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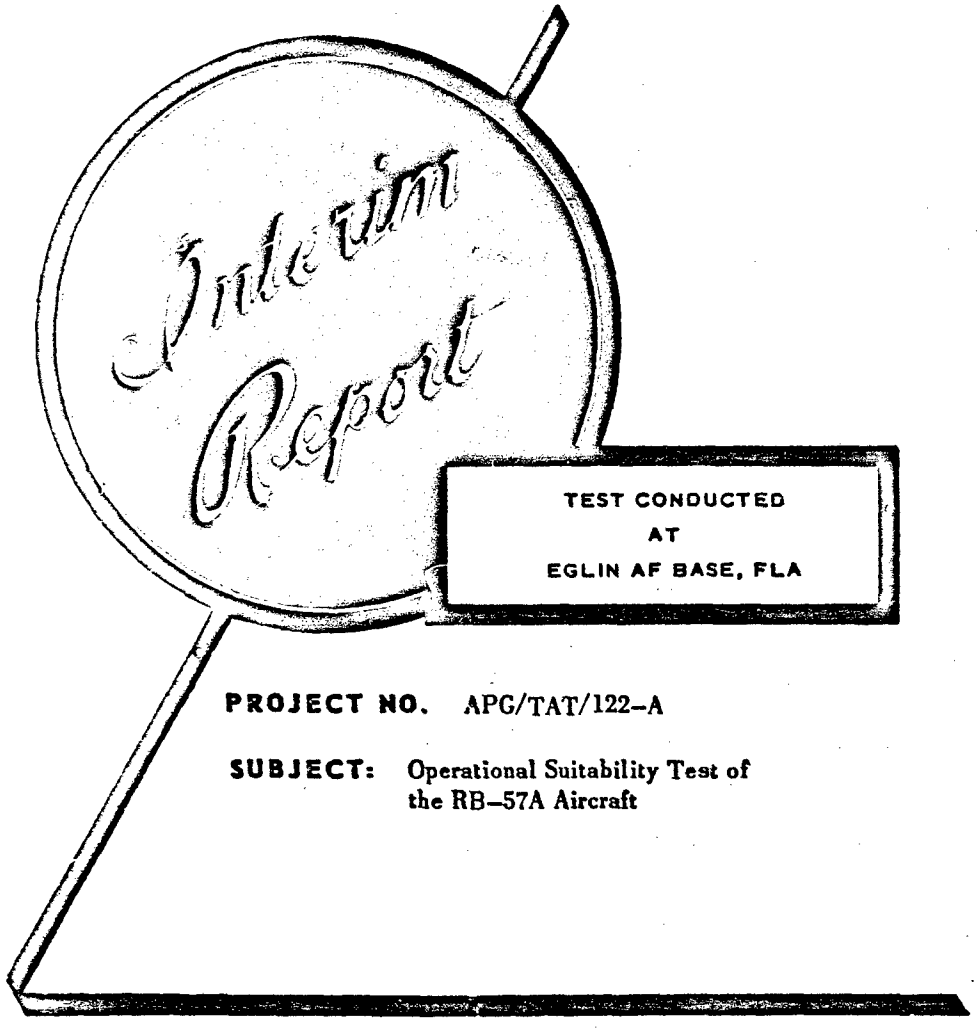

TEST CONDUCTED
AT
EGLIN AF BASE, FLA

PROJECT NO. APG/TAT/122–A

SUBJECT: Operational Suitability Test of the RB–57A Aircraft

DATE

14 SEPTEMBER 1954

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

PROJECT NO. APG/TAT/122-A

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AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

14 September 1954

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

PROJECT NO. APG/TAT/122-A

1. This is the Interim Report on the Accelerated Phase of the Operational Suitability Test of the RB-57A Aircraft. The object of this accelerated phase was to provide timely operational and maintenance information to Headquarters USAF and to the tactical organizations on the RB-57A.

2. The RB-57 aircraft is the USAF version of the British Canberra, built by the Glenn L. Martin Company, and is intended to perform night visual and photographic reconnaissance and day topographic mapping photography.

3. The RB-57A is suitable for night photographic reconnaissance when operating within range of either ground radar or Shoran installations and at altitudes at which interpretable photography can be obtained (155 statute miles at 12,000 feet altitude). However, because of the limitations imposed by the navigation and photographic system, the maximum capability of 1,000 miles radius and 45,000 feet altitude of the aircraft cannot be exploited.

4. It is recommended that a suitable airborne search type radar be installed in the RB-57A to extend the effective operational radius to that of the available operational radius of the aircraft. It is further recommended that a longer focal length night camera (24 or 36 inches) be provided for the RB-57A and other tactical night reconnaissance vehicles to increase the maximum altitude at which interpretable night photography can be obtained.

Patrick W. Timberlake

PATRICK W. TIMBERLAKE
Major General, USAF
Commander

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

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

PROJECT NO. APG/TAT/122-A

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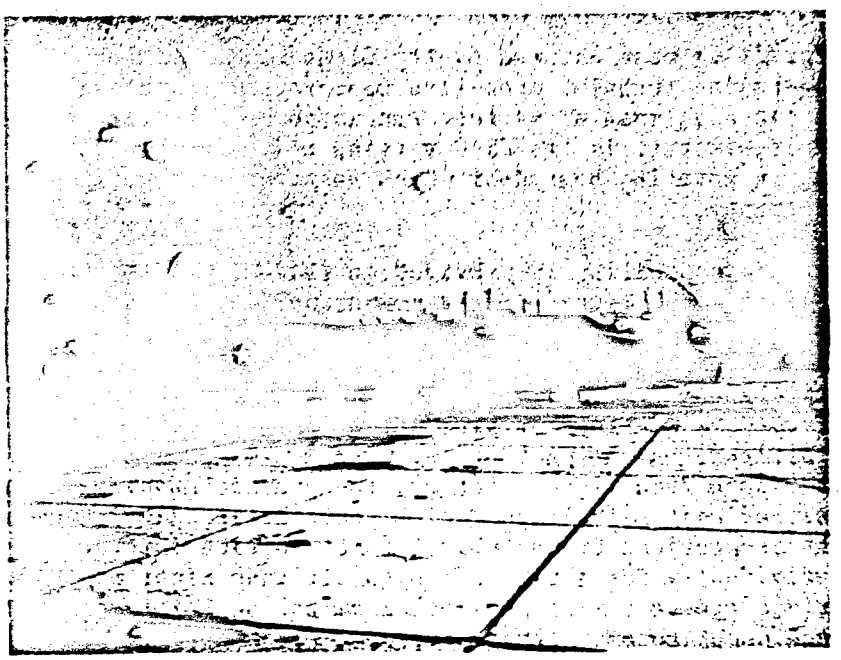
SUMMARY

1. INTRODUCTION:

a. This is an interim report on the accelerated phase of the "Operational Suitability Test of the RB-57A Aircraft," Project No. APG/TAT/122-A. The test was initiated in accordance with APGC Letter Directive, dated 28 October 1953.



