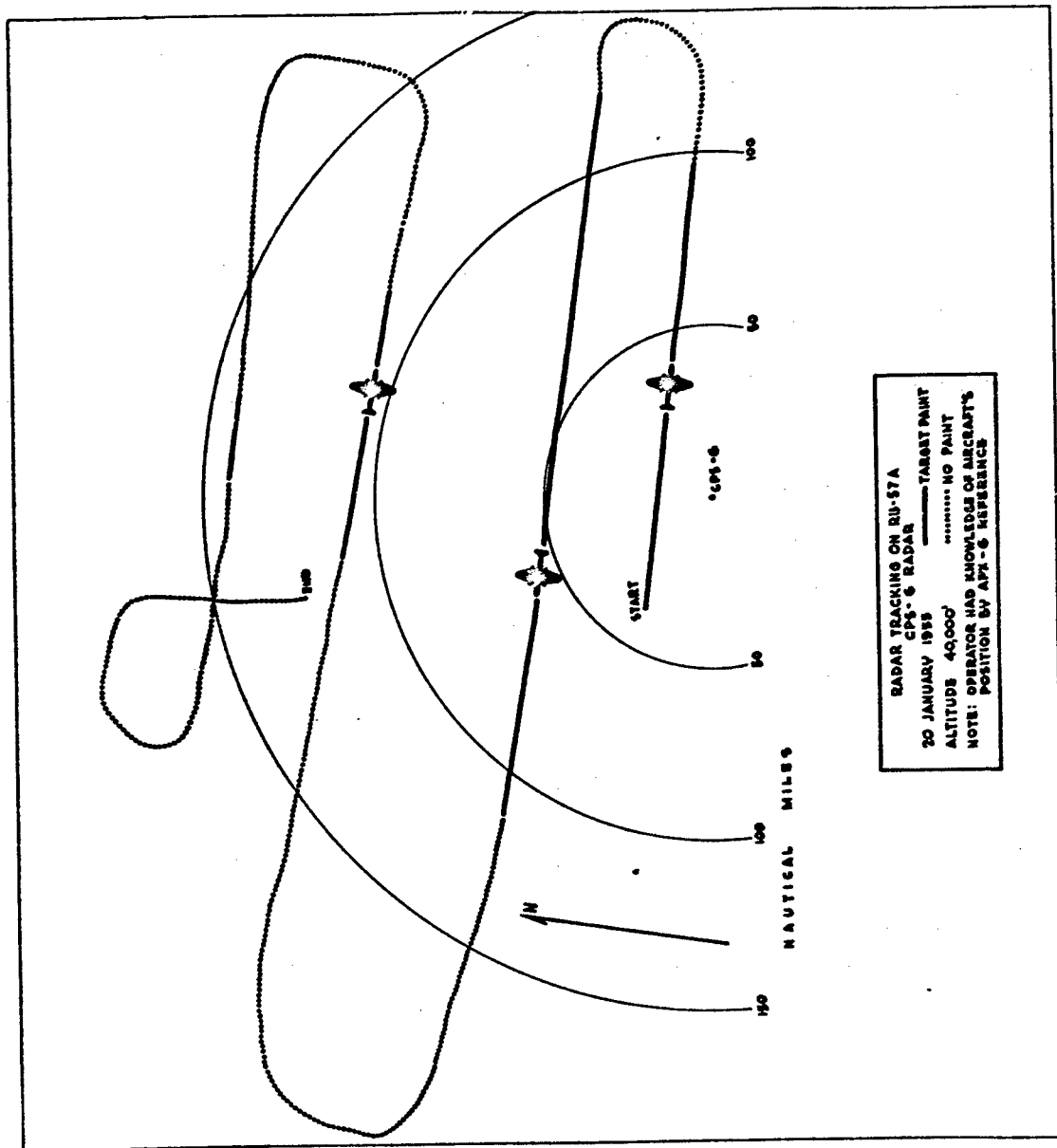


Figure No. 28. CPS-6 Radar Tracking RB-57A (40,000 feet)

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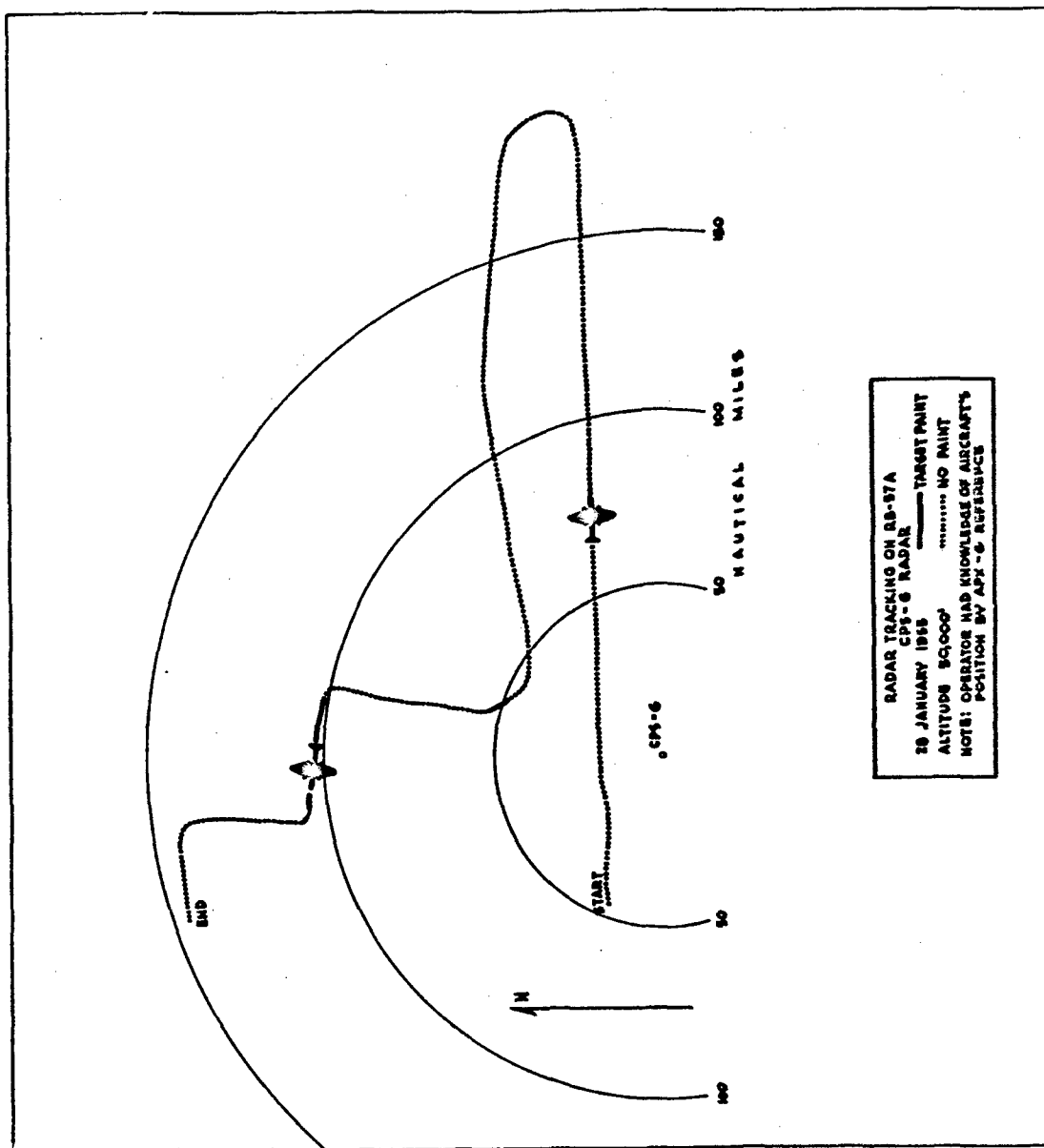


Figure No. 30. CPS-6 Radar Tracking RB-57A (50,000 feet)

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- (a) The aspect of the aircraft in relation to the ground radar station
- (b) The altitude of the test aircraft
- (c) The detection ranges
- (d) The type of ground radar equipment used. The CPS-6 radar corresponds to the "Token" radar of the USSR. (S)

5. INTERCEPTION TESTS:

a. Day Interceptor:

One test mission was flown with a day interceptor during this test. The interceptor type used was the F-86F because it was the most maneuverable fighter available. The mission was flown with attacks being initiated at 20,000 feet altitude. Four simulated firing passes were made by the F-86F. It was found that the F-86F could not track the RB-57A through more than a 180° turn at .75 Mach. The F-86F began falling behind at that time because the RB-57A had a smaller turning radius. The only practicable method of attack for the F-86F on this mission was of the "hit and run" variety. The F-86F made a high speed pass in this maneuver, then zoomed back up to altitude for another attack. No hits were indicated by gun camera film after the RB-57A began evasive action during any attack. (C)

b. All-Weather Interceptors:

- (1) Six test missions were flown with the F-89D with the E-6 Fire Control System, and six test missions were flown with F-94C aircraft equipped with the E-5 Fire Control System. F-89D attacks were attempted at altitudes up to 45,000 feet. F-94C attacks were made at 40,000 feet altitude. (C)
- (2) The F-89D interceptor made 14 individual attacks and all were successful. Only 5 of the attacks were made exclusively by radar, however, due to malfunctioning radar. Average detection range of the E-6 FCS was 10 miles with the RB-57A as target, and average lock-on range was 7 miles. The F-89D had an average air-speed advantage of approximately 50 knots during attacks. (S)

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- (3) The F-94C made 16 attacks and 4 were successful. Nine of the unsuccessful attacks were attributed to E-5 Fire Control System malfunctions, two were caused by the F-94C canopy frosting over, and one was caused by poor GCI positioning. The E-5 FCS average radar detection range, with the RB-57A as target, was 14 miles, and average lock-on was obtained at 10 miles range. It was noted that detection ranges increased substantially when the RB-57A was in banks. No difficulty was encountered in successfully attacking the RB-57A when the interceptor was positioned accurately with all equipment operating satisfactorily.
- (S)

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SELECTED RB-57A PHOTOGRAPHY

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T-1 Bombsight visually controlled night photo, Vertical 36" Composite Camera (K-47 body with KA-2 cone and KA-1 36" lens), altitude 30,000 feet, bomb burst computed for 5000 feet, 1/10 second exposure, synchronous mode operation with A-18 IMC magazine.

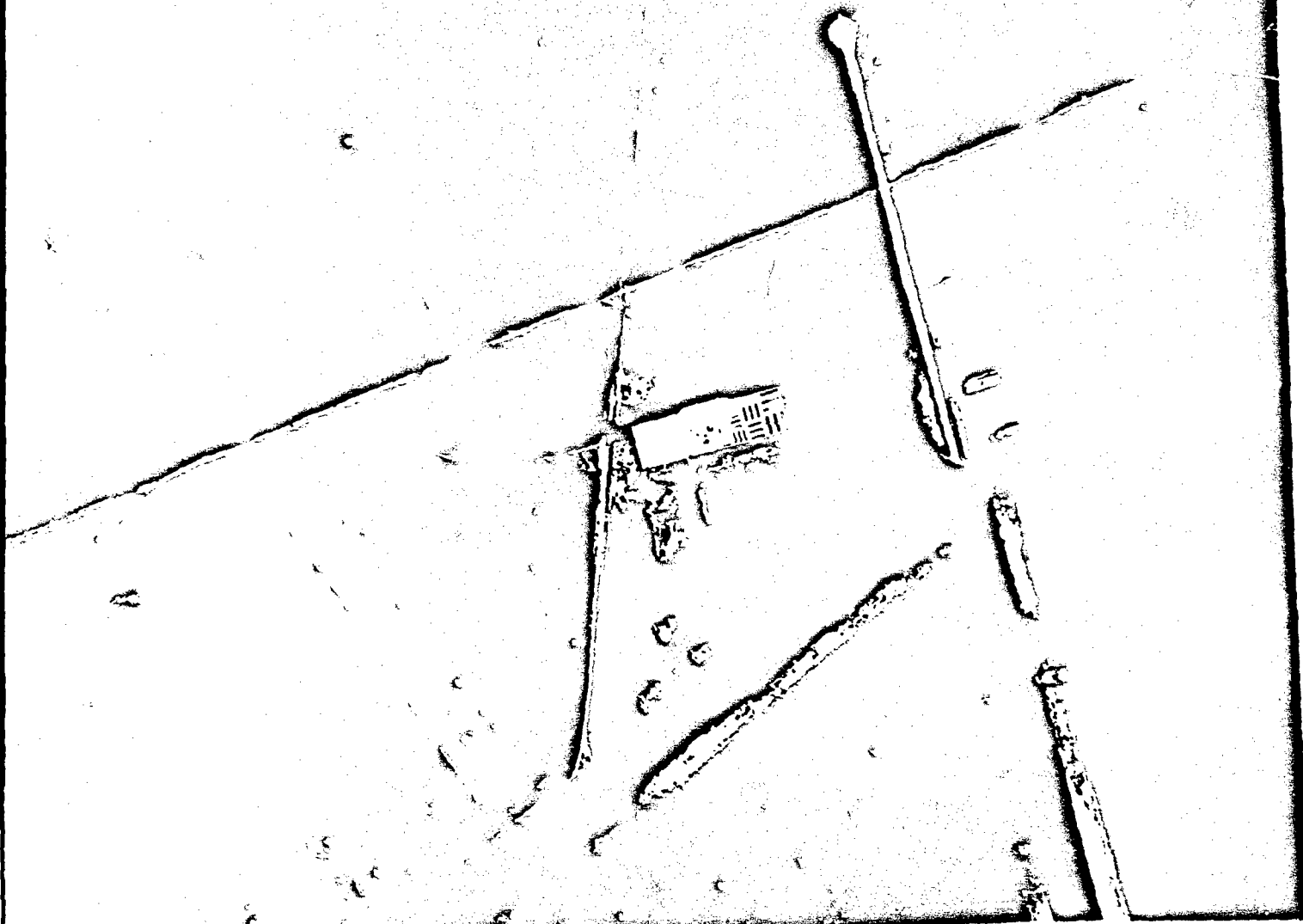
TARGET - Resolution Target (C)

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T-1 Bombsight visually controlled night photo. Vertical 24" Composite Camera (K-47 body with KA-2 cone and KA-2 lens), altitude 12,000 feet, bomb burst computed for 3000 feet, 1/10 second exposure, synchronous made operation with A-18 INC magazine.