RB-57A Aircraft

b. This phase was conducted over a period of approximately 30 days so that using organizations might be provided with timely information on the operations and maintenance of the RB-57A aircraft. The primary objective of this test was to discover and examine areas where troubles would most likely be experienced by tactical reconnaissance organizations being equipped with RB-57A aircraft.

c. This phase of testing did not include an evaluation of the visual reconnaissance suitability of the aircraft nor its ability to survive in hostile air. These will be covered in the final report.

d. Details of problems encountered, procedures used and conclusions reached for major testing areas are included in the appendices of this report. This procedure has been followed so that each appendix may be detached from the report, if desired, for use as a complete, separate examination of a particular area of interest.

2. PURPOSE AND DESCRIPTION OF TEST ITEM:

a. The RB-57A aircraft is intended to perform night visual and photographic reconnaissance behind enemy lines and to accomplish day topographic mapping as required. Under current concepts, units equipped with this aircraft will be under the direct control of the Commander of the Tactical Air Force or Tactical Air Command in a combat theater.

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-E1-5 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.

c. Photographic capability is provided in this aircraft by two tandem camera stations located in an air-conditioned camera compartment aft of the rotary bomb bay door of the aircraft. 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 for 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 for day topographic mapping photography. All K-37 cameras are equipped with A-18 Image Motion Compensating (IMC) Magazines. Illumination for night photography is provided by photoflash bombs carried internally on the rotary bomb door and released individually for medium and high altitude night photography. A-6 and B-4 photoflash cartridge ejectors will provide illumination for low altitude night photography when this equipment becomes available. Two ejectors will be installed in each wing of the RB-57A aircraft. The A-6 ejector has a capacity of 52 M-112 Photoflash Cartridges, and the B-4 has a capacity of 20 M-123 Photoflash Cartridges each. Cameras and illuminants in the RB-57A are remotely controlled.

d. The aircraft is equipped with an ARC-27 UHF Radio, ARN-6 Radio Compass, APX-6 IFF, APN-22 Radar Altimeter, and either APN-84 Shoran or APN-11A Radar Beacon with AN/APA-90 Indicator Group. The aircraft uses a liquid oxygen system. Fuel vapor inertion in wing and fuselage tanks is accomplished by bottled nitrogen. The aircraft is unarmed and has no tail warning radar of any kind.

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

a. The capability of the aircraft to operate as a satisfactory camera platform.

b. The capability to position the aircraft, day or night, over any predetermined target within its radius of action at an altitude suitable for photographic purposes.

c. The suitability of the aircraft photographic system.

d. Maintenance, materiel and personnel requirements.

4. CONCLUSIONS: It is concluded that:

a. The RB-57A is suitable for night photographic operations when operating within approximately 155 statute miles or less from ground radar or Shoran installations. This limitation is due to the following reasons:

(1) The aircraft is not equipped with a navigation system that will provide precision positioning beyond the range of line-of-sight signal reception of the APN-11A and Shoran.

(2) The operating altitude for night photography of a satisfactory scale in the RB-57A is restricted to 12,000 feet by the 12-inch focal length of the K-37 night camera.

(3) The line-of-sight signal reception distance at 12,000 feet is approximately 155 statute miles.

(4) The nose position of the aircraft is unsuitable for use in visual navigation for night photographic purposes.

b. The RB-57A is potentially suitable for night photographic operations at ranges commensurate with the radius of action of the aircraft. This will, however, require improvement of the aircraft navigation system to provide a precision positioning capability at these ranges.

c. The RB-57A nose position is unsuitable for use in visual observation or pilotage navigation.

d. The photographic control system of the RB-57A is too inflexible. Reasons for this are:

(1) There is no provision for using the split-vertical camera position with M-120 Photoflash Bombs.

(2) When operating the vertical and split-vertical stations simultaneously, 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.

e. The RB-57A is a suitable camera platform for use with its standard camera configuration.

f. The radio navigation equipment of the RB-57A is inadequate for training operations within the United States or for normal operation within a combat theater.

g. The RB-57A cartridge starter system is presently unreliable and potentially dangerous to ground personnel.

h. Only minor maintenance, materiel and personnel adjustments to the using organization will be required for this aircraft, based on testing accomplished to date.

5. RECOMMENDATIONS: It is recommended that:

a. The present navigational deficiencies of the RB-57A be eliminated by providing:

(1) A suitable airborne search type radar set to provide a navigational capability beyond the range of the APN-11A or Shoran.

(2) A suitable viewfinder in the aft navigator's station to provide a means of drift reading and for visual observation and direction for day photography.

b. Use of the nose visual station be discontinued and visual reconnaissance be either accomplished from the pilot's position or eliminated from the aircraft's mission requirements.

c. The camera control system of the RB-57A be modified to provide a camera control recycle feature for day photography to assure that the first operating pulse from the control will go to both vertical and split-vertical camera positions.

d. The camera control and camera equipment be modified to provide a station selection capability to use the split-vertical camera position with photoflash bombs as well as with cartridge illuminants for night photography.

e. Action be taken to provide a night camera with longer focal length for RB-57A aircraft in order to increase the maximum altitude for interpretable photography and thereby increase the effective operating range of the aircraft for night photographic reconnaissance.

f. VHF Omnirange equipment be installed in the RB-57A aircraft.

g. Suitable precautions be taken to safeguard ground personnel until the modified cartridge starter has been evaluated.

h. The reliability of the cartridge starter system be improved sufficiently to provide satisfactory operation.

i. The Technical Order deficiencies referred to in Appendix D be corrected.

DISCUSSION

1. GENERAL:

a. Missions of the accelerated phase were conducted primarily to assure that aircraft systems would operate correctly and to formulate standard operating procedures for using organizations. This was necessary since operating information was lacking for many of the aircraft systems at the time of this test.

b. Three RB-57A aircraft with unmodified fuel controls were used for this phase of testing. Use of these unmodified fuel controls restricted the maximum effective operating altitude to approximately 32,000 feet. Since this phase of testing, the RB-57A has reached altitudes in excess of 50,000 feet with modified fuel controls. Operation above 45,000 feet, however, required the use of T-1 Partial Pressure Suits.

c. Aircraft operated throughout this test under maximum airspeed limitations of .78 Mach or 450 knots, whichever is less, for operation without tip tanks and .78 or 434 knots for operation with tip tanks.

d. Thirty-seven test sorties were flown during this phase and only two sorties were completely ineffective. Total test flying time during the accelerated phase was fifty-five hours and thirty-five minutes. This figure does not include transition flights, engineering test flights, etc.

2. ORGANIZATIONAL IMPACT:

a. Personnel: The tentative Table of Organization (1-1457P) appears adequate on the basis of limited testing except that four additional airmen in the Armament Career Field (two Weapons Mechanics, AFSC 46250, and two Apprentice Weapons Mechanics, AFSC 46230) are required.

b. Training:

(1) A 20-day factory training course prior to receipt of aircraft is required for aircraft crew chiefs (AFSC 43171X) and supervisory armament personnel (AFSC 46270 and 46250).

(2) All other ground support requirements for personnel training appear to be within the scope of on-the-job training.

(3) Flight training of aircrews poses no serious problem. Pilots (AFSC 1324G) require indoctrination in jet operation prior to checking out in the RB-57A and should, if feasible, be currently qualified in both jet and multi-engine aircraft at time of check-out. Navigators

(AFSC 1525C) require only the normal Mobile Training Unit (MTU) ground school on aircraft systems and emergency procedures.

c. Equipment:

(1) Support Equipment: The quality of support equipment appears, based on limited data, to be either adequate or in the process of improvement.

(2) Armament Equipment: The addition of one M-108 Truck, Crane, 6 x 6 2½-ton capacity, is recommended for loading M-120 Photoflash Bombs.

(3) Camera Equipment: All RB-57A camera equipment used during the accelerated phase of this test was explosion-proofed in accordance with Technical Orders then in effect. It is recommended that all required explosion proofing of camera equipment be performed at depot level in order that using organizations may receive the aircraft camera equipment in fully operational condition.

d. Facilities:

(1) Limited data indicate that a 7000-foot hard surface runway will be adequate for normal operation of the RB-57A aircraft.

(2) Tactical deployment of RB-57A aircraft outside the Zone of Interior will create a serious logistical problem in procurement and storage of suitable liquid oxygen. Limited operational usage indicates that amounts required will vary with ambient temperature, as the evaporation rate increases with warmer temperatures. This problem will be further evaluated and reported in the final report.

(3) Suitable storage facilities for starter cartridges, now classified as Class 9 high explosives, must be provided.

3. CAPABILITIES:

a. Simplicity of operation makes the RB-57A an extremely easy aircraft to fly and simplifies the problem of pilot transition from multi-engine conventional aircraft.

b. The T-1 Optical Sighting Head, located in the nose section of the aircraft, is adequately accurate for use in day pinpoint photography, day mapping photography, and for night photography of targets that are lighted or that otherwise present identifiable aiming points.

c. The aircraft bomb door is satisfactory for operations at speeds up to 325 knots IAS and may be operated with caution up to 400 knots. This is the airspeed capability for door rotation. However, bombs may be dropped from the door satisfactorily at speeds up to the maximum airspeed limitation of the aircraft provided that the door is rotated at the recommended indicated airspeed.

d. The photo system of the RB-57A provides simplified controls, simplified operating procedures, use of standard equipment, installation and removal procedures that are rapid and simple, and (based on limited testing) dependable operation.

e. The precision navigation system of the RB-57A provides adequate accuracy for definite fixes and target location required for day and night reconnaissance provided that the area coverage desired is within the range limitations of the installed equipment.

f. The RB-57A has a capability as a bombardment aircraft by changing the configuration of the bomb door to accommodate various types of bombs. Accuracy with this arrangement will depend on the control method used. Methods available include manual Shoran with oral arc direction, manual operation of MSQ-1 direction using the APN-11A and APA-90, and fixed angle bombing using the T-1 Optical Sighting Head.

g. The RB-57A has a capability for Napalm or other low altitude bombing through use of the external stores racks.

h. The fuel system of the RB-57A can be operated very effectively and with a minimum of instruction due to extremely simple controls.

i. The speed of the RB-57A (.78 Mach), while not in the class of the fastest interceptors, is in a range comparable to other jet bombers.

4. LIMITATIONS:

a. Use of the nose visual station requires the navigator to leave his ejection seat, remove his parachute and take a very uncomfortable position lying on the catwalk leading to the nose position. This position has no safety belt or restraining straps and is so cramped and uncomfortable that it can be used continuously for only about 25 minutes.

b. Use of the bomb door system above 400 knots IAS is accompanied by turbulence during door rotation that increases in intensity with the indicated airspeed until an almost uncontrollable pitch-up is encountered during rotation at 450 knots IAS.

c. Changes in configuration of the RB-57A bomb door take excessive time to accomplish, thus reducing the flexibility of the door's employment.

d. There is no provision in the camera mount system for drift compensation for mapping photography. Mapping runs may, however, be made upwind or downwind to stay within US Army Corps of Engineers' mapping specifications. There is no suitable navigational capability for night photographic reconnaissance beyond a maximum radius of 155 statute miles using the RB-57A and the K-37 twelve-inch night camera. This limitation is due to the dependence on APN-11A and Shoran with line-of-sight signal reception for photo-navigation and the altitude restriction incurred by the use of the twelve-inch focal length K-37 camera.

e. Pilot operation of camera controls is distracting, especially during night APN-11A missions in that the "Operate" switch is not easily accessible.

f. There is no adequate self-contained navigational aid capable of being operated at ranges commensurate with the radius of action of the aircraft.

g. The bomb door system requires that caution be exercised during ground operations due to the automatic closing tendency this equipment has when the aircraft battery is turned on.

h. Napalm bombs (M-116 Tanks) must be dropped from the RB-57A with "kickoff braces" installed on the external stores racks. Damage may result to the aircraft ailerons by the tanks if this is not done.

i. Elaborate precautions must be taken during engine starts using the cartridge starter system. This is due to the potential danger from starter turbine disintegration and because the starter cartridges are now classified as high explosives.

5. TACTICS AND TECHNIQUES: Tactics and techniques were not developed during this phase except to the extent required for the formulation of standard operating procedures for the aircraft and aircraft systems. It was, however, indicated that tactics and techniques will be largely confined to those involving APN-11A and/or Shoran for accomplishment of the aircraft's primary mission when operating under combat conditions unless the navigational concept for this aircraft is modified. The test final report will include the tactics and techniques developed for use of the aircraft in its primary and secondary roles.