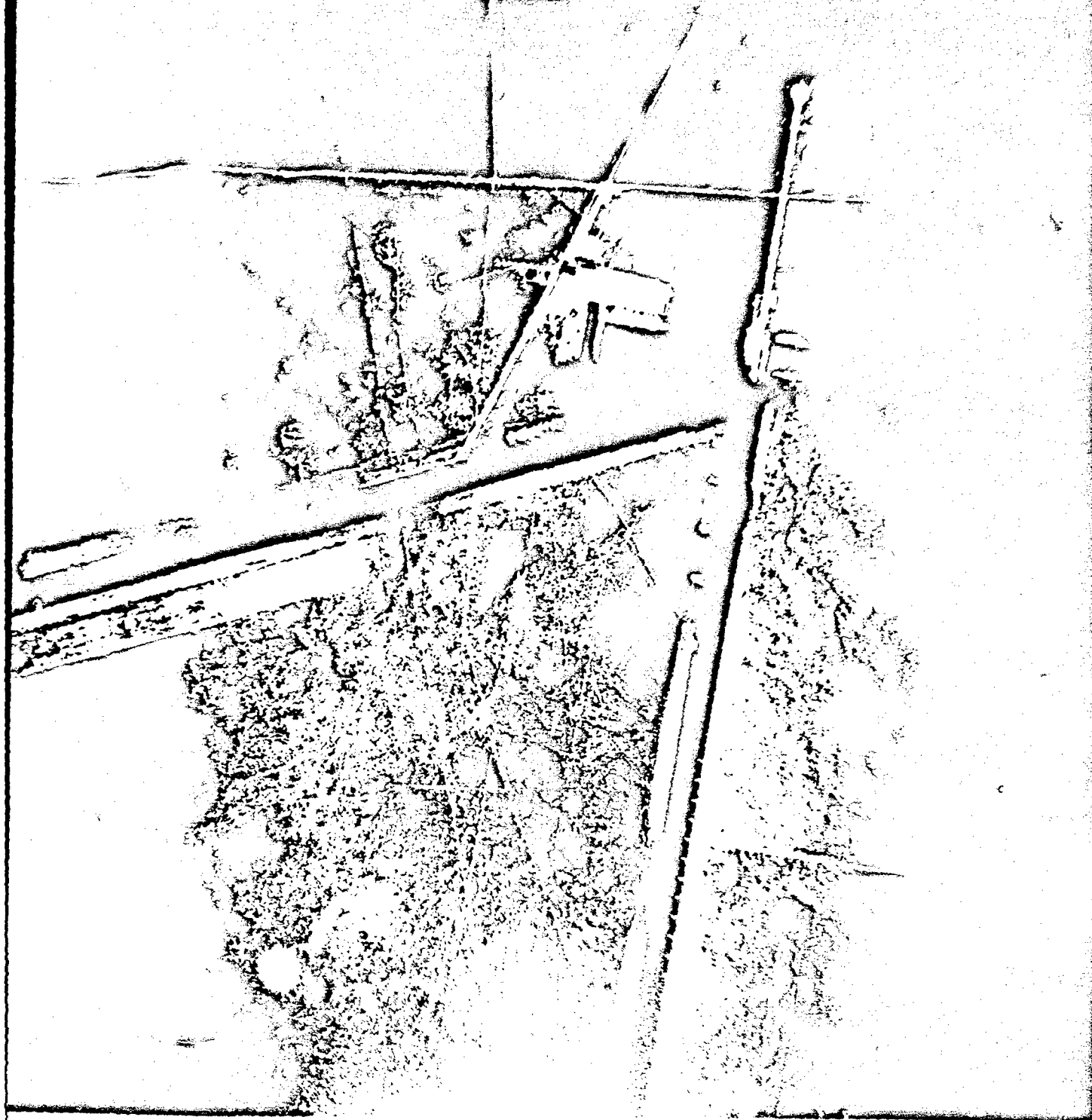
TARGET - Resolution Target (C)

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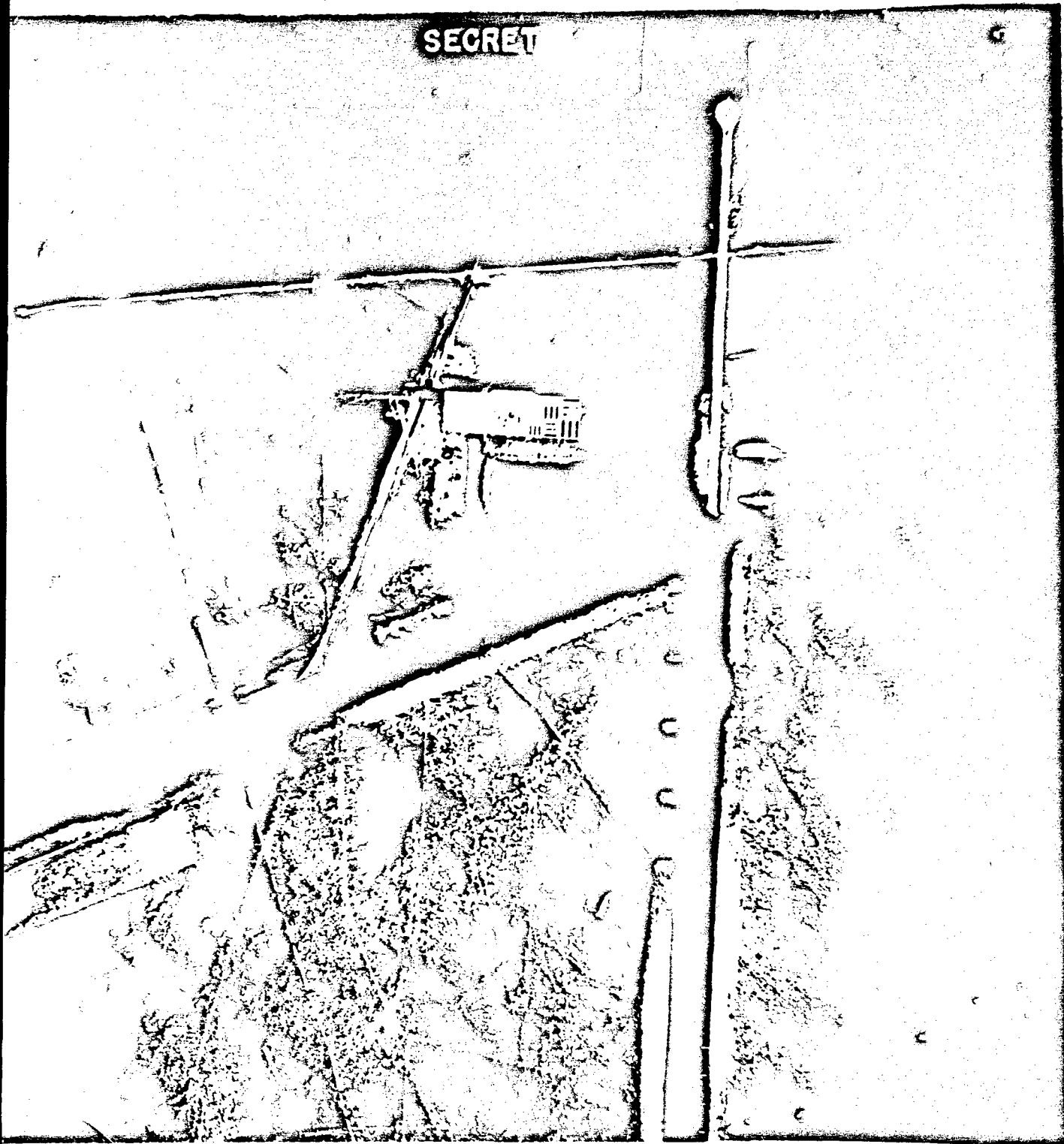
T-1 Bombsight visually controlled bomb run, Vertical 12" K-37, altitude
8000 feet, M-120 Photoflash Bomb, burst altitude 4000 feet.
TARGET - Resolution Target (C)

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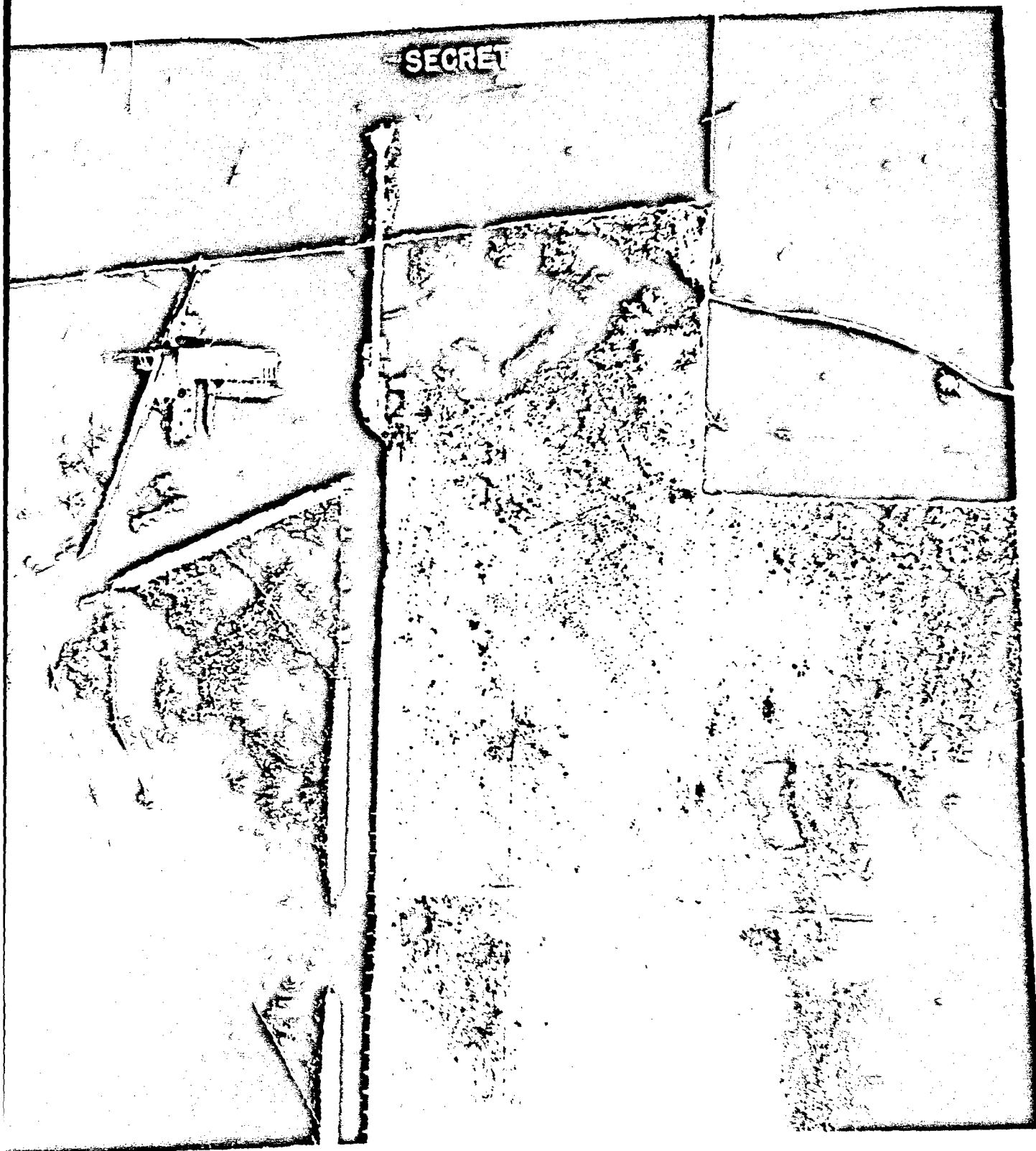
MSQ-1 controlled bomb run using APW-11A with APA-90 Indicator Group.
Vertical 12" K-37, altitude 6000 feet, M-120 Photoflash Bomb, burst
altitude 3000 feet.

TARGET - Resolution Target (C)

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MSQ-1 controlled bomb run using APW-11A with APA-90 Indicator Group.
Vertical 12" K-37, altitude 8000 feet, M-120 Photoflash Bomb, burst
altitude 4000 feet.

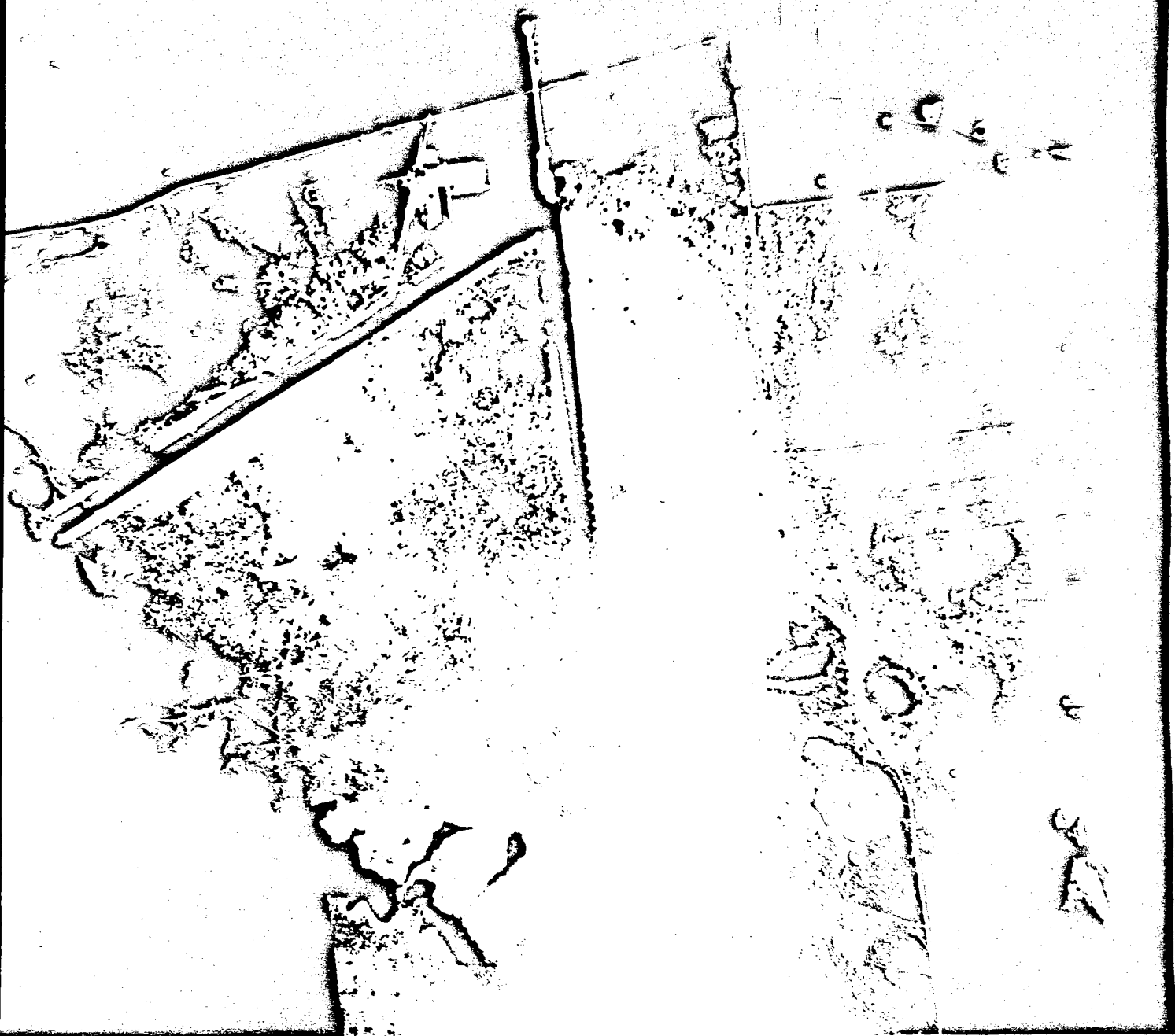
TARGET - Resolution Target (C)

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MSQ-1 controlled bomb run using APW-11A with APA-90 Indicator Group.
Vertical 12" K-37, altitude 14,000 feet, M-120 Photoflash Bomb, burst
altitude 7000 feet.