6. COLLECTIVE ANALYSIS:

a. The primary mission of the RB-57A aircraft is night photographic and visual reconnaissance. It has a secondary mission of day mapping and supplemental day photography. To be suitable for this purpose, this aircraft should have:

(1) A navigational capability to locate selected pinpoint targets, day and night, at ranges commensurate with the radius of action of the aircraft.

(2) A photographic capability to obtain satsifactory low, medium or high altitude night photography (as required) of these targets.

(3) A visual reconnaissance capability sufficient to permit surface observations during all operations.

(4) A photographic capability to obtain medium and high altitude day topographic mapping photography with large-scale supplementary photography, as required.

(5) A capability to survive in hostile air while accomplishing all assigned operations.

b. Evaluating the present capability of the RB-57A with the requirements set forth in paragraph 5a, above, the following is found to hold true:

(1) The RB-57A has a capability to effectively locate selected pinpoint targets, day and night, using ground electronic installations. This capability is limited to a maximum range of 300 statute miles at 40,000 feet, but due to altitude restrictions of installed photographic equipment, this range is reduced to 155 statute miles at 12,000 feet. The possible radius of action of this aircraft, however, is in excess of 1000 miles, according to aircraft specifications. It does not, therefore, satisfy the requirement for a suitable navigational capability of a range commensurate with its radius of action.

(2) The present photographic system of the RB-57A does not incorporate a capability to obtain satisfactory high altitude night photography. The system does have a capability for low and medium altitude night photography (4000 to 12,000 feet) with photoflash bombs, but this photography is limited to a single vertical camera that gives insufficient coverage at lower altitudes. The RB-57A does not, therefore, fully satisfy the photographic requirements of a night reconnaissance aircraft.

(3) The visual reconnaissance capability of this aircraft is centered in the nose position since this is the only position that permits constant observation of surface activities. The nose position, however, requires that dangerous practices be made standard operating procedure in order to use the position. The aircraft, in its present configuration does not, therefore, satisfy the visual reconnaissance requirement for an aircraft with the mission of the RB-57A.

(4) The RB-57A does have a capability to obtain medium and high altitude day topographic mapping photography with large-scale supplementary photography as desired, except that the camera mount incorporates no feature for correcting drift. All mapping runs must then be made either upwind or downwind if the photography is to be without "crab". It also has a disadvantage in that the large-scale photo capability is provided by K-38 cameras with 24-inch focal lengths. This focal length is satisfactory for large-scale supplementary photography at medium altitudes (up to approximately 25,000 feet), but the results from this type camera would be of questionable value at altitudes of 40,000 feet or above where the resultant photography would be of a scale 1:20,000 or less. It appears, however, that the RB-57A does have a mapping and supplementary photography capability, provided that these operations are carried out under the navigational restrictions to which reference has already been made. It must also be understood that use of the T-1

Sighting Head in the RB-57A nose position for flight line control involves the same difficulties encountered in using this position for visual reconnaissance.

(5) The capability of the RB-57A to survive in hostile air while accomplishing all assigned operations was not covered during this phase of testing. An examination of features, however, reveals that the RB-57A has no defensive armament, has no tail or radar warning equipment, and has very poor visibility to the rear.

c. An evaluation of the navigational capabilities of present USAF aircraft possessing a night tactical reconnaissance capability reveals the following:

(1) The RB-26 navigation system includes Shoran, Loran for a navigational capability beyond Shoran range, a capability for operation with MSQ-1 and a nose station that has proven adequate for visual observation and direction under combat conditions.

(2) The RB-45 navigation system includes Radar Set AN/APQ-24 for a navigational capability with unlimited range and a Sonne viewfinder to be used for day photography.

(3) The RB-57A navigation system includes APN-11A and Shoran for day and night photography and an unsuitable nose position with a T-1 Optical Sighting Head for day photography. There is no provision for a night precision navigation capability beyond the range of Shoran or APN-11A.

d. An examination of the camera equipment of the RB-26, RB-45 and RB-57A aircraft reveals that all three aircraft use the same K-37 night camera with 12-inch focal length and are thus subject to the same limitation on operating altitude. Night photographs indicate that all three aircraft are adequate camera platforms when using the K-37 camera at altitudes of 12,000 feet or below.

e. Based on limited data compiled during this phase of testing, it appears unlikely that the RB-57A aircraft is more capable of performing the night reconnaissance mission than either of the aircraft types it is scheduled to replace in the Air Order of Battle.

W. B. FU[illegible]
Colonel, USAF
Commander

APPENDICES:
A. Navigation and Photography
B. Aircraft Performance and Handling Characteristics
C. Armament
D. Materiel

PROJECT NO. APG/TAT/122-A

NAVIGATION AND PHOTOGRAPHY

NAVIGATION AND PHOTOGRAPHY

1. INTRODUCTION: This Appendix has been designed to furnish navigational and photographic operating information concerning the RB-57A aircraft. Concentration has been placed on the navigational methods most capable of accomplishing the positioning requirements of night photography. In this respect, the celestial navigation capabilities of the RB-57A were not examined during this period. The normal error experienced in this type of navigation precludes its use for precision fixing for night photography.

2. DEAD RECKONING:

a. Basic Instruments:

(1) The following instruments are located in the rear navigation station:

(a) True airspeed meter.

(b) Free air temperature gage.

(c) Pressure altimeter.

(d) J-2 Compass Remote Indicator.

(e) Radio compass control box and indicator.

(2) The corrections set forth in Technical Order AN-01-35EAB-1 for heat of friction, compressibility, and airspeed installation were used in addition to corrections for actual instrument error to determine the true readings. True airspeeds used in flight were taken from the true airspeed meter.

(3) The J-2 Compass Remote Indicator is marked into five degree increments. The master indicator, located on the pilot's instrument panel, is marked into two degree increments. Both indicators contain cardinal and intercardinal points. Dials on both indicators are rotatable.

(4) The radio compass was used both as a fixing and a homing device. The presence of an additional control box and indicator at the pilot's station allows for practically instantaneous two-station fixing by using the control switches provided.

(5) The T-1 Optical Sighting Head, located in the nose visual station, provided the means for securing drift readings. In order to use the nose visual station, the navigator lies down on the catwalk with his

head in the nose of the aircraft. This position is very uncomfortable and can be occupied for only short periods of time. It is also potentially quite dangerous to use the nose position in its present configuration, in that it requires the navigator to leave the safety of his ejection seat and remove his parachute in order to take his position in the nose. The nose position also lacks any provision for safety straps or belts. This, in itself, is normally considered unacceptable, particularly in pressurized aircraft. Twelve sorties were flown during this phase using the T-1 Sight and the nose position.

b. Procedures:

(1) A complete and accurate preflight log was prepared for each mission regardless of the method of navigation to be used. Routes to be flown were separated into a series of legs which terminated at a prominent physical landmark or checkpoint. This necessitated several alterations in course during a mission. Allowances were made for the radius of each turn by computing the radius under a "no-wind" condition. To establish uniformity for planning purposes, all turns were made at a rate of 1½ degrees per second or 4 minutes per 360 degrees of turn. The formula used to determine the radius of each turn was 4 minutes of TAS divided by 2 pi (44/7). This arc was actually drawn on the flight chart. Distances flown while making turns were added to the distance for that particular leg.

(2) The time portion of the preflight log was computed to the nearest tenth of a minute. This was believed to be necessary because of the high speeds encountered.

(3) Compromises were made on normal inflight log requirements due to cramped working space and time consumed going from the rear navigation station to the nose station and returning. The preflight log was, however, followed with constant checks and alterations being made during flight.

(4) Maps used were of the scale 1:1,000,000.

(5) Drift readings and double drifts were accomplished using the T-1 Sight.

c. Results:

(1) Drift readings from the T-1 Sight were accurate and easily determined during day operations and at altitudes below 20,000 feet.

(2) However, drift readings at night and at altitudes above 20,000 feet during day operations, using the T-1 Sight, were difficult to determine due to the slow apparent motion of the ground during the day and the lack of visual pinpoint ground references at night.

(3) Two spot-checks at cruising conditions showed the indicated true airspeed to be approximately 10 knots greater than computed true airspeed.

(4) The radio compass is very susceptible to interference from electrical disturbances encountered in adverse weather. Fixing and homing capability with this instrument, therefore, depends largely on atmospheric conditions.

(5) The average error on two sorties (totalling four hours and twenty minutes) flown using only dead reckoning navigation methods was three per cent of the distance flown. At no time was this error observed to be more than five per cent or less than one per cent.

(6) The average time required during this phase to perform a navigational preflight for a normal mission was approximately two hours.

(7) Normal inflight log procedures were not satisfactory for the missions flown. A map-log method will be evaluated in later tests.

d. Recommendations:

(1) The nose visual station in its present configuration be modified to provide the navigator with improved comfort and greater safety or be eliminated from the aircraft.

(2) A remote J-2 Compass Indicator, an altimeter and an airspeed meter be installed in the nose position if this position is to be retained.

3. APN-84/SHORAN:

a. Installation:

(1) The Shoran unit used during this test consisted of the Range Indicator (IP-186) and the Radio Transmitter (T-342) with antennae and cabling. The indicator is installed in the rear navigation station, forward and to the left of the navigator's seat. Calibration procedures are included as Inclosure 1 to this Appendix. The transmitter is located aft of the camera compartment access door and occupies the same position as the APN-11A and APA-90 equipment when this system is installed. This limits the aircraft to either a Shoran or APN-11A installation and precludes a capability of employing either installation at will during flight.

b. Shoran Fixing:

(1) Nine sorties were flown during the accelerated phase using APN-84 Shoran for pinpoint photography. Selected photographs are included as Inclosure 5 to this Appendix.

(2) Two methods were used to secure positions by Shoran. The first is to position the drift and rate pulse as near as possible to the marker pulse with the mileage dials while the scale miles switch is on the 100-mile setting. Then, by changing to the 10-mile setting, interpolation of ranges can be read from the indicator. These ranges are added to the mileage dials to obtain totals which are then plotted. The second follows the same procedure, but by aligning the rate and drift pulses on the marker pulse with the vernier gears, accurate distances are then read from the mileage and vernier dials. The time of fix will be the time of the last operation when using either method.

(3) Although interpolation fixing is less accurate, it was used more frequently since it required less time.

c. Shoran Pinpoint Photography:

(1) Pinpoint targets were selected at distances of 100, 120, 150, 200 and 250 statute miles from one of the two Shoran stations. Shoran data was then obtained for each of the targets. Data was determined by scaling from maps and by normal computations.

(2) Oral arc flying was accomplished by intercepting the Shoran arc at a 90 degree angle approximately three minutes out from the target. The distance from arc to start the turn, the rate of turn while on the arc, and the initial heading on the arc were all precomputed.

(3) Each of the four possible approaches to the objective point were used so that the weaker of the two Shoran signals was used both for rate and drift and that runs were made away from stations as well as toward them.

(4) No RDI and comparator units were installed.

(5) Each of the nine sorties was flown under simulated night conditions with the navigator's compartment blacked out. The navigator constantly gave the pilot verbal directions as to the position of the aircraft in relation to the arc on these sorties and notified the pilot when to open the bomb door and simulate bombs away. Daytime application would differ only in that the bomb door would not be opened and the day cameras would be turned on instead of simulating a bomb drop.

(6) Results:

(a) Minimum altitudes required for successful photographic runs at the Shoran distances indicated were:

1. 100 statute miles - 10,000 feet on 4 runs.

2. 120 statute miles - 12,000 feet on 4 runs.

3. 150 statute miles - 15,000 feet on 4 runs.

4. 200 statute miles - 23,000 feet on 4 runs.

5. 250 statute miles - 34,500 feet on 1 run.

(b) Oral arc flying at high speeds is considered suitable only when a high degree of crew coordination and individual skill exists.

(c) The comparator and PDI units are considered very desirable for high speed arc flying.

(d) Although Shoran data computed using the standard form is more accurate, data scaled from maps produced full photographic coverage in all cases. Data obtained by this method was measured while in flight on two runs and produced 100 per cent photographic coverage.

(e) No provisions are provided in the RB-57A for AC voltage indications to pilot or navigator.

(f) There was no apparent difference in approach numbers of arcs that were flown.

d. Recommendations:

(1) Comparator and PDI units be installed in the RB-57A.

(2) An AC voltmeter with manual inverter adjustment be installed.

4. APN-11A WITH APA-90 INDICATOR GROUP:

a. Installation:

(1) The APA-90 Indicator is located on the left side of the pilot's main instrument panel.

(2) The control switches for this indicator and for the APN-11A Radar Beacon are located on the pilot's auxiliary instrument panel. An additional "Roger" button is provided on the left grip of the control column.

(3) The APN-11A transmitting and receiving antennae are flush type and are located on the rear fuselage access hatch.

b. Application:

(1) Five sorties using this equipment for night pinpoint photoflash photography and one sortie using the equipment for day pinpoint photography were flown during the accelerated phase. Selected photographs are included as Inclosure 5 to this Appendix.

(2) Ground controlled pinpoint photography using this equipment in conjunction with ground control from an MSQ-1 ground radar site, was accomplished at altitudes from 2500 feet to 30,000 feet. All directions from the MSQ-1 ground controller were transmitted through the APA-90 Indicator Group.