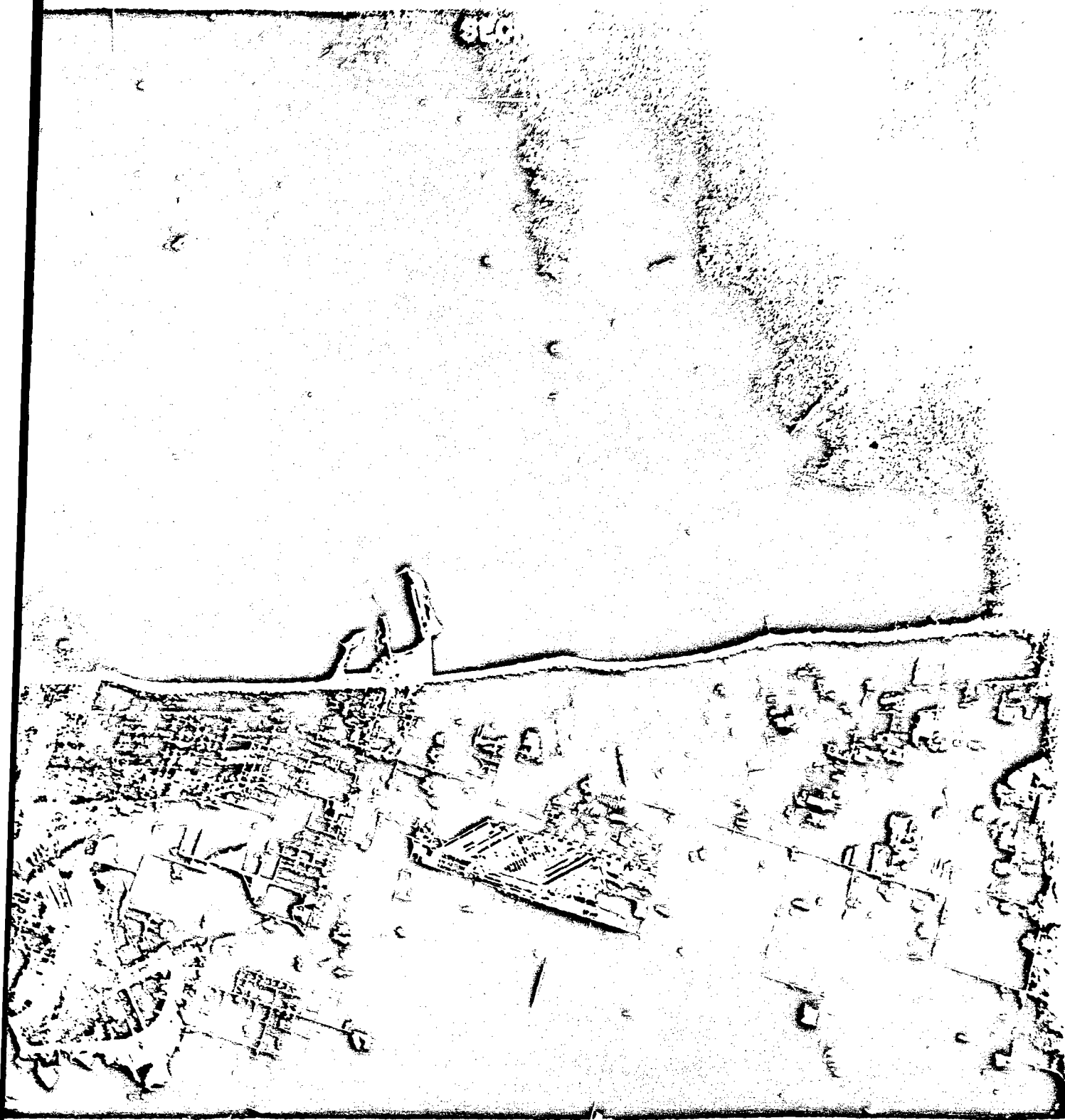
TARGET - Resolution Target

(C)

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APN-84 controlled day pinpoint photography. Vertical 6" T-11, altitude
34,500 feet. Map-scaled target distance 250,7967 statute miles.
TARGET - Docks at Gulfport, Mississippi (C)

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APN-84 controlled day pinpoint photography. Vertical 6" T-11, altitude 20,000 feet. Computed target distance 137,17064 statute miles.
TARGET - Courthouse at Milton, Florida (C)

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T-1 Berisight visually controlled day photo, Right Split-vertical 24"
K-30, 20,000/100,000 feet, TARGET - Revolution Target (C)

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OPERATING PROCEDURES

1. Test aircraft were operated in accordance with appropriate technical orders with the following exceptions:

a. Test aircraft were started without auxiliary power units over a period of six months to test this method of operation under extended operational conditions. (C)

b. The emergency fuel control system was not used for missions flown in this test. This was concurred in by Headquarters AMC. Necessary action has been taken by AMC to delete the use of the system for take-off in the RB-57A. (U)

c. Test aircraft equipped with unmodified nose sections were flown with the crew compartment pressurized. This was done under a waiver granted by Headquarters AMC, with the provision that the nose navigator's position would not be occupied while the crew compartment was pressurized and that pressurized operation would be limited to necessary operational suitability testing. (U)

2. The T-1 Partial Pressure Suit was worn by crew members on all flights above 45,000 feet. Local aircraft modifications were made to accommodate a type AW-57 AIC-10 interphone system adapter and provide a 28-volt electrical outlet for the pressure suit face plate heater element. (U)

3. APW-11A and APA-90 Operating Procedure:

Since there is no standard operating procedure for tactical employment of this equipment, the following procedure was used for all APW-11A photo missions flown during this test, using the APA-90 Indicator Group for pilot direction and an MSQ-1 ground radar site for flight control. A standard operating procedure is being developed by Project APG/TAE/31-A, "OST of the APW-11A with MSQ-1."

a. The pilot contacted the MSQ-1 site upon take-off, advised the site of his altitude and position, and followed directions of MSQ-1 site until control had been established. (U)

b. The ground controller of the MSQ-1 site, upon assuming control of the aircraft, performed his initial control check. The pilot verbally advised his ground controller of the functions that are being displayed on his APA-90 Indicator Group. The ground controller

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erased these signals. This procedure was preceded by a signal PREPARE TO CHECK and followed by the same signal PREPARE TO CHECK. The pilot erased both of these signals by operating his ROGER switch. This indicated that the control check was completed. If a control check was again necessary at any later time during the mission, the same procedure was used without resorting to voice contact. (U)

c. Directional Controls (Turns): A preparatory signal of LEFT or RIGHT was followed by the signal 2, 5, 10, 30, or 90 to indicate the number of degrees of turn required, which the pilot "Roger" and then initiated. If a sequence of signals was sent after each "Roger," the pilot added these quantities and initiated the sum correction indicated. In addition, if the controller desired that the pilot make a 180-degree turn, he signaled FLY - 180, which the pilot erased and waited for an execution signal of RIGHT or LEFT which the controller erased. The pilot then executed a 180-degree turn in the direction indicated. (U)

d. Vertical Control (Altitude): A preparatory signal of PREPARE will be followed by CLIMB or DESCEND and will be "Roger" by the pilot. The pilot will then wait for a signal of FLY followed by 1, 3, 5, or 10 (thousand feet). The pilot will "Roger" these signals and initiate the climb or descent indicated. (U)

e. Lost Procedure: The red light "CN" in the indicator indicated that MSQ-1 has beacon contact. This light "OUT" indicated that MSQ-1 did not have contact. The pilot continued on his present heading and altitude for one minute if the light went out. If light did not come on, he initiated a 180-degree turn and returned at the same altitude until contact is made or until such time that it is apparent that no contact will be made. If no beacon contact is made, pilot will attempt to obtain UHF contact and instructions from ground controller before returning to base. (U)

f. Bombing Procedure (Night Photo Bombing): An initial run will be made "dry" at each altitude to permit the ground controller to obtain accurate drift and ground speed data. On "wet" runs, a signal of PREPARE TO BCMB will be sent approximately one minute from "Bombs Away" point. This will be "Roger" by pilot, and bomb bay will be opened. An execution signal of BCMB will be given at the computed bomb release point, the pilot will instruct the photo-navigator to release the bombs, and then "Roger" the signal. (U)

g. Day Photo Procedure: The same signals will be used for this operation as for night photoflash bombing. The signal BCMB, however, will be the signal of actuation of the aircraft day cameras. At one minute from target a signal of PREPARE TO BCMB will be given. The pilot will "Roger" this signal and prepare the system for camera

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operation. Ten seconds from target, a signal of PREPARE will be given and will not be erased, but will be followed by an execution signal of BCMB. The pilot will then initiate camera operation and "Roger" the signal. (U)

4. SHORAN CALIBRATION PROCEDURE:

<u>STEP NO.</u>	<u>CONTROL USED</u>	<u>POSITION</u>
1	Brightness	Full CCW
2	Remote/Local Gain Switch	Local
3	Gain 1 and 2	Full CCW
4	Scale Miles Switch	"1" Mile
5	Power On Button	Depress
6	Stand-by Switch	Operate
7	Brightness and Focus	Adjust (when red light comes on)
8	Rate Mileage Dial	Detent 99.8381
9	Rate Counter (Vernier)	99.8381 Miles
10	Rate Reference Button NOTE: The rate reference button should seat itself and lock the rate vernier counter at 99.8381 miles. If not, use the following procedure: (a) Disengage rate vernier counter at 9.8381 miles. (b) Depress rate reference button and rotate mileage dial with hand crank (or position control) until rate reference button becomes seated with rate mileage dial near zero miles. (c) Engage rate vernier counter.	
11	Drift Mileage Dial	Detent Nearest Zero

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<u>STEP NO.</u>	<u>CONTROL USED</u>	<u>POSITION</u>
12	Drift Vernier Counter	99.8381 Miles
13	Drift Reference Button	Depress and repeat same process as for Rate side
14	Station Interchange Switch	Rate HF
15	Rate and Drift Vernier Counters	99.8381 Miles
16	Zero Check Switch, NOTE: Twenty minutes must have elapsed since <u>power</u> "On" before proceeding to the next step.	Red Light "ON"
17	Receiver Tuning Knob	Tune to higher transmission frequency (usually 260 mc)
18	Gain 1 (Readjust receiver tuning for optimum reception)	Clockwise until rate pulse reaches maximum size
19	HF Zero Set (Screwdriver adjustment). Refine this adjustment on .2-mile scale	Uncover and superimpose rate marker pulse on rate pulse
20	Receiver Tuning Knob	Tune to lower transmission frequency (usually 230 mc)
21	Gain 2 (Readjust receiver tuning for optimum reception)	Clockwise until drift pulses reach maximum size
22	LF Zero Set (Screwdriver adjustment). Refine this adjustment on .2-mile scale	Superimpose drift marker pulse on drift pulse
23	Zero Check Switch	Red Light "OFF"

NOTE: The following procedure should be performed after the aircraft has reached flight altitude:

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<u>STEP NO.</u>	<u>CONTROL USED</u>	<u>POSITION</u>
24	Scale Miles Switch	100 Miles
25	Stand-by Switch	"Cal" Position
26	UHF-Call ground station and request calibration pulse	
27	Receiver Tuning Knob	Tune to ground station transmission frequency
28	Cal Adjust	Unlock and stop motion of calibration pulse

Repeat step 28 on the 10- and 1-mile scales, then lock Cal Adjust.

5. HIGH ALTITUDE NIGHT PHOTO SYSTEM OPERATING PROCEDURE: (U)

EQUIPMENT: Vertical K-37 (one), with A-18 magazine. Twenty-one M-120 Photoflash Bombs.

- BEFORE TAKE-OFF:**
1. All camera and station control switches in "Off" position. (Check to see that all navigator and nose station master control switches are in "Off" position.)
 2. Camera Main Power Switch to "On" position. (This switch is located on upper center of pilot's control panel.)
 3. Camera Compartment Temperature Control Switch to "On." (This switch is located on photo-navigator's vertical panel.)

- IN FLIGHT:**
1. Mode Selector Switch at vertical station control to "Comp."
 2. Top Magazine Control Power and Camera Switches to "On" position.
 3. Set Bomb Release Control as follows:
 - a. Mode Selector to "Bombs."
 - b. Set Interval as required.

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- c. Set Limiter to number of bombs per run.
4. Set Top Magazine Control to Altitude, Ground Speed and Focal Length.
5. All other controls in "Off" position.

ENTERING TARGET AREA: 1. Master Armament Switch to "On."

2. Bomb Door Switch to "Open."

3. Master Control Panel:

a. Power to "On."

b. Ready to "On." (Allow at least 60 seconds prior to bomb release.)

AT TARGET:

Master Control Panel Operate Switch to "On."

(Leave on until all pictures have been taken.)

NOTE: For extra picture, position Mode Selector on Vertical Station Control to "Intv" and press extra picture button.

6. HIGH ALTITUDE DAY PHOTO SYSTEM OPERATING PROCEDURE: (U)

EQUIPMENT:

Cameras - K-38 (two) Split Vertical Station
T-11 (one) Vertical Station

Magazine - A-8B (on K-38 Cameras)

BEFORE TAKE-OFF:

1. All camera and station control switches in "Off" position. (Check to see that all navigator and nose station master control switches are in "Off" position.)
2. Camera Main Power Switch to "On" position. (This switch is located on upper center of pilot's control panel.)
3. Camera Compartment Temperature Control Switch to "On" position. (This switch is located on photo-navigator's vertical panel.)

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IN FLIGHT:
(To set up system.)

1. Vertical Station Mode Selector to "Intv."
2. Split Vertical Station Mode Selector to "Intv."
3. Bomb Release Control as follows:
 - a. Set Mode Selector to "Cam."
 - b. Set Intervalometer as required for Altitude, Ground Speed and Overlap.
 - c. Limiter as required. NOTE: If Limiter is not needed, it can be eliminated from system by placing it in the "Off" position.
4. Recheck remaining controls for "Off" position.

ENTERING TARGET AREA: 1. Master Control Panel:

- a. Power "On." (Power Indicator Lamps on each master control will light.)
- b. Ready "On." (Allow one minute prior to photo time.) When power light goes out and ready light comes on system is ready. Camera doors will open on this operation.

AT TARGET:

1. Master Control Operate Switch "On."
2. Extra pictures can be taken by Vertical Extra "Pic" or Split Vertical Extra "Pic" Button as desired.

7. NAVIGATOR EJECTION SEAT SAFETY PROCEDURE:

The navigator replaced the safety pins in the ejection seat before leaving the rear navigator position during flight. The pins were again removed after the navigator returned to the rear position, readjusted his parachute and fastened his safety belt.

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MAINTENANCE AND MATERIEL

SUMMARY

1. INTRODUCTION:

This appendix includes maintenance and supply data collected during the "Operational Suitability Test of the RB-57A Aircraft," Project No. APG/TAS/122-A, from 20 April 1954 through 31 January 1955. (U)

2. DESCRIPTION:

A detailed description of the RB-57A type aircraft is included in the main body of the report. (Reference paragraph 2b, Summary.) (U)

3. OBJECT:

To determine the operational suitability of the RB-57A aircraft insofar as maintenance, supply, and personnel requirements are concerned. (U)

4. CONCLUSION:

The RB-57 aircraft is suitable from an overall materiel standpoint. However, corrections are required for the following deficiencies: (C)

- a. The external locks for the flight control surfaces are too small to effectively lock the controls. (C)
- b. The number of weapons personnel and aircraft mechanics listed on the Table of Organization is inadequate. (C)
- c. The special hand tools necessary to minimize the maintenance effort are inadequate. (C)
- d. The technical publication handbooks are unsuitable with the exception of T.O. 2J-J65-2, "Handbook of Maintenance Instructions." (C)

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5. RECOMMENDATIONS:

a. Action be initiated to correct the deficiencies noted in paragraph 4, above. (C)

b. The Table of Organization be augmented by four weapons mechanics (two with AFSC 46230 and two with AFSC 46250) and 18 aircraft mechanics (AFSC 43151K or 43131K) per reconnaissance bomber squadron. (C)

c. The technical publication handbooks be revised. (C)

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DISCUSSION

1. ORGANIZATIONAL IMPACT:

a. Personnel:

The number of personnel authorized by Table of Organization 1-1457P, dated 1 November 1954, is inadequate in AFS's 43 and 46. (C)

- (1) The full armament authorization is six men. This is obviously inadequate as a four-man crew is required to load 21 photoflash bombs. Also, a five-man crew is required to safely mount a fully loaded bomb door. The addition of four airmen (two A/1C, 46250, and two A/2C, 46230) to the Table of Organization alleviates the possibility of a serious time delay which would affect the assigned mission. (C)
- (2) The maintenance crew for each RB-57 type aircraft is comprised of two men (one crew chief, AFSC 43171K and one aircraft mechanic, AFSC 43151K). Based on the required number of maintenance man-hours to generate one flying hour (20.2 to 1), this crew is inadequate. Using this guideline, a crew of four aircraft mechanics would be required. However, as maintenance personnel become more experienced and as the number of technical order compliances diminishes, a three-man crew could adequately maintain this aircraft. This would result in a net increase of 18 aircraft mechanics (AFSC 43151K or 43131K) in the Table of Organization. (C)

b. Training:

Factory training should be available to maintenance supervisors, aircraft crew chiefs, and armament personnel prior to receipt of aircraft. All other assigned personnel can be trained through OJT. (C)

c. Equipment:

All of the supporting equipment was investigated. In general, the equipment is adequate to support this type aircraft. For particular deficiencies, refer to paragraph 5, Inclosure 2 (Test Results). (C)

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d. Supply Support:

The Test Support Table was used only as a guide for the necessary equipment. This table lists all the supporting equipment for B/RB-57 type aircraft. The only deficiency noted during the testing period was the inability to maintain an adequate stock level of engine starters. This, however, was due to defective starters (which have now been modified) rather than supply channels. (C)

2. CAPABILITIES AND LIMITATIONS:

a. Capabilities:

- (1) From a maintenance viewpoint the RB-57 aircraft can be expected to generate the required 50 flying hours per month. (C)
- (2) The aircraft maintenance requirement can be adequately supported by the assigned equipment. (C)
- (3) The RB-57 can be adequately maintained by the personnel codes assigned to a typical organization according to T.O. 1-1457P, dated 1 November 1954. (C)

b. Limitations:

- (1) From a personnel viewpoint, this aircraft cannot be maintained by the number of personnel assigned to a typical organization. (C)
- (2) The technical publication handbooks are unsuitable from a maintenance viewpoint. (C)

3. COLLECTIVE ANALYSIS:

a. At first data analysis this aircraft appeared to be unsuitable. This observation resulted from the 31% in-commission rate and the excessive amount of unscheduled maintenance and considerable loss of aircraft utilization effected by technical order compliance. Upon further investigation, it is evident that these are "one-time compliance" technical orders resulting from design deficiencies, e.g., canopy, control surfaces (skin and rivets), engine starters, battery compartment vent, etc. Once the technical orders had been complied with, no further difficulties were encountered. (C)

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b. The overall maintenance of the RB-57 aircraft is considered typical for a light bombardment type aircraft. Maintenance personnel agree to the ease with which this aircraft can be maintained. The accessibility of the systems is one of the particularly desirable maintenance features. (U)

c. The in-commission rate (31%) mentioned in the Test Results is lower than anticipated. However, data reflected on AF Form 110A indicated that grounding, awaiting action on correction of deficiencies, and technical order compliance consumed 4,458 calendar hours. This represents 22.4% of the total available hours and 42.5% of the total calendar hours consumed by maintenance. The direct maintenance man-hours expended on technical order compliances were 1,082, 16% of the total maintenance effort or 30% of the total unscheduled maintenance. (C)

d. The ratio of 20.2 maintenance man-hours per flying hour includes both scheduled and unscheduled direct organizational maintenance applied against the aircraft. This ratio is reduced to 17:1 by deleting the man-hours expended on "one-time compliance" technical orders from the total maintenance effort. (C)

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TEST PROCEDURES

1. Data was collected by utilizing the following:
 - a. AF Form 533, "Spare Parts Consumption Data for Initial Operation - New Aircraft."
 - b. AF Form 110A, "Daily Report of Aircraft Status and Selected Flight Operations."
 - c. APGC Form O-519 (Test), "Daily Maintenance Record," and AF Form 1A (or DD Form 781).
 - d. APGC Form 80, "Daily Aircraft Status Report."
 - e. APGC Form 8, "Aircraft Status and Utilization Log."
 - f. AFTO Form 29, "Unsatisfactory Report" (DD Form 535).
 - g. Daily notations made from observation and discussions with maintenance and supply personnel.
 - h. Weekly compilation of the organizational and field maintenance required to support the three test aircraft. (U)
2. During the reporting period, the following were investigated:
 - a. Aircraft availability rates.
 - b. Scheduled and unscheduled maintenance requirements.
 - c. Suitability of aircraft systems.
 - d. Adequacy of support equipment.
 - e. Supply support requirements.
 - f. Maintenance personnel requirements.
 - g. Maintenance training requirements.
 - h. Adequacy of technical publications. (U)

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TEST RESULTS AND DISCUSSION OF RESULTS

1. AIRCRAFT AVAILABILITY*: (C)

ACFT NO.	ACFT OUT OF COM		ACFT IN COM		TOTAL HRS AVAILABLE	% IN CCM
	MAINT	PARTS	NOT FLY	FLY		
52-1430*	307	0	479:50	25:10	812	62.2
52-1432	3,544	914	2284:35	145:25	6,888	35.3
52-1433	3,888	1,188	1702:00	110:00	6,888	26.3
52-1464	2,749	1,166	1389:10	59:50	5,364	27.0
TOTALS	10,488	3,268	5855:35	340:25	19,952	31.05

* Data are in calendar hours.

2. DIRECT MAINTENANCE MAN-HOURS: (C)

ACFT NO.	MAINTENANCE MAN-HOURS		MAN-HOURS PER FLYING HOUR	FIELD MAINTENANCE
	SCHEDULED	UNSCHEDULED		
52-1430*	442:35	290:20	29.1	85:45
52-1432	1486:25	1430:10	20.1	730:30
52-1433	956:45	983:50	17.6	613:30
52-1464	649:40	632:35	21.4	193:30
TOTALS	3535:25	3336:55*	20.2	1628:15**

* 1,082 man-hours were expended on "one-time compliance" technical orders.

** An additional 703 man-hours were expended on all RB-57 aircraft. It was not possible to break down this total by serial numbers. This total of field maintenance is not included in the ratio of man-hours per flying hour.

* Crashed during test and was replaced by aircraft number 52-1464.

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3. INSPECTION MAN-HOURS:

- a. Average Preflight 6.0
- b. Average Postflight 5.2
- c. Average Periodic 214 (C)

4. AIRCRAFT SYSTEMS:

Each of the aircraft systems was investigated. The following list includes the particular deficiencies and malfunctions of the major aircraft systems. However, all discrepancies have been reported on AFIO Form 29, "Unsatisfactory Report." For a complete list of unsatisfactory reports, refer to Inclosure 3. (U)

a. Power Plant:

- (1) During the testing period, four engines were changed. The average number of man-hours required to accomplish an engine change was 25. This was accomplished utilizing a four-man crew and a built-up engine. (U)
- (2) The time required to "build up" a J65-W-5 engine is 120 man-hours. This total time includes uncrating, cleaning, and assembling the new engine as well as disassembling, pickling, and crating the old engine. (U)
- (3) There was a total of 1525:30 maintenance man-hours expended on the power plant. Of this time 650:15 man-hours were expended during seven periodic inspections. (U)
- (4) The engine starter was the primary trouble area in the power plant system. The repeated failures, in turn, caused difficulty in maintaining adequate stock levels. Once these starters were modified, no further difficulties were encountered. (U)

b. Airframe:

- (1) Cracks and "popped" rivets were noticed on the horizontal stabilizers. The "popped" rivets were being replaced with cherry rivets when an Urgent

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Action Interim T.O. 1B-57-527B, dated 21 November 1954, directed that all elevators be removed and modified with a heavier material. This T.O. was complied with, and no further difficulties existed. (U)

- (2) The external control locks for the rudder and elevator control surfaces have damaged the aircraft. The locks are too small to effectively "hold" the surfaces. The locking pins on these control locks have also been ineffective. (U)
- (3) The tools, hand and special, supplied to maintain this airframe are not entirely adequate. Refer to paragraph 5b(2) of this inclosure for additional required tools. (U)

c. Electrical:

- (1) Difficulties occur when maintenance personnel start paralleling the generators because of the location of the voltage regulators. One regulator is located in the upper fuse compartment to the rear of the navigator's position. Two are located in the lower fuselage section. If one specialist attempts to work by himself, he must crawl up and down in the aircraft repeatedly to complete the work. This represents a hazard to personnel inasmuch as the engines must be running. As a result of these deficiencies, an excessive number of man-hours is expended in trouble shooting and maintaining this system. (U)
- (2) The battery can be used as a source of power to fire the cartridge on the starter for the engine. The power being generated by the first engine can then be used to fire the cartridge on the other engine starter. This starting procedure would minimize the need for battery carts for all engine starts. It is necessary to note, however, that auxiliary power is necessary for preflight and postflight inspections. (U)

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d. Communications:

Hand tools and special tools are inadequate for this system. For a more comprehensive breakdown of these deficiencies, refer to paragraph 5b(1) of this inclosure. (U)

e. Armament:

No particular maintenance difficulties occurred in this system. However, support equipment was inadequate. Refer to paragraphs 5a(3) and (4) of this inclosure for the deficiencies. (U)

f. Utility:

Extreme difficulty has been experienced during the servicing of the liquid oxygen system. In almost all servicing operations, the liquid oxygen servicing nozzle freezes to the filler valve receptacles on the aircraft. A waiting period of at least 20 to 30 minutes is necessary to free the nozzle. The liquid oxygen servicing nozzle has been modified in order to alleviate the freezing characteristics encountered. The modification data was accomplished in accordance with Edwards AF Base Drawing No. 55 EDD 715. (U)

g. Fuel:

- (1) Fuel syphoning occurred frequently during the initial climbs of the aircraft, and it was discovered that the syphoned fuel was flowing aft from the main wing tank vent on the under surface of the wing. Due to the air flow around the airfoil, the fuel entered the aileron access section and the aileron rod boots, thence into the leading edge of the aileron. Investigation revealed that the diaphragm in the fuel float valve, P/N 20-1227-000, was rupturing. This valve was replaced and an unsatisfactory report was submitted. (U)
- (2) Fuel, when overflowing through the saber vent, sprays along the bottom of the aft section. Consequently, fuel accumulates in the tail cone and drains back into the belly of the aircraft. Relocation of the saber vent would eliminate this condition. The approximate station change would be from station #40 to station #45. This has been submitted as an engineering change proposal. (U)

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5. SUPPORT EQUIPMENT:

All of the supporting equipment was investigated. (U)

a. The following deficiencies were noted with the support items:

- (1) Tow Bar: This item has been modified to prevent damage to the pitot tube mast when the aircraft is being towed over uneven terrain and/or when the tug makes a left turn. (U)
- (2) Trailer - Liquid Oxygen: It is believed that a combination of warm air flowing between the inner case and outer shell of the nozzle, coupled with moisture, is causing the nozzle to freeze to the valve receptacle during servicing. The liquid oxygen servicing nozzle has been modified to alleviate the freezing characteristics. (U)
- (3) Forward Bomb Dolly - Bomb Door: No suitable provisions for a locking device on the forward bomb dolly have been made. Eglin AF Base UR Serial No. 54-517, "Bomb, Door Forward, Tow Truck," recommended a possible brake installation. However, this suggested modification was disapproved. (U)
- (4) Hoisting Apparatus, Bomb Door: (Mark 8) This unit weighs approximately 50 pounds. The shaft is approximately 48 inches long. The shaft end is inseted in a receptacle slot and must be held in a position of 20° below the horizontal. Because of the weight, armament personnel unintentionally allow the hoist to drop slightly, causing the shaft end to slip. When hoisting the bomb door, the cable at the shaft end tends to cut the metal in the receptacle slot. The recommended modification is the addition of a supporting leg to prevent the hoisting apparatus from being lowered by the using personnel. (U)

b. The following items are tools requested by maintenance personnel. The addition of these tools to the kits would decrease the time expended on maintenance, in general. (U)

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(1) Communications Requirements:

- (a) Adequate hand tools for Cannon plugs would be water pump type pliers with hard leather or fibre gripping jaw seats. Recommend one per tool kit. (U)
- (b) Stakon wrenches are not authorized but are necessary to facilitate maintenance. Recommend one per tool kit. (U)
- (c) Spintite wrenches in standard sizes are needed to facilitate maintenance because of the inaccessible locations of various parts. Recommend one set per tool kit. (U)
- (d) Wire strippers are necessary for the communications section. Recommend one per communications section. (U)
- (e) Speed wrenches for Allen head screws will considerably decrease the man-hours expended in removing and replacing the 16 screws on the AN/ARC-27. Normally 10 to 15 minutes are consumed in removing these 16 screws. With a specially designed speed wrench, this time could be reduced to two or three minutes. This seven-to twelve-minute saving, multiplied by the number of ARC-27 sets in a squadron, can result in a considerable saving in man-hours. Recommend consideration for such a tool and issuance of one per communications section. (U)

(2) Airframe Requirements:

- (a) Tire pressure gauge is a necessary tool to be added to the mechanic's tool kit. (U)
- (b) No special tool has been issued for removal of brake assemblies. They are presently being removed with mallets. (U)
- (c) No bearing puller has been issued for removing bearings from the axle prior to removing the axle on the nose landing gear. The axles are presently removed with hard rubber mallets. (U)

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c. Presently, two headsets, H-70/AIC(28800-70), Class 16-A, S/N 1790-207385219, are authorized in the ECL 30-30-AIC-10. However, when two or more aircraft need communications preflights or postflights, there is a maintenance delay in that two men are required to check out the equipment in each aircraft. This results in other aircraft awaiting maintenance. It is recommended that two headsets be assigned for every four aircraft. (U)

6. SUPPLY SUPPORT REQUIREMENTS:

a. Spare Parts Consumed:

A complete list of the spare parts consumed has been submitted on AF Form 533, "Spare Parts Consumption Data for Initial Operation - New Aircraft." (U)

b. Tentative Table of Equipment:

See paragraph 9k of this inclosure. (U)

c. Equipment Component List:

See paragraph 9l of this inclosure. (U)

d. Test Support Table:

See paragraph 9m of this inclosure. (U)