(3) The maximum range limitations of this equipment were not investigated during this phase. However, this limitation should approximate that of Shoran since both operations depend on line-of-sight signal reception.

(4) A standard operating procedure for the operation of the APN-11A Beacon and the APA-90 Indicator Group was established for this phase and is included as Inclosure 2 to this Appendix.

c. Results:

(1) The APN-11A and APA-90 were used on 28 runs without failure or malfunction of any equipment.

(2) 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 antennae on the aircraft. Further investigation will be performed, however, before recommendations are made for relocation or addition of antennae.

(3) The accuracy of operations directed by MSQ-1 ground radar is dependent upon the ground controller's skill, the skill of the aircraft pilot, the condition of ground and airborne equipment, and the degree of coordination achieved during such operations. With this in mind, the primary purpose of these sorties was to check out the operation of the APN-11A and APA-90 in the RB-57A aircraft and not to perform any test on the accuracy of MSQ-1 radar. It is believed worthy of note, however, that photographic results obtained from these sorties showed target coverage in 19 out of 20 plots.

5. MAP READING:

a. Application:

(1) Map reading was used as a primary means of reference on two day sorties.

(2) Map reading was primarily accomplished for the purposes of target identification and navigational fixing.

(3) Map reading was also conducted in conjunction with photographic mapping performed with the T-1 Sight.

(4) The rear navigation station and the nose visual station were tested for suitability for this means of reference.

b. Results:

(1) Map reading at night from the rear navigation station was limited to abnormally prominent check points, such as lakes, coast line features, large cities, etc., when attempted in conjunction with night transition flights.

(2) Vision from the rear navigation station is limited to the view from the right side of the aircraft and line-of-sight angle of 20-30 degrees from vertical.

(3) Map reading in the nose position is very fatiguing after periods of approximately 25 minutes. Downward visibility is suitable in this position. Vision for map reading at 90 degrees left or right is possible but very difficult and tiring. In wearing the P-4 Helmet in the nose position, the helmet strikes the plexiglass section and prevents horizontal vision.

c. Recommendations:

(1) Action be taken to modify the nose position in order to provide a more effective capability for map reading.

(2) Maps not larger than 18 x 24 inches be used in the nose position. Refolding or opening and closing a map while in the limited space of the nose station is extremely difficult.

6. T-1 OPTICAL SIGHTHEAD:

a. Day Mapping:

(1) Selected areas were mapped on three day sorties at altitudes of approximately 16,000, 30,000, and 40,000 feet using the T-1 Optical Sighthead for directional control.

(2) Map scale of 1:500,000 was used for flight line map.

(3) Photo runs were made both upwind and downwind with winds determined by double-drift solutions.

(4) Results:

(a) Overlap was constant on five flight lines at 15,840 feet from 59 to 64 per cent. The area covered by these lines was 18 x 67 nautical miles. The photo scale was constant within 80 feet. Tip and tilt were not analyzed.

(b) Photo quality was excellent and directional control was suitable on all sorties.

(c) The camera control system of the RB-57A does not provide for camera control recycle, drift compensation, or indication of camera operation noticeable to pilot or to the navigator when in the nose position.

(5) Recommendations:

(a) Study be given to providing a remote controlled camera mount for drift compensation if mapping performed by this aircraft is required to conform to Corps of Engineer specifications. Otherwise, upwind or downwind runs will be required at all times to remain within the "crab" limitations for mapping photography.

(b) A "photo-warning" light be installed to warn the pilot of camera actuation in order that course corrections may be made while the camera shutters are closed.

b. Bomb Aiming:

(1) The T-1 Optical Sighthead was used to control drops of M-120 Photoflash Bombs on three sorties during this phase. Drops were made at night on a lighted "T" target from altitudes of 6000 to 14,000 feet. Selected photographs are included as Inclosure 5 to this Appendix.

(2) Ground speeds were controlled so that precomputed dropping angles could be used.

(3) All drops consisted of three bombs individually released with the aircraft intended t be directly over the target when the second bomb exploded. Bursting altitudes were computed for one-half of release altitude.

(4) Sighting angles were computed in degrees using natural trigonometric functions.

Example: Bombing Altitude - 8000 feet (3 bombs).
Fuze Setting - 18.0 sec.
Bomb Interval - 5.0 sec.
Ground Speed - 280 knots (472.9 feet per sec).

Solution: $\frac{(18 + 5) \times 472.9}{8000}$ = Tan 1.35%

Tan 53°40' = 1.35% (from Trig Tables).
Sighting Angle = 53°40'.

(5) Results:

(a) The T-1 Optical Sighthead proved to be suitable at night on targets which were lighted, or because of some other reason could be identified through the sighting reticle.

(b) Fifteen runs were made on a lighted target and produced accurate and complete photographic coverage on each run.

(6) Recommendation: The crosshair light rheostat allow further dimming. The lowest position of the control is now too bright.

7. PHOTO SYSTEMS:

a. Day Configuration:

(1) Eighteen sorties were flown during this phase, using the day photo configuration.

(2) The day configuration allows for two K-38 twenty-four inch cameras in the split-vertical position and one T-11 six-inch camera in the vertical position.

(3) The camera control system, when placed in operation, sends a pulse to a stepping relay which, in turn, sends pulses to vertical and split-vertical stations in a 1 to 4 ratio. One vertical picture is taken for every four split-vertical operations.

(4) There is no recycle feature in the system to insure that the first pulse will go to both vertical and split-vertical positions when the operate switch is turned on. The incorporation of such a feature would be very helpful during day mapping operations to enable the navigator to place cameras in operation over a specific ground location.

It would also be helpful during day training flights where night conditions are simulated to enable the navigator to accurately select a definite number of evenly spaced vertical photos on simulated bomb drops and then determine the accuracy to be expected using photoflash photography.

(5) A day photo standard operating procedure is included as Inclosure 4 to this Appendix.

b. Night Configuration:

(1) Seven sorties using the night configuration with M-120 Photoflash Bombs for illuminants were flown during this phase. These sorties produced 45 night photographs. Ninety per cent of the night photographs had over 2 lines per millimeter resolution. Fifty per cent of the total photographs had 4.2 lines per millimeter, and 10 per cent had 6 lines per millimeter resolution.

(2) The standard night configuration is composed of two K-37 twelve-inch focal length cameras in split-vertical arrangement for operation with the cartridge ejector system, and one K-37 twelve-inch focal length camera in a prime vertical position for operation with M-120 Photoflash Bombs and using the K-37 shutter trip control.

(3) No provisions are made for alterations or substitutions in this configuration.

(4) A standard operating procedure for use with the night configuration is included as Inclosure 3 to this Appendix.

c. Results:

(1) The photo system of the RB-57A is a dependable system, but one that incorporates very little flexibility. Only one "runaway" camera was encountered during the course of testing. The A-18 Magazine also operated very dependably, having no malfunctions during this phase.

(2) No difficulties were encountered in operating the system from the navigator's position. Operation of the camera system from the pilot's position, however, is quite distracting. This is especially true during night APN-11A missions. The "Operate" switch for the camera system is too inconvenient for the pilot to reach comfortably while flying the aircraft.

(3) Present operation with the night configuration using M-120 Photoflash Bombs limits photo coverage to that obtained from one K-37 camera. This coverage at 12,000 feet altitude is only 9000 feet wide. The use of the split-vertical position with M-120 Photoflash Bombs would

almost double this ground coverage.

d. Recommendations:

(1) A recycle feature be incorporated into the day camera control configuration.

(2) The camera control system be modified to provide a camera selection capability for night photography.

(3) The pilot's control panel be relocated or that all camera operation be delegated to the navigator.

6. GENERAL CONCLUSIONS:

a. The operational suitability of the RB-57A is limited to operating within line-of-sight ranges of ground radar or Shoran installations at altitudes commensurate with the limitations of installed camera equipment.

b. The present camera system is limited to one standard day and one standard night configuration with no provisions for substitutions or alterations.

c. The day camera configuration has a requirement for a recycle feature to insure that the first operating pulse will go to both vertical and split-vertical camera stations.

d. The aircraft and camera mount constitute a suitable camera platform for aerial photography with the standard camera configurations except that there is no provision for drift correction to remove "crab" from mapping photography.

e. The present camera control system is unsuitable for pilot operation in that the pilot is distracted from operation of the aircraft.

f. The present navigation system of the aircraft limits the effective combat radius to approximately 300 statute miles at 40,000 feet due to dependence upon Shoran and APN-11A, both of which have line-of-sight signal characteristics.

g. The present night camera system, because of the K-37 twelve-inch focal length camera, further reduces the effective night combat radius of the aircraft by reducing the altitude at which satisfactory photography can be accomplished. Scale requirements for satisfactory night photography are normally not larger than 1:12,000. This scale with the K-37 camera limits the operating altitude to a maximum of 12,000 feet. The line-of-sight range for this altitude is approximately 155 statute miles.

h. The present configuration of the nose visual station is inadequate and unsafe for use in photo reconnaissance, visual reconnaissance, day mapping, and/or map reading.

i. Night illumination of all navigator's instruments and camera controls is good.

8. GENERAL RECOMMENDATIONS:

a. The present photo-navigational limitations of the RB-57A aircraft be corrected.

b. The nose visual station as installed be eliminated from the aircraft.

c. A suitable airborne search type radar set be installed to provide a navigational capability beyond the range of Shoran or MSQ-1 ground radar.

d. A viewfinder or similar equipment be installed in the rear navigation station for day photography.

e. The operating procedures calling for pilot operation of the camera control be eliminated.

f. A recycle feature be incorporated in the day camera configuration to insure that, upon actuation of the "Operate" switch, the first operating pulse will be transmitted to both vertical and split-vertical stations.

g. The night camera system be modified to use split-vertical cameras with M-120 Photoflash Bombs as well as with cartridges, and further modify the system to allow for selection of camera positions in the night configuration as desired.

h. Action be taken to secure night cameras with 24-inch or 36-inch focal lengths to allow satisfactory photography at higher altitudes and a resultant greater radius of action.

PROJECT NO. APG/TAT/122-A

AN/APN-84 CALIBRATION PROCEDURES

AN/APN-64 CALIBRATION PROCEDURES

STEP NO.	CONTROL USED	POSITION
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.	Brightness and Focus	Adjust (when red light comes on)
7.	Rate Mileage Dial	Detent 99.8381
8.	Rate Counter (Vernier)	99.8381 Miles
9.	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.	
10.	Drift Mileage Dial	Detent Nearest Zero
11.	Drift Vernier Counter	99.8381 Miles
12.	Drift Reference Button	Depress and repeat same process as for Rate side.

STEP NO.	CONTROL USED	POSITION
13.	Station Interchange Switch	Rate HF
14.	Rate and Drift Vernier Counters	99.8381 Miles
15.	Zero Check Switch NOTE: Twenty minutes must have elapsed since power "On" before proceeding to the next step.	Red Light "On"
16.	Receiver Tuning Knob	Tune to higher transmission frequency (usually 250 mc).
17.	Gain 1 (Readjust receiver tuning for optimum reception.)	Clockwise until rate pulse reaches maximum size.
18.	HF Zero Set (Screwdriver adjustment.) Refine this adjustment on .2-mile scale.	Uncover and superimpose rate marker pulse on rate pulse.
19.	Receiver Tuning Knob	Tune to lower transmission frequency (usually 230 mc).
20.	Gain 2 (Readjust receiver tuning for optimum reception.)	Clockwise until drift pulses reach maximum size.
21.	LF Zero Set (Screwdriver adjustment.) Refine this adjustment on .2-mile scale.	Superimpose drift marker pulse on drift pulse.
22.	Zero Check Switch	Red Light "Off"

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

23.	Scale Miles Switch	100 Miles
24.	Standby Switch	"Cal" Position
25.	UHF - Call ground station and request calibration pulse.	
26.	Receiver Tuning Knob	Tune to ground station transmission frequency.
27.	Cal Adjust	Unlock and stop motion of calibration pulse.

Repeat step 27 on the 10- and 1-mile scales, then lock cal adjust.

PROJECT NO. APC/TAT/122-A

STANDARD OPERATING PROCEDURES - APN-11A MISSIONS WITH APA-90 INDICATOR GROUP

STANDARD OPERATING PROCEDURES - APN-11A MISSIONS
WITH APA-90 INDICATOR GROUP

PURPOSE: To establish a standard operating procedure to be followed by the aircrews and the ground controller on all APN-11A missions on Project No. APG/TAT/ 122-AB.

PROCEDURE:

1. Upon take-off the pilot will contact Devil Control on UHF 288.0 and report his position and altitude.

2. The ground controller will at this time perform his initial control check. The pilot will verbally advise his ground controller of the functions that are being displayed upon his indicator. The ground controller will erase these signals. This procedure will be preceded by a signal PREPARE TO CHECK and will be followed by the same signal PREPARE TO CHECK. The pilot will erase both of these signals. This will indicate that the control check is completed.

   NOTE: If at any later time during the mission a control check is necessary, voice contact need not be made.