7. PERSONNEL REQUIREMENTS:

The number of weapons and aircraft maintenance personnel specified in the Table of Organization, T/O 1-1475P, is inadequate. (U)

a. The breakdown of the weapons section is as follows:

<u>NO. PERS</u>	<u>AFSC</u>	<u>RANK</u>	<u>TITLE</u>
1	46270	M/Sgt	Weapons Maintenance Supervisor
1	46270	S/Sgt	Senior Weapons Mechanic
2	46250	A/1C	Weapons Mechanic
2	46230	A/2C	Apprentice Weapons Mechanic

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Five men are required to safely mount a fully loaded bomb door. The addition of four airmen (two A/1C, 46250, and two A/2C, 46230) to the Table of Organization alleviates the possibility of a serious time delay which could affect the assigned mission. (U)

b. The maintenance crew for each RB-57 type aircraft, according to the Table of Organization, is comprised of two men (one crew chief, AFSC 43171K and one aircraft mechanic, AFSC 43151K). Because of the anticipated 17 maintenance man-hours required to generate one flying hour, one additional aircraft mechanic is necessary on each aircraft crew. (U)

8. TRAINING REQUIREMENTS:

a. Due to the newness and complexity of the armament system, there is a requirement for factory training for the non-commissioned officers in this career field. The factory training course should include a course on equipment handling, equipment loading, and system trouble shooting. (U)

b. A factory training course of aircraft familiarization for the maintenance supervisors and aircraft crew chiefs is considered necessary. The crew chiefs can then train the remaining crew members through OJT. (U)

c. Senior level specialists in the remaining fields (hydraulics, electronics, communications, etc.) are considered proficient enough to maintain their respective systems. (U)

9. TECHNICAL PUBLICATIONS:

The following aircraft and engine technical orders have been investigated. The discrepancies found have been compiled in order that the unsatisfactory conditions can be reported on AFIO Form 29, "Unsatisfactory Report." (U)

a. T.O. No. 1B-57(R)A-1, "Flight Handbook," has the following deficiencies: (U)

(1) Section I - Description:

- (a) "Flight Control System," page 24: A statement regarding controllable trim devices is incorrect and misleading. Aileron trim is accomplished by bungee tension on the aileron

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controls, and the aileron tabs operate independently of the trim system. (U)

- (b) "Figure 1-20," page 25: An obsolete horizontal stabilizer switch is shown in this picture. (U)
- (c) "Brake System," page 30: While two or three brake applications should be possible during hydraulic system failure, insufficient stress is placed on the fact that only one application should be relied upon. (U)
- (d) "Parking Brake," page 30: This paragraph states that, to release the brakes, the control lever should be placed in the "CFF" position after depressing the pedals. This statement is incorrect since the control lever returns to the "OFF" position automatically when the pedals are depressed. (U)
- (e) "Figure 1-36," page 45; "Ejection Seats," page 46; and "Figure 2-2," page 52: No information is included on the Stanley Automatic Release safety belt. This safety belt also incorporates an initiator and initiator safety pin which must be removed prior to flight. (U)

(2) Section II - Normal Procedures:

- (a) "Exterior Inspection," page 51. (U)
 - 1. Paragraph 3, "Wheel Well" - right hand section should include "Hydraulic Level - Proper Amounts." (U)
 - 2. Paragraph 7, "Wing Trailing Edge" - right hand section should include "Control Lock - Removal." (U)

These comments should be placed in the above mentioned sections rather than in the general paragraph at the beginning of the checklist. (U)

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- (b) "On Entering the Airplane," page 52. (U)
 - 1. "Interior Check (all flights)" - This section should include: (U)
 - a. "Detonator Circuit Breakers" as there are two pilots circuit breakers and one navigators circuit breaker involved. (U)
 - b. "Star Valve - Closed". (U)
 - 2. "Interior Check (night flights)" - This section should be specific in the check required and not included with "all other flights as necessary and check others." (U)
- (c) "Before Take-Off," page 56, "Preflight Airplane Check:" This section should include "canopy and column stow detonator circuit breakers - IN" rather than "canopy jettison detonator circuit breakers - IN." (U)
- (d) "Take-off," page 58: The "note" in paragraph 1 states "the optimum take-off speed of approximately 110 knots IAS for an approximate gross weight of 45,000 pounds . . ." This airspeed is too low in view of the nose high altitude necessary to break ground. A take-off speed of 120-130 knots IAS is more suitable. (U)
- (e) "Traffic Pattern Check List," page 59: (U)
 - 1. The "caution" paragraph states: "Rapid throttle movement would cause the emergency system to override the normal system and could result in a flame-out or compressor stall." This statement is basically incorrect as the amount of fuel flowing is the determining factor in the automatic operation of the emergency fuel system. (U)
 - 2. "Brake Pressure - Checked:" Should be included in this section. (U)

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- (f) "Before Leaving the Airplane," page 61: This check should include "Start and Ignition Circuit Breakers - OUT" to prevent inadvertent firing of the starters. (U)

(3) Section III - Emergency Procedures:

- (a) "Engine Failure," page 63: The minimum single engine control speed of 140 knots IAS should be revised upward. Research and development flights have determined 155 knots IAS to be a more realistic speed. (U)
- (b) "Engine Re-Start in Flight," page 63: This checklist requires descent to below 30,000 feet prior to re-start. This altitude is considered too high for a successful re-start. Re-starts attempted during the test were never successful above 20,000 feet, and seldom successful above 16,000 feet. (U)
- (c) "Complete Electrical Failure," page 73: The "Warning" paragraph states that the ejection seats will be inoperative in the event of complete electrical failure. This is incorrect. The seat ejection is manually initiated. It is recommended that this be changed to "control column stow unit will be inoperative." (U)

(4) Section IV - Description and Operation of Auxiliary Equipment:

- (a) The fuse panel located at the rear photo-navigator's station is accessible in flight, yet no information is available on this item in T.O. 1B-57(R)A-1. (U)
- (b) "Radio Compass AN/ARN-6," page 82: The audio mixing switches provide signal mixing in the "UP" rather than the "DOWN" position as indicated in this paragraph. (U)
- (c) "Photographic Equipment," page 94: The camera control system does not "constitute basically a Universal Camera Control System." (U)

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- (d) "Photographic Equipment," page 94: This paragraph fails to indicate that explosion-proof equipment is required in the camera compartment. (U)
- (e) "Photographic Equipment," page 94: Pilot operation of the camera control system is not possible as indicated by this paragraph, since much of the control panel is out of the pilot's reach. (U)
- (f) "Bomb Release Control Panel," page 97: This paragraph states: "In the 'CAM' position, the intervalometer and limiter control pulses operate the vertical and split vertical cameras." When the mode selector is in "CAM" position, pulses also go to the bomb door, and will initiate bomb release if the door is open and the armament switch "CN." Bombs were inadvertently released on one test flight because of this condition. (U)
- (g) "Figure 4-18," page 103: The bomb loading diagram illustrates numerous bomb load configurations, but omits the standard M120 Photo-flash Bomb currently used for night photography. (U)

(5) Section V - Operating Limitations:

"Maximum Allowable Airspeeds," page 110: (U)

- (a) The airspeed limitations set forth in this section are not current as of the revision date of the page. (U)
- (b) Maximum IAS with tip tanks installed is listed as follows: page 110, 437 knots; page 129, Figure 9-1, 435 knots; page 136, 434 knots. At best, airspeed limitations published in the technical order are conflicting, and confuse the reader. (U)

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- (6) Appendix I - Operating Data: "Figure A-3," page 142: The figures given in the Airspeed Installation Correction Table are incorrect. Also, a serious deficiency exists in that an Altimeter Installation Correction Table is not included. (U)

b. Technical Order No. 1B-57(R)A-2, "Handbook of Maintenance Instructions", has the following deficiencies: (U)

- (1) "Section II," page 153, paragraph 2-480: This does not state clearances when variable incidence stabilizer is in the nose "UP" and "DOWN" position. (U)
- (2) "Section V," page 406F, paragraph 5-122: Last three lines have no connection to the rest of the paragraph. (U)
- (3) "Section V," page 462, paragraphs 5-326 and 5-327: This does not include instructions for defueling of wing tanks before disconnecting and removing low pressure valves. (U)

c. Technical Order No. 1B-57(R)A-3, "Handbook of Structural Repair," is presently being studied by a manual reviewing board to finalize the necessary changes. (U)

d. Technical Order No. 1B-57A-4, "Parts Catalogue," was found inadequate during the reporting period. (U)

e. Technical Order No. 1B-57(R)A-5, "Handbook, Basic Weight Check List and Loading Data," has a fuel capacity discrepancy. (U)

- (1) Manufacturer's Specifications: (U)

No. 1 Tank	1040 gallons
No. 2 Tank	654 gallons
2 Wing Tanks @ 319 gallons	<u>638 gallons</u>
Total Fuel Capacity	2332 gallons

- (2) 1B-57(R)A-1, revised 15 September 1954: (U)

No. 1 Tank	1038 gallons
No. 2 Tank	683 gallons
2 Wing Tanks @ 296 gallons	<u>592 gallons</u>
Total Fuel Capacity	2313 gallons

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(3) 1B-57(R)A-5, dated 27 August 1954: (U)

No. 1 Tank	1010 gallons
No. 2 Tank	662 gallons
2 Wing Tanks @ 290 gallons	<u>580 gallons</u>
Total Fuel Capacity	2252 gallons

(4) Actual Capacity: (U)

No. 1 Tank	1000 gallons
No. 2 Tank	645 gallons
2 Wing Tanks @ 291 gallons	<u>582 gallons</u>
Actual Total Capacity	2227 gallons

To insure an accurate account of the number of gallons required to fill the fuel tanks to capacity, an RB-57A aircraft was defueled, fuel lines disconnected and drained and a sample gallon was weighed. The tanks were then filled to capacity, using a total of 2227 gallons, as determined gravimetrically. This discrepancy has been submitted on DD Form 535, "Unsatisfactory Report," Eglin AF Base S/N 54-599. (U)

f. Technical Order No. 1B-57A-6, "Handbook of Inspection Requirements," proved to be incomplete and unrealistic during the test period. The handbook does not include all of the items to be inspected, and the times allotted for inspection items are unrealistic. (U)

g. Technical Order No. 2J-J65-4, "Handbook, Service Instructions, Models J65-W-3, J65-W-5, J65-B-3 Aircraft Engines," has been adequate for this testing period. (U)

h. Technical Order No. 2J-J65-4, "Illustrated Parts Breakdown, Models J65-W-3, J65-W-5, J65-B-3 Aircraft Engines," has been unsatisfactory. (U)

i. Technical Order No. 2J-J65-6, "Handbook, Minor Repairs, and Replacements, Jet Engine Components, Models J65-W-3, J65-W-5, J65-B-3 Aircraft Engines," has been adequate during this reporting period. (U)

j. The Tentative Table of Equipment was investigated as to the adequacy of the equipment assigned to a field operating organization. The items listed in this publication are adequate. (U)

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k. Equipment Component Lists have shown no discrepancies to date. The revisions on the ECL were included with the Tentative Table of Equipment. (U)

l. The Test Support Table was used only as a guide for the necessary equipment. This table lists all supporting equipment for B/RB-57 type aircraft. No deficiencies were noted during the testing period. (U)

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LIST OF UNSATISFACTORY REPORTS

<u>NUMBER</u>	<u>DATE</u>	<u>TITLE</u>
54-309	5 April 54	Battery Installation
54-326	8 April 54	Transfer Tube Failure
54-330	8 April 54	Transfer Tube Failure
54-347	12 April 54	Wing Fuel Tank Vent System
54-354	12 April 54	Turbo Starter Assembly
54-362	14 April 54	Clamp, Elevator Locking
54-366	14 April 54	Starter Cartridge
54-382	16 April 54	Exhaust Clamp, Starter
54-394	20 April 54	Failure of Turbo Starter Breech Assembly
54-397	21 April 54	Leakage of Reducer Valve in Purging System
54-400	21 April 54	Fitting Assembly, Attachment for Side Stay, Main Landing Gear
54-409	22 April 54	Engine Debris Guard
54-420	23 April 54	Canopy Jettison System
54-423	23 April 54	Valve Assembly, Filler
54-425	26 April 54	Paint Peeling from Engine Nacelles
54-426	28 April 54	Nose Assembly, Starter Fairing
54-432	30 April 54	Improper Installation of Canopy Ejection Mechanism in R.H. Armrest of Pilot's Seat
54-447	30 April 54	Installation of Napalm Tanks on Bomb Pylon Assembly

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<u>NUMBER</u>	<u>DATE</u>	<u>TITLE</u>
54-449	30 April 54	Fire Detector Lead Wire Pulled from Thermocouple
54-455	3 May 54	Lack of Warning Stenciled on Outside of Fuselage for Starter Cartridges
54-456	3 May 54	Handle Installation, Forward Entrance Door
54-459	3 May 54	Technical Order 1B-57A-6 dated 15 Feb 54
54-464	5 May 54	Cable Assembly
54-468	6 May 54	Chafing of Pilot's and Navigator's Ejection Seat Hose Assembly
54-483	9 May 54	Valve-Hydraulic, Solenoid Operated
54-488	10 May 54	Outlet, Fuel Vent
54-492	10 May 54	Pipe Assembly, Engine Tail
54-505	19 May 54	Turbo Starter Failure
54-506	17 May 54	T.O. 1B-57(R)A-1, dated 1 Oct 53, No Caution Note on Danger of Turbine Starter Exploding
54-508	17 May 54	Pylon Assemblies
54-511	17 May 54	Connector, Receptacle
54-514	24 May 54	Turbo Starter Clutch Failure
54-517	19 May 54	Tow Truck, Bomb Door, Forward
54-524	21 May 54	Failure of Turbo Starter
54-531	24 May 54	Service Cowl Seal Decomposing
54-537	26 May 54	Oxygen Hose, Navigator's
54-541	27 May 54	Latch Assembly, Engine Cowl
54-542	27 May 54	Lower Aft Cowl Assembly Spring

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<u>NUMBER</u>	<u>DATE</u>	<u>TITLE</u>
54-556	3 Jun 54	Lamp Incandescent
54-559	3 Jun 54	Error in Manufacturer's Listed Fuel Tank Capacities
54-584	14 Jun 54	Fuel Control Malfunction
54-597	18 Jun 54	Fuel Control Diaphragm Failure
54-598	18 Jun 54	Control Assy, Fuel
54-633	1 Jul 54	Breech Cover Assy
54-637	2 Jul 54	Binding of Throttle Linkage
54-640	7 Jul 54	Elevator Trim Tab
54-642	7 Jul 54	T.O. 1B-57A-2
54-668	19 Jul 54	Elevator Assy
54-672	20 Jul 54	Electrical System
54-674	20 Jul 54	Cone, Aft Nacelle
54-677	22 Jul 54	Bolt, Explosive on Aux. Fuel Tip Tank Installation
54-678	22 Jul 54	Pylon Installation
54-683	26 Jul 54	T.O. 1B-57(R)A-1 & T.O. 1B-57(R)A-2
54-689	27 Jul 54	Improper Fit of Canopy Assys.
54-692	27 Jul 54	T.O. 1B-57(R)A-2, Maint. Instructions
54-701	2 Aug 54	Electrical System
54-711	4 Aug 54	Turbine Cooling
54-752	20 Aug 54	Handle Installation, Forward Entrance Door
54-754	20 Aug 54	Starter Exhaust Duct

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<u>NUMBER</u>	<u>DATE</u>	<u>TITLE</u>
54-774	26 Aug 54	Relief Valve
54-781	3 Sep 54	Starter Fairing Assy
54-782	3 Sep 54	Oxygen Vent Valve
54-806	14 Sep 54	Capacity of Liquid Oxygen Converter
54-812	15 Sep 54	Fuel Collecting in Tail Section
54-822	15 Sep 54	Gasket - Rubber Cork
54-823	15 Sep 54	Gasket - Rubber Cork
54-820	20 Sep 54	Turbo Starter Assy
54-856	20 Sep 54	Fuel Pump
54-858	21 Sep 54	Float Valve Assy
54-863	22 Sep 54	Gauge, Liquid Oxygen
54-889	30 Sep 54	Turbo Starter Assy
54-905	5 Oct 54	Intervalometer - Automatic Aerial Camera
54-919	6 Oct 54	Receptacle, Static Hose Stowage
54-925	8 Oct 54	Door Installation-Aft Fuselage Access
54-926	8 Oct 54	Receptacle, Vacuum Stowage
54-978	25 Oct 54	Elevator Tab Assy
54-988	26 Oct 54	Adapter, Switch Actuator
54-1003	27 Oct 54	Window Assy, Direct Vision
54-1024	29 Oct 54	Installation of Container, Desiccant
54-1026	29 Oct 54	Brake Assy
54-1036	2 Nov 54	Turbo Starter

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<u>NUMBER</u>	<u>DATE</u>	<u>TITLE</u>
54-1102	18 Nov 54	Valve, Fuel Shut-Off
54-1118	22 Nov 54	Installation, Vibration Insulators on Cabin Air Pressure Regulator
54-1120	22 Nov 54	Detector, Overheat
54-1126	24 Nov 54	Brake Assy
54-1129	24 Nov 54	Brake Assy
54-1187	9 Dec 54	Door Assy
54-1204	13 Dec 54	Meletron Pressure Switch Drain In- stallation
54-1205	13 Dec 54	Elevator & Tab Assy
54-1206	13 Dec 54	Aileraon Assy, L.H.
54-1209	14 Dec 54	Installation of MLG Uplock Switch
54-1227	21 Dec 54	T.O. 1B-1-506, Purging & Inspection of A/C Liquid Oxygen System
54-1232	21 Dec 54	Rt. Front Auxiliary Spar Web
54-1233	22 Dec 54	Purging of Liquid Oxygen Tank Trailer, Oxygen Servicing, 4-wheel, MB-1
55-100	26 Jan 55	Seat Assembly, Pilot's and Naviga- tor's
55-111	27 Jan 55	Failure of T.O.C. by Contractor

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LIST OF TECHNICAL ORDER COMPLIANCES (U)

1. AIRFRAME TECHNICAL ORDER COMPLIANCES, RB-57 AIRCRAFT:

T.O. NUMBER	T.O. DATED	DATE T.O. COMPLIED WITH		
		A/C #52-1432	A/C #52-1433	A/C #52-1464
1B-1-23	27 Jan 54	30 Mar 54	19 Apr 54	23 Jun 54 PCN
1B-1-42	28 Jan 54	1 Apr 54	5 Apr 54	23 Jun 54
1B-1-504	26 Oct 54	10 Nov 54	9 Nov 54	10 Nov 54
1B-1-506	17 Dec 54	8 Jan 55	8 Jan 55	13 Jan 55
1B-57-209	2 Apr 54	23 Apr 54 PCN	5 Apr 54 PCN	16 Jun 54
1B-57-212	9 Apr 54	23 Apr 54 PCN	27 Apr 54	16 Jun 54
1B-57-216	27 Apr 54	13 May 54 PCN	7 May 54 PCN	16 Jun 54
1B-57-217	20 May 54	8 Jun 54		28 Oct 54
1B-57-218	21 Sep 54	27 Dec 54 PCN	15 Dec 54 PCN	
1B-57-222	14 May 54	4 Jun 54 PCN	25 Jun 54 PCN	23 Jun 54
1B-57-223	14 May 54	4 Jun 54 PCN	25 Jun 54 PCN	23 Jun 54
1B-57-225	16 Aug 54	12 Nov 54	15 Nov 54	
1B-57-229	30 Jun 54	6 Jul 54	15 Jul 54	6 Jul 54
1B-57-233	3 Jun 54	22 Jun 54 PCN	25 Jun 54 PCN	23 Jun 54
1B-57-236	11 Jun 54	2 Jun 54	25 Jun 54 PCN	16 Jun 54
1B-57-241	11 Oct 54	28 Dec 54	15 Dec 54	
1B-57-246	21 Sep 54	29 Nov 54	30 Nov 54	
1B-57-251	5 Oct 54		15 Nov 54	10 Nov 54
1B-57-252	13 Aug 54	24 Sep 54 PCN	24 Sep 54 PCN	27 Dec 54 PCN
1B-57-253	28 Jul 54	14 Jul 54	10 Sep 54 PCN	13 Sep 54 PCN

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T.O. NUMBER	T.O. DATED	DATE T.O. COMPLIED WITH		
		A/C #52-1432	A/C #52-1433	A/C #52-1464
1B-57-261	11 Oct 54	9 Dec 54		
1B-57-263	31 Aug 54	15 Sep 54 PCW	15 Sep 54 PCW	
1B-57-265	6 Aug 54	13 Sep 54 PCW	15 Sep 54 PCW	10 Aug 54
1B-57-276	24 Aug 54	24 Sep 54 PCW	24 Sep 54 PCW	24 Sep 54 PCW
1B-57-279	5 Oct 54	1 Nov 54	1 Nov 54	1 Nov 54
1B-57-512	4 Jan 55	20 Jan 55 PCW	20 Jan 55 PCW	20 Jan 55 PCW
1B-57-513	22 Oct 54	8 Nov 54 PCW	1 Nov 54 PCW	8 Nov 54 PCW
1B-57-516	8 Nov 54	30 Nov 54 PCW	30 Nov 54 PCW	30 Nov 54 PCW
1B-57-520	2 Nov 54	20 Jan 55		13 Jan 55
1B-57-521	2 Nov 54	11 Jan 55		10 Jan 55
1B-57-522	4 Nov 54			4 Dec 54
1B-57-527	3 Dec 54	29 Dec 54 PCW	4 Jan 55	13 Jan 55 PCW
1B-57-536	26 Nov 44			
1B-57-542	17 Dec 54	6 Jan 55 PCW	4 Jan 55 PCW	6 Jan 55 PCW
1B-57-574	4 Jan 55	20 Jan 55 PCW	20 Jan 55 PCW	20 Jan 55 PCW
1B-57-578	30 Dec 54	20 Jan 55	20 Jan 55	24 Jan 55
1B-57-585	12 Jan 55	20 Jan 55	20 Jan 55	19 Jan 55
1B-57(R)A-210	24 Jun 54	16 Aug 54 PCW	16 Aug 54 PCW	24 Jun 54
1B-57(R)A-220	7 Oct 54	30 Nov 54	30 Nov 54	
1B-57(R)A-521	6 Jan 55	20 Jan 55 PCW	20 Jan 55 PCW	20 Jan 55 PCW
2J-J1-208	20 May 54	2 Oct 54	2 Oct 54	2 Oct 54
4S2-8-501	21 Sep 54	2 Dec 54 PCW	2 Dec 54 PCW	2 Dec 54 PCW

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T.O. NUMBER	T.O. DATED	DATE T.O. COMPLIED WITH		
		A/C #52-1432	A/C #52-1433	A/C #52-1464
8C7-7-5-501	21 Jun 54	11 Aug 54	3 Aug 54	27 Jul 54
9H8-10-2-501	22 Apr 54	7 May 54	7 May 54	23 Jun 54
18A1-1-503	30 Jun 54	14 Sep 54	15 Sep 54	27 Sep 54
13A1-1-506	19 Aug 54	23 Aug 54	15 Sep 54	27 Sep 54
13A1-1-507	1 Nov 54			
13F1-4-501	22 Apr 54	5 Oct 54	2 Oct 54	
05-40D-23	31 Aug 54			

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2. LIST OF ENGINE TECHNICAL ORDER COMPLIANCES, RB-57 AIRCRAFT:

TECHNICAL ORDER NO.	DATE	DATE TECHNICAL ORDER COMPLIED WITH					
		S/N 52-1432		S/N 52-4133		S/N 52-1464	
		Engine #1	Engine #2	Engine #1	Engine #2	Engine #1	Engine #2
1B-57-25A	23 July 54	PCW 20 Aug 54	5 Oct 54	PCW 20 Aug 54	PCW 20 Aug 54	PCW 2 Sep 54	5 Nov 54
2J-1-16	25 June 53	29 Jun 54		28 Jun 54	28 Apr 54		
2J-J65-209	30 June 54	PCW 25 Aug 54	5 Oct 54	PCW 25 Aug 54	1 Oct 54	1 Sep 54	N/A
2J-J65-214	30 Apr 54	PCW 25 Aug 54	5 Oct 54	PCW 1 Oct 54	1 Oct 54	PCW 1 Oct 54	5 Nov 54
2J-J65-503	18 Oct 54	28 Dec 54	28 Dec 54	15 Dec 54	15 Dec 54	15 Dec 54	15 Dec 54
2J-J65-505	22 Nov 54	PCW 10 Dec 54	PCW 10 Dec 54	PCW 10 Dec 54	PCW 15 Dec 54	PCW 10 Dec 54	PCW 10 Dec 54
2J-J65-506	22 Nov 54	PCW 1 Dec 54	N/A	PCW 1 Dec 54	1 Dec 54	N/A	N/A
2J-J65-510	3 Dec 54	4 Jan 55		4 Jan 55	4 Jan 55	6 Jan 55	6 Jan 55
2J-J65-511	26 Nov 54	PCW 9 Dec 54	PCW 9 Dec 54	PCW 9 Dec 54	PCW 9 Dec 54	PCW 9 Dec 54	PCW 9 Dec 54
2J-J65-512	26 Nov 54	PCW 4 Jan 55	PCW 4 Jan 55			PCW 4 Jan 55	PCW 4 Jan 55
2J-J65-514	10 Dec 54	4 Jan 55	4 Jan 55	4 Jan 55	4 Jan 55	6 Jan 55	6 Jan 55
2J-J65-519	5 Jan 55	N/A	N/A	N/A	N/A	N/A	N/A

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RB-57A SYSTEM DEFICIENCIES

1. INTRODUCTION:

Deficiencies contained in this appendix affect, directly or indirectly, the use of the RB-57A as a weapon system. Using organizations should be aware of the limitations imposed by these deficiencies, and plan to operate within such limitations until corrective action is taken. (U)

2. AIRCRAFT, GENERAL:

a. Interception Warning Devices:

- (1) The RB-57A has no tail warning device to warn the crew of visual stern chase and/or attack. This is a serious deficiency in view of the poor rearward visibility in the RB-57A.
- (2) The test aircraft for this project had no radar warning device (AN/APS-54) to warn the crew when the aircraft was under attack by radar equipped interceptor aircraft.

b. The Auxiliary Starter System:

T.O. No. 1B-57(R)A-1 directs that an auxiliary power unit be used for normal engine starts, and engines will not be started without auxiliary power except in emergencies. This requirement restricts the mobility characteristics of this aircraft and should be eliminated. Aircraft of this test were started without auxiliary power for a 6-month period to test the suitability of this method. Batteries were not damaged by this method of starting during the period, nor was another detrimental effect noted upon installed equipment. In addition, an aircraft was instrumentated to record the current required for a complete cycle starting using the following procedure:

Battery switch "On"

No. 1 inverter "On"

No. 1 fuselage booster pump "On"

No. 1 fuselage transfer valve "On"

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No. 2 fuselage tank "On"

No. 1 and No. 2 engine tank "On"

Throttle idle

Starter switch "On"

It was found that an initial momentary surge of approximately 650 amps occurred when the main inverter was turned ON. This peak load was of approximately .01 seconds duration and dropped sharply to 300 amps in .20 seconds and further dropped to 110 amps in .70 seconds. The current then had a secondary surge to 217 amps and dropped sharply and stabilized at approximately 72 amps 1.8 seconds after the inverter was turned ON. No other high current drains were encountered, and the current load was stabilized at approximately 135 amps when the engine started. The cycle from No. 1 inverter "On" to starter switch actuation was approximately 16.80 seconds. The major amperage drain during the operation was, as shown above, caused by the No. 1 inverter. This item was included in the starting procedure because it is necessary for fuel flow and oil pressure indications during starting. It is recommended that the electrical circuit be modified to supply fuel flow meter and oil pressure gage current from an inverter having a smaller initial starting load in order to eliminate the requirement for an auxiliary power unit for normal starting operations of the RB-57A. (C)

c. Cabin Conditioning System:

- (1) Considerable difficulty was experienced in attempting to maintain a comfortable cabin temperature for both crew members on day flights at high altitude. Solar heating warms the pilot without increasing the cabin temperature substantially. This normally results in the pilot maintaining a cabin temperature lower than is comfortable for the photo-navigator. By venting hot air to the photo-navigator and closing the adjustable outlets on either side of the pilot's head, both crew positions were more evenly heated. An experimental green plastic shade, fastened to the inside of the canopy with suction cups, was used on several flights. It provided some relief from solar heating and overhead glare, but restricted visibility in turns and reduced the pilot's headroom. (C)

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- (2) Location of the two adjustable conditioned-air outlets behind the pilot's head is unsatisfactory. Considerable physical effort is required of the pilot to adjust these openings, yet frequent manipulation is necessary when flying at high altitude (see paragraph (1), above). (C)
- (3) The cabin conditioning system often creates fog in the cabin when descending from high altitude into warmer air. This condition can be especially dangerous in the traffic pattern. On one test flight, cabin fogging reduced the pilot's visibility so much he was unable to see the instrument panel during a practice GCA go-around. Operation in "RAM" position is advisable when atmospheric conditions are conducive to heavy cabin fogging. (C)
- (4) No provision is made for cabin cooling during ground operation. The fixed canopy admits a large amount of solar heating without providing adequate ground ventilation. This results in excessively high cockpit temperatures. The only corrective measure found to be effective was the use of the cabin conditioning system in full cold position and engine operation at or above 70% RPM. The problem is also minimized by use of the canopy sun shade until engines are started, and by expediting taxiing and take-off. (C)

d. Communications and Electronics Equipment:

- (1) The AN/ARN-6 Radio Compass and the AN/AIC-10 Intercommunications Set control panels at the rear station are located too far aft. Normal operation of these controls from the photo-navigator's position is extremely difficult. (C)
- (2) Neither of the photo-navigator stations are equipped with a signal mixing feature. Such a feature would provide the photo-navigator with more flexibility in use of radio equipment, and facilitate crew coordination. A "hot mike" interphone would further improve the present system. (C)
- (3) The AN/APN-11A Radar Set Roger switch location in the left grip of the control wheel is unsatisfactory.

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In addition to frequent triggering of this switch on photo runs, the pilot's left hand must operate throttles and master armament, bomb door, and microphone switches. Right-hand operation of the Roger switch is preferable, and presents no modification problems since the right grip trigger has no present function. (C)

- (4) The AN/ARN-6 Radio Compass antenna installation allows excessive signal interference during flight through visible moisture. For this reason, station tuning is impossible at times. The radio compass also fails to indicate a reliable station passage, even at minimum altitude. On one test flight, ground radar measured a 9-mile error at 20,000 feet between actual station passage and the radio compass indication. (C)
- (5) The C-626/ARC-27 Radio Set Control is located in the equipment compartment, and cannot be reached in flight. Thus, preset frequencies cannot be changed, nor can a tone signal be transmitted at any time while airborne. (U)
- (6) The APW-11A antenna installation is unsuitable. The receiver antenna is flush mounted under the aft fuselage section and is blanked out during turns, climbs, and descents when the aircraft is 100 nautical miles or more from the MSQ-1 ground radar site. A flash report (see Appendix J) was made of this subject. A recommendation was made that an additional receiver antenna be installed on the top side of the aircraft to eliminate this difficulty. (C)

e. Fuel System:

- (1) The only method of determining when individual fuel tanks are dry is by observing the fuel quantity indicator. This method is unsuitable because the smallest graduation on the indicator is 250 pounds. Installation of fuel flow warning lights would give an immediate indication of dry tanks and prevent dry operation damage to booster pumps. (C)
- (2) Malfunction of the No. 1 fuselage tank fuel-level shut-off valve can result in fuel being pumped over-

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board without the pilot's knowledge. A device to warn the pilot of such a situation is highly desirable. (U)

- (3) Fuel is vented overboard from full wing tanks whenever the aircraft is in a nose high attitude. (U)
- (4) Fuel does not feed evenly from the tip tanks. This condition is a distraction to the pilot, and requires constant attention to maintain satisfactory lateral trim. (U)
- (5) The inverter, stabilizer, and fuel pump circuit breakers on the pilot's circuit breaker panel are difficult to check visually because of their unlighted location in the cockpit and the black coloring of the switches. (U)
- (6) The selector knobs for the fuel boost pump, fuel tank valves, fuel shut-off valves, and fuel quantity gage loosen in flight so they turn on the shaft and occasionally fall off. These knobs are not recoverable by the pilot when this occurs in flight, and the controls cannot be operated without a knob. (U)

f. Night Lighting:

- (1) The single landing light installation eliminates the "range finding" characteristics of dual landing lights, and makes depth perception somewhat difficult. Although not essential for normal operations, dual landing lights would provide a safety factor in the event one light failed. This seems highly desirable in an aircraft primarily intended for night operation. (U)
- (2) The wing tip taxi lights are unsuitable. They dimly illuminate the ground directly under and in front of the wing tips, but fail to provide sufficient illumination to safely taxi the aircraft. Until the effectiveness of these lights is improved, use of the landing light for night taxiing is advisable. (U)
- (3) The AN/APN-22 Radar Altimeter warning light has no dimming feature, and its brilliance is distracting to the pilot during night operation. (U)

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g. Oxygen System:

- (1) The pilot's oxygen regulator and oxygen quantity gage are located too far aft for the pilot to conveniently monitor his oxygen quantity and flow. (U)
- (2) The oxygen warning light gives adequate indication at night, but is too deeply recessed to be noticeable in the day time. (U)
- (3) The pilot has no means of double-checking oxygen flow to the photo-navigator. An additional warning light visible to the pilot is desirable for this purpose. (U)
- (4) There is no oxygen quantity gage provided at the photo-navigator's station, and he is unable to check the oxygen quantity except through the pilot. (U)

h. Canopy:

- (1) The curved, one-piece canopy causes glare at night, although it can be reduced by turning cockpit lights low and maintaining a clean canopy. The canopy posed no unusual visibility problems during operation in rain. (U)
- (2) Visibility to the rear of the aircraft wing is non-existent at any altitude or from any flight station. Forward visibility is fairly good for taxiing and at lower altitudes but is poor during take-offs and climbs. Since the pilot sits on the left side of the cabin, the only useful ground visibility he retains at higher altitudes is through the left side of the canopy. Ground visibility through the right side of the canopy is restricted even at low altitudes. (C)
- (3) The canopy de-misting system is inadequate and does not perform its required function. At high altitudes, moisture forms and freezes to the inside surface of the outer canopy shell. The pilot's visibility is severely limited when large portions of the canopy ice up in this manner. (U)
- (4) The heating element in the clear vision panel effectively de-mists and de-ices the panel except at high altitude, where ice will form on the outer edges of

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the panel. However, the panel is located so far to the left side of the canopy that its value for emergency vision during a landing is extremely doubtful. The pilot can position his eyes to get a reasonable visibility through the clear vision panel only by removing his helmet and holding his head to the left as far as possible. (U)

1. Pilot's Station:

- (1) The "Take-Off and Landing" checklist is unsuitable. The presentation is confusing with the words "TAKE OFF" and "LANDING" arranged in vertical order, and the checklist items are too general. The checklist can be read without difficulty in daylight, but is not placed where it can be illuminated effectively for night operation, nor is the checklist especially suitable for red light illumination. Both of these conditions are unsatisfactory for an aircraft intended primarily for night operation using red cockpit lighting. (U)
- (2) The J-8 attitude gyro is unsuitable. It is too small to indicate small changes of flight attitude, and the fast rate of precession causes false indications after completion of turns. (U)
- (3) The altimeter has a large installation error at high indicated airspeeds. This error is considered excessive in view of the fact that T.O. No. 1B-57(R)A-1 makes no mention of it. At 450 knots IAS, the altimeter reads approximately 550 feet high. This could easily cause an accident when operating at high indicated airspeeds at low level. (C)
- (4) The landing gear warning light lacks sufficient brilliance for adequate warning in daylight operation. It has proved satisfactory for night operation. (U)
- (5) The landing gear control lever is located too far forward to be reached by the average pilot when his shoulder harness is locked. (U)
- (6) The landing gear control lever knob loosens after continued use, and cannot always be re-tightened on the lever. (U)

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- (7) The aileron trim switch location on the left console is unsatisfactory. It must be operated frequently due to uneven feeding of wing and tip fuel tanks, yet is difficult to locate by feel. This switch should be combined with the horizontal stabilizer trim switch on the pilot's control wheel, if this arrangement is feasible. (U)
- (8) The trim and stabilizer position indicators are located low and to the left of the pilot, on the main switch panel. They are very difficult for the pilot to read accurately without lowering his head into the cockpit. (U)
- (9) The speed brakes are relatively ineffective at all speeds, but especially below 250 knots. This results in longer descent times from high altitude and very poor deceleration characteristics during landing approaches. (U)
- (10) The close proximity of the master armament switch and the tip tank jettison switch is conducive to inadvertent dropping of the tip tanks. Although T.O. No. 1B-57(R)A-2 does not require this arrangement, the tip tank, canopy, and master jettison switch guards were safety wired during the test to prevent such an occurrence. (C)
- (11) The pilot's leg room is very restricted, and the position of the control column makes entry into the pilot's seat very difficult. Also, the small entrance door and lack of standing room between the entrance door and the pilot's seat causes difficulty in loading parachutes and other flying gear. (U)

j. Miscellaneous:

- (1) The ejection seat design fails to accommodate standard USAF emergency equipment now in use, such as automatic opening parachute, life raft, survival kit, etc. (C)
- (2) The ejection seat now requires the use of four safety pins. This number of pins for each seat is considered excessive and unnecessary, as two pins should provide adequate safeguard. In addition, the present seat safety pins are so small and of such flimsy construction that they are easily deformed or lost. (U)

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- (3) The Stanley automatic release safety belt is unsatisfactory as installed. The belt is anchored too high on the seat, and therefore cannot possibly be tightened for a snug fit. (U)
- (4) The fuse panel cover, located to the left of the navigator's seat, is attached with two different types of Airloc fasteners. The eight wing head fasteners are relatively simple to remove in flight, but the three round head fasteners can only be removed with the aid of a large screwdriver. (U)
- (5) The control snubber in the cockpit will not retain the control column when taxiing in moderately high winds. The snubber is also poorly designed in that the spring clip bends out of shape easily, and the pin will not stay in place on the control column. (U)
- (6) The external control locks provided are too bulky and are easily damaged in normal use. They will not remain in place during high wind conditions, and therefore fail to provide adequate protection. The control surfaces can be damaged during installation of the control locks if the locks are not handled carefully. (U)

3. PHOTO SYSTEM:

a. Camera Control Panel:

- (1) The panel will not fully extend to the open position while the photo-navigator's table is down. This requires the photo-navigator to clean up and stow his table prior to photo run. He must then use other means of holding material and for writing. (U)
- (2) The film transportation and synchronization lights on the A-18 magazine control heads are too bright. These lights should have a brilliance adjustment feature to avoid distraction to the pilot. (U)
- (3) The upper A-18 magazine control is supposed to control the vertical or the right split vertical camera. Of the three aircraft tested, one was wired so that this control head controlled the left split vertical camera. All aircraft should be checked upon delivery

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to insure that they are installed in accordance with the technical orders. (U)

- (4) The two A-18 magazine control heads are not interchangeable because of the difference in the location of the slot in the female cannon plug connection. It is desirable that these two control heads be interchangeable for inflight trouble shooting and other emergency maintenance. Although these two Cannon plugs are not alike, they are carried as like items under the same stock number in the stock lists. (U)
- (5) Several malfunctions occurred in the bomb release system early in the testing. These were caused by failure of the B-9A Intervalometer in the bomb release control. The trouble was traced to arcing within the B-9A because of back voltage from the C lead. This was corrected by the installation of a 200-volt 1 mfd condenser from the C lead to ground. Study should be made on a permanent correction to this deficiency. (C)
- (6) With the Bomb Release Control in the "CAM" position when bombs are being carried, release will be made upon actuation of the operate switch. This is not stated in T.O. 1B-57(R)A-1 Flight Handbook, and could cause accidental release of internal stores. (U)
- (7) There is no provision for using the split vertical camera position with photoflash bombs. This provision should be included for this aircraft in order to increase the lateral coverage at altitudes affording the most effective use of the 12-inch K-37 camera. These altitudes are approximately 8000 to 12,000 feet. This requirement can best be illustrated by the limited coverage now available with the single vertical K-37 camera at 10,000 feet. Only 7500 feet lateral coverage is provided, and this, in turn, accentuates an already critical aircraft positioning accuracy requirement. Operation with split vertical cameras at the above altitudes would be of great benefit, both in accommodating larger targets and in decreasing accuracy requirements for effective target coverage. (C)

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- (8) There is no automatic re-set feature for day photography to assure that the first operating pulse will go to both vertical and split-vertical camera stations. An exposure may or may not be secured by the vertical camera station until as many as four exposures have been made by the split-vertical station. (C)

b. Camera Compartment:

- (1) The camera compartment access door should be either removable or redesigned to allow it to be completely opened. The present requirement for a tail stand will extend the time required for camera servicing by approximately 30 minutes. (U)
- (2) The rack provided for stowage of the static and vacuum lines should be made stronger and more durable. (U)
- (3) T-11 static lines should be of more flexible material for more efficient utilization during cold weather. (U)
- (4) Some type of protective cover should be provided to protect the photo-optic glass during camera servicing. (U)
- (5) A ground conditioning system should be provided for ground operation. (U)
- (6) The fuel vent shut-off valve in the camera compartment interferes with loading and unloading of the cameras. Consideration should be given to relocating this valve. (U)
- (7) The camera compartment temperatures, vacuum and de-fogging system are inadequate in that malfunction rates are high, and the system is ineffective at very low temperatures. (C)

c. Others:

- (1) There is a need for some type of intercommunication system that could be utilized between the forward crew compartment and camera compartment to aid in

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camera installation and preflight. This system could be entirely independent of the airplane's system, or be such that it would utilize the aircraft system. (U)

- (2) The two H-1 Amplifiers for the A-18 magazines located in the forward equipment compartment were incorrectly decaled in the test aircraft. All aircraft should be checked upon delivery to insure that these two amplifiers are properly identified. (U)

4. NAVIGATION SYSTEM:

a. Photo-Navigator Station (Nose):

- (1) The passageway to this station does not provide sufficient width. Although no difficulty was encountered in entering, slight difficulty was encountered in exiting due to the fact that one must move backward and push. (U)
- (2) In the prone position, assuming that the T-1 Optical Sighting Head is being used or that map reading is being done, there is no visual or physical access to oxygen controls, recorder, or interphone jackbox switches. The drift knob, sight release lever, and the caging knob are difficult to operate due to their positions. (U)
- (3) While wearing the P-4 helmet the photo-navigator's visibility is limited. The helmet strikes the plexiglass section and restricts horizontal vision. Vision at 90° right or left is very difficult. Visibility downward requires considerable strain to place the head over the sighting head. (C)
- (4) There is no physical comfort when operating in the nose station in the prone position. The canted chest board tilts the body at an awkward angle, causing back strain. It also tends to keep the body sliding backward, requiring exertion to stay in proper position to work. Due to strain on neck and arms, it is difficult to keep notes and/or operate the photo-navigator's computer. (C)

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- (5) No dead reckoning navigation instruments are available to the photo-navigator when operating at this station. (C)
- (6) There is no emergency exit in the nose. In event of an emergency requiring bail-out, the photo-navigator must return to his ejection seat, put on parachute, lock seat belt and shoulder harness, and go through ejection procedure. In the event of nose or canopy blowing off, there is no restraining belt or harness to prevent suction of the photo-navigator through the opening. (C)
- (7) No provisions are made for portable oxygen equipment for use going to and from the nose. Hence, for nose visual station utilization, entry must be made at a safe cabin pressure altitude. (C)
- (8) The white lighting of this station is considered too bright for use during flight because of the distraction to the pilot. Provisions for a brilliance control and a flexible mounted pencil beam map light would satisfy the lighting requirement at this station. (U)

b. Photo-Navigator Station (Rear):

- (1) The radio compass is unreliable for navigation purposes because of deficiencies stated in paragraph 2d(4) of this appendix. (U)
- (2) No AC voltmeter is provided to indicate the voltage being supplied to the APN-84 Shoran equipment. The addition of this instrument with a voltage adjustment feature is desirable. (U)
- (3) The periscopic sextant mount, because of its installation to the right of the centerline of the aircraft's fuselage along a laterally depressed surface, will not travel the entire 15 degrees of the gimbal design limits. This limitation applies only to those observations to the right of the aircraft. The exact amount of travel was not determined as no difficulty was experienced in testing since all celestial flights were made in smooth air. This condition could present a potential problem during flights in rough air if an

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excessive left wing high condition existed during collimation. In addition, the limited head room around the sextant eyepiece requires the navigator to remove his P-4 helmet during some celestial observations depending upon the relative bearing of the body being observed. This means that the navigator will be without oxygen while helmet is off. (C)

- (4) The navigator's table is located in such a position as to prevent the camera control panel from extending to the full open position when the table is down. In addition, the table has no restraining strip on the edge toward navigator to prevent pencils and other small navigation tools from falling from the table during flight. (U)

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EXTRACT FROM

FLASH REPORT NO. 1

ON

OPERATIONAL SUITABILITY TEST OF THE RB-57A AIRCRAFT
(CLIMATIC PHASE)

PROJECT NO. APG/TAT/122-B

HEADQUARTERS
AIR FORCE OPERATIONAL TEST CENTER
AIR PROVING GROUND COMMAND

This document is classified CONFIDENTIAL in accordance
with paragraph 24a, AFR 205-1

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1. INTRODUCTION:

a. Project No. APG/TAT/122-B, "(U) Operational Suitability Test of the RB-57A Aircraft (Climatic Phase)," was performed in the Climatic Hangar at Eglin Air Force Base, Florida. Testing was conducted by WADC personnel, and was monitored by an AFOTC project officer for information pertaining to operational suitability of the aircraft under low temperature conditions.

b. For the purpose of this test, RB-57 #52-1427 was furnished by WADC and instrumented by the Glenn L. Martin Company in accordance with instructions from WADC.

c. This report presents the major information obtained pertinent to the Operational Suitability Test of the RB-57A aircraft under low temperatures. Detailed information on this project will be presented in the final report on the current Operational Suitability Test of the RB-57A aircraft (Project No. APG/TAT/122-AB).

2. PURPOSE AND DESCRIPTION OF ITEM:

* * * * *

3. OBJECT: The object of this test was to determine the operational suitability of the RB-57A during periods of low temperature.

4. DISCUSSION:

a. Power plant and aircraft systems components were tested at stabilized temperatures of +70°F, +20°F, -20°F, and -65°F.

b. Time studies were accomplished on installation and removal of engine and camera equipment at each stabilized temperature. The right engine was used for the purpose of this time study. It is considered that the times, with the exception of engine cowl installation, are well within the man-hour requirement to be operationally suitable down to and including -65°F. Difficulties encountered with camera installation consisted of vacuum hoses and electrical connections becoming extremely brittle and inflexible at -40°F and below. This condition requires approximately 30 minutes of direct heat on the item before installation can be accomplished. The major difficulty encountered during engine installation was in the installation of the engine cowling at +20°F and below. Due to the fact that the aircraft was mounted on jacks and tied down in such a manner as to permit engine runs, it is unknown whether this difficulty was due to

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temperature or slight warp in the airframe, or a combination of both. The difficulty was such that 3.3 man-hours were consumed in the installation of this item at -20°F . Test personnel were unable to completely install this item (cowling bolts drawn up and safetied) at -40°F and below.

c. The camera control system and internal bomb release control was operated satisfactorily at -40°F . Tests on this system were not conducted at -65°F due to instructions received by this Headquarters just prior to this phase of testing, that cameras which had not been "explosion proofed" would not be installed in RB-57A aircraft. Neither time nor material was available to correct this condition before completion of low temperature testing.

d. At -40°F the rubber seals on the landing gear doors froze solid and would not permit the doors to close flush with the surface of the aircraft. This condition existed with both main gear doors and the nose gear door.

e. Fuel valves stuck intermittently at -40°F . At -65°F , the fuel control valves froze to the extent that operation was extremely sluggish or required direct application of heat prior to operation.

f. Difficulties encountered with the hydraulic system consisted of minor leaks and seepage down to -65°F ; however, at -65°F it was impossible to maintain pressure in the system accumulator. This difficulty appears to be a metal contraction problem rather than a diaphragm problem.

g. The main cabin access door handle mechanism would not operate at -40°F , and was broken at -65°F while attempting to turn the handle. The equipment compartment access door handle failed at -20°F ; however, this failure was not due to temperatures, but to weak construction.

h. At -40°F and below, initial attempts to start the engine all resulted in false starts, with one exception, and that was when the engine had been preheated. During all false starts (ignition occurring, but no sustained start), the maximum engine rpm attained was approximately 1400 rpm, as compared to a desired value of 2000 rpm in ten seconds. As many as three starting attempts were required to get the engine started; however, it usually started on the second attempt. It appears that this unsatisfactory condition is a result of insufficient energy in the starting system at low temperatures. However, the problem may be associated with the engine oil lubrication system as reported below in paragraph 1.

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i. The pilot's compartment would not maintain pressure within the prescribed limitations (3.5 psi to 2.75 psi for 60 seconds) below -20°F. At -20°F, the cabin maintained pressure for 45 seconds. Heat was applied for 35 minutes and pressure was maintained for 60.5 seconds. At -40°F, pressure was maintained 31.5 seconds before heating, and 53.5 seconds after heat had been applied to the cabin for 45 minutes. At -65°F, pressure was maintained 26.7 seconds prior to heating the cabin, and 49.9 seconds after the cabin had been heated for 30 minutes. Application of heat in the above pressurization checks was from an external ground heater ducted through the cabin compartment access door prior to each check. The applicable -2 Technical Order does not specify temperature tolerance on these pressurization checks. Past experience had indicated that static checks of this type are not representative of operational performance and little, if any, significance should be placed on the reported discrepancy. However, specifications should be developed and specified in order to adequately check out these systems in the future.

j. At -40°F and below, the main landing gear wheel could not be freed or spun to accomplish braking tests. At -65°F, approximately 1000 pounds of tangential force could not turn the wheel. Further investigation of this discrepancy was not conducted by WADC at this time.

k. Nitrogen purge system operated satisfactorily down to -40°F. No check was made at -65°F, due to an apparent malfunction of pressure regulator valves. It was feared that this condition would exert too high a pressure and rupture the fuel tanks.

l. At -65°F, an excessive warmup period (15-30 minutes) was required to bring oil pressure up to that prescribed as sufficient to allow the application of full power to the engine.

5. CONCLUSION: It is concluded that the RB-57A, in its present configuration, is operationally unsuitable below -20°F.

6. RECOMMENDATIONS: It is recommended that:

a. The RB-57A aircraft not be subjected to arctic operation until the following items have been accomplished:

- (1) Further study be conducted to determine a satisfactory fix for the engine starting and lubrication system of this aircraft below -20°F.

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- (2) Landing gear door seals be composed of material capable of retaining sufficient flexibility down to and including -65°F to allow proper operation of landing gear doors.
- (3) New type fuel valves be installed, or the present fuel valves be redesigned to permit operation at temperatures down to and including -65°F .
- (4) Further study be conducted on the landing gear wheel bearing and lubrication in order to obtain proper operation below -20°F .
- (5) Sealants presently in use in the pilot's pressurized compartment be replaced with a sealant which is capable of retaining a satisfactory degree of sealing quality at temperatures down to and including -65°F .
- (6) Cabin access door handle and equipment compartment access door handle be generally strengthened and redesigned to permit operation down to and including -65°F .
- (7) Further study be conducted on the hydraulic accumulator at -65°F in order to effect a satisfactory fix on this item.
- (8) Vacuum hoses in camera compartment be made of a material capable of maintaining a satisfactory degree of flexibility down to and including -65°F .
- (9) Since the tests on the nitrogen purge system at -65°F were inconclusive, further cold room study should be conducted on the nitrogen purge system regulator valves at -65°F .

b. Immediate consideration be given to correcting similar systems and components of the B-57B aircraft before it is subjected to arctic operations.

/s/W. B. Putnam
W. B. PUTNAM
Colonel, USAF
Commander

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COMDR, AMC

281530Z Sep 54

AIR MAIL

Director of Procurement & Production Engineering
Hq, USAF
ATTN: AFMPE-EN-1 Lt Col Wolf
Washington 25, D. C.

AIR MAIL

AFMPE-EN-1
2 Aug 54

FRCM: MCPHBB-9-54-N.....Subj: APMC Flash Report, REF: AFMPE-EN-1,
dtd 2 August 1954.

The following comments are made on the deficiencies covered in Paragraph 6a of APMC Flash Report No. 1 - OST-RB-57A Project No. APM/TAT/122-B.

1. Further investigation reveals that the false starts averaged 1400 to 1550 rpm. Since this is the rpm expected when no assistance from the engine occurs, it is probable that the difficulty is in the priming or ignition system. Low temperature starting tests of the J-65-W-5 Engine are to be conducted in the near future. Expected completion date of these tests is 1 April 1955.
2. The Contractor is redesigning the door seals and a larger hydraulic cylinder for the main gear.
3. It has been found that this fuel valve problem is as a result of grease distribution in the valve mechanism. Cycling the valve 200 times prior to cold weather operation has corrected this deficiency.
4. Specifications calls for the wheels of this aircraft to be packed with MIL-L-3545 grease. However, this grease is not satisfactory for use below -40°F. For arctic operation it is recommended that MIL-L-3278 grease be used.
5. The APMC Report points out that this discrepancy has little or no significance. The sealants being used are considered satisfactory by this Headquarters and meet specifications.

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6. Redesign of the door handles is presently being conducted.

7. The Contractor is investigating this deficiency.

8. Installation of cameras in the aircraft require that the compartment be preheated and then the compartment is maintained at 75°F ~~±~~10°F. This eliminates the need for hoses to be flexible at low temperatures.

9. Further tests are to be run on the purge system regular valves.

The above items apply to both the RB-57A or the B-57B with the exception of #5 and #8. No modification of the arctic tests RB-57A or the B-57B would be recommended on items 1 and 3. Item 4 is self-explanatory. Modification for items 2, 6 and 7 could not be accomplished in time for the 1954-1955 tests.

SIGNED: PROCUREMENT, AIRCRAFT DIVISION.

R. C. OTTO, Major, USAF

MCFHEB/RCO/kp/F-18A 39132

CARL F. DEMBERG

Colonel, USAF

Chief, Aircraft Division

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FLASH REPORTS

FROM: Commander, APCC, Eglin AFB, Florida

TO: Chief of Staff, Headquarters USAF, Washington 25, D. C.

INFO COPIES TO: Commander, ARDC, Baltimore, Maryland
Commander, WADC, Wright-Patterson AFB, Ohio
Commander, AMC, Wright-Patterson AFB, Ohio
Commander, TAC, Langley AFB, Virginia

DCS/O-TR 785. ATTN: AFRDQ, Headquarters USAF. Flash Report on Project No. AFG/TAT/122-AB, "OST of the RB-57A Aircraft," subject is explosion proofing of RB-57A camera equipment.

Current TO's permit use of no explosion proofed camera equipment in RB-57A aircraft. A recent incident at this Center, however, indicates that raw JP-4 fuel may enter the RB-57A camera compartment during flight under normal operating conditions.

A night photo mission was scheduled in an RB-57A aircraft with explosion proofed camera equipment installed. The aircraft aborted after approximately 35 minutes due to bad weather and no photo was accomplished.

A post flight inspection was made of the camera compartment. The camera and magazine were covered with JP-4 fuel so that fuel flowed into the open camera when the magazine was removed. Source of fuel was found to be a leaking connector in main fuel vent tube running through top of camera compartment. Fuel was still dripping from this connector when the post flight inspection was made approximately 10 minutes after landing.

An emergency unsatisfactory report (Eglin 54-812) has been submitted on the type connector used in the main fuel vent tube. It is recommended that only explosion proofed camera equipment be used in RB-57A aircraft until this connector is improved as raw JP-4 fuel in the RB-57A camera compartment is considered to constitute a fire hazard when operating non-explosion proofed camera equipment in this type aircraft.

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FROM: Commander, AMCC, Eglin AFB, Florida

TO: Chief of Staff, Headquarters USAF, Washington 25, D. C.

INFO COPIES TO: Commander, ARDC, Baltimore, Maryland
Commander, WADC, Wright-Patterson AFB, Ohio
Commander, AMC, Wright-Patterson AFB, Ohio
Commander, TAC, Langley AFB, Virginia

DCS/O-TR 50045C. ATTN: AFERQ, Headquarters USAF. Flash Report No. 2 on Project No. APG/TAS/122-A, "OST of the RB-57A Aircraft." This message classified CCONFIDENTIAL in accordance with paragraph 24a(9) AFR 205-1. This message is in four parts.

Part I. Subject of this report is AFN-11A Antenna Installation on RB-57A Aircraft. Flight checks flown by RB-57A aircraft at this Command indicate that the AFN-11A antenna is blanked out at ranges beyond 100 nautical miles during maneuvers that place the underside of the aircraft away from ground radar station.

Part II. Reference flash report on Project No. APG/TAE/31-A, "OST of the AFN-11A and MSQ-1 Utilizing B-45 and F-84 Aircraft," TNEOTC-ED 5077, dated 29 December 1953, addressed to Chief of Staff, Headquarters USAF, info Commander, ARDC, Commander, WADC. Results of testing of RB-57A aircraft at this Command further confirms information on AFN-11A reception characteristics contained in this report.

Part III. Recommend that the AFN-11A antenna installation of the RB-57A aircraft be modified to include an additional AFN-11A receiver antenna to be placed on the topside of the aircraft in order to minimize loss of radar contact.

Part IV. Further recommend a study of future aircraft programmed to be equipped with AFN-11A to insure that AFN-11A antenna installation is not blanked out during climbs, turns, and descents on aircraft. This recommendation is intended to include the B/RB-66.

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DEPARTMENT OF THE AIR FORCE

HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

MAY 23 2000

MEMORANDUM FOR DTIC/OCQ (ZENA ROGERS)
8725 JOHN J. KINGMAN ROAD, SUITE 0944
FORT BELVOIR VA 22060-6218

FROM: HQ AFMC/SCDP
4225 Logistics Avenue, Room A112
Wright-Patterson AFB OH 45433-5744

SUBJECT: Change in Distribution Statement for AFMC Documents

1. Distribution statements on several documents were officially changed to Distribution Statement A in accordance with AFI 61-204, 27 Jul 94, *Disseminating Scientific and Technical Information*. The documents (excluding those marked out in Atch 3) are owned by AFMC and were reviewed by the HQ AFMC History Office and HQ AFMC Public Affairs Office. The documents cleared for public release are listed on three attachments.

2. Please direct further questions to Ms. Lezora Nobles, AFMC STINFO Assistant, HQ AFMC/SCDP, DSN 787-8583.

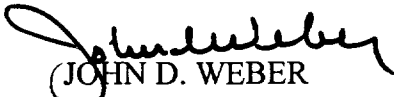
PATRICIA T. McWILLIAMS
AFMC STINFO Program Manager
Directorate of Communications and Information

Attachments:

1. AFDTC/PA Memo, 11 Jan 95
2. HQ AFMC/PAX 1st Ind, 4 May 00
3. HQ AFMC/PAX Memo, 5 May 00

2. Attachments a through c are part of an internal AFMC/HO review; attachments d and e are requested by Mr. Morris Betry, a private researcher; attachments f through h are requested by Ms. Pat McWilliams (AFMC/SCDP); and attachment i is requested by Mr. Gregory Hughes (ASC/ENFD).

3. The AFMC/HO point of contact for these reviews is Dr. William Elliott, who may be reached at extension 77476.

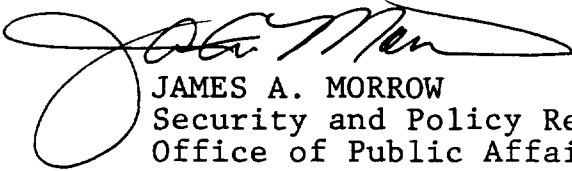

JOHN D. WEBER
Command Historian

- 6
8 Attachments:
- a. ~~AFSC No. 150.174~~
 - b. ~~AFSC No. 400.490~~
 - c. DTIC No. AD-098 048
 - d. DTIC No. AD-376 934
 - e. DTIC No. AD-895 879
 - f. DTIC No. AD-094 838
 - g. DTIC No. AD-068 388
 - h. DTIC No. AD-046 931
 - i. ~~AFLC No. R1-120-2~~

1st Ind, HQ AFMC/PAX

4 May 2000

This material has been reviewed for security and policy IAW AFI 35-101. It is cleared for public release.


JAMES A. MORROW
Security and Policy Review
Office of Public Affairs