3. Directional Controls (Turns): Preparatory signal of LEFT or RIGHT followed by the signal 2, 5, 10, 30, or 90 degrees which the pilot will "Roger" and then initiate. If a sequence of signals is sent after each "Roger", the pilot will add these quantities and initiate the sum. In addition, if at any time the controller desires that the pilot make a 180 degree turn he will signal FLY - 180 which the pilot will erase and standby for a RIGHT or LEFT which controller will erase. At this time he will initiate turn.

4. Vertical Control (Altitude): A preparatory signal of PREPARE followed by CLIMB or DESCEND which will be "Rogered" by the pilot. The pilot will then standby for a signal of FLY followed by 1, 3, 5, or 10 (thousand feet) which pilot will "Roger" and initiate.

5. Lost Procedure: The red light gleaming atop of indicator will mean that operator has beacon contact. No light indicates that beacon is lost. Pilot will continue on his present heading and altitude for one minute. If light does not come on, he will initiate a 180 degree turn and return at present altitude until contact is made or until such time that it is apparent that no contact will be made. If no contact is made, pilot will attempt UHF contact and instructions from ground controller before returning to base.

6. Bomb Procedure (Day Photo): One minute from target a signal of PREPARE TO BOMB will be given. The pilot will "Roger" this signal and prepare the system for camera operation. Ten seconds from target a signal of PREPARE will be given, and will not be erased, but will be followed by a secondary signal of BOMB. The pilot will then initiate cameras and "Roger" signal.

7. Bombing Procedure (Night Photo Bombing): At a point far enough from target so as to allow ground controller ample time to set up run, a signal will be sent of PREPARE TO BOMB. This will be "Rogered" by the pilot, and bomb doors will be opened. At approximately ten seconds from the ground controller's computed bomb release point a signal of PREPARE will be given but will not be "Rogered" by pilot. At the computed bomb release point a secondary signal of BOMB will be given. The pilot will instruct photo-navigator to release the bombs and then "Roger" the signal.

PROJECT NO. APG/TAT/122-A

STANDARD OPERATING PROCEDURES - HIGH ALTITUDE NIGHT PHOTOGRAPHY

STANDARD OPERATING PROCEDURES - HIGH ALTITUDE NIGHT PHOTOGRAPHY

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.
   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.

PROJECT NO. APG/TAT/122-A

STANDARD OPERATING PROCEDURES - HIGH ALTITUDE DAY PHOTOGRAPHY

STANDARD OPERATING PROCEDURES - HIGH ALTITUDE DAY PHOTOGRAPHY

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.)

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:

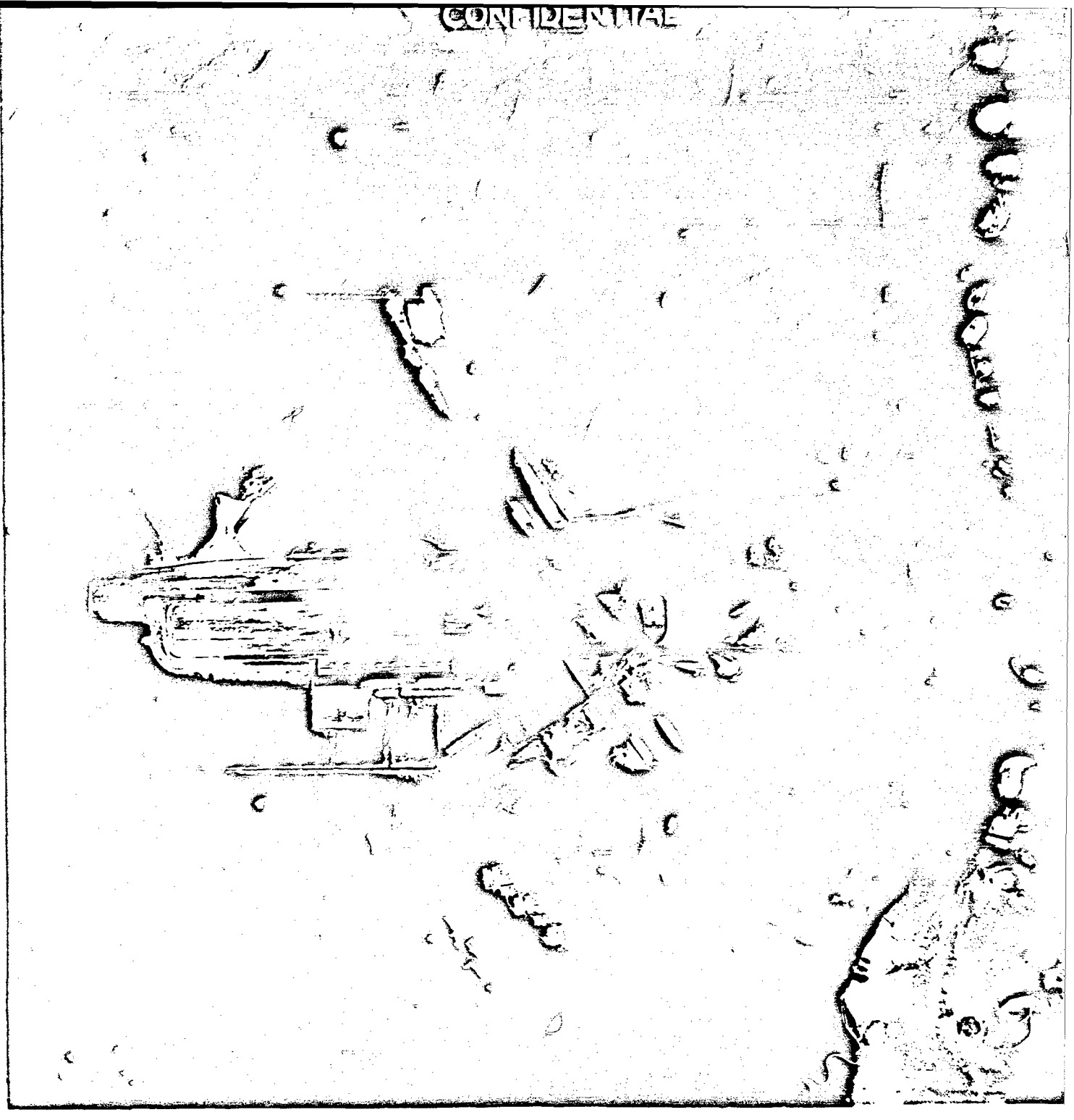
1. Master Control Operate Switch "On".

2. Extra pictures can be taken by Vertical Extra Pic or Split-Vertical Extra Pic Button as desired.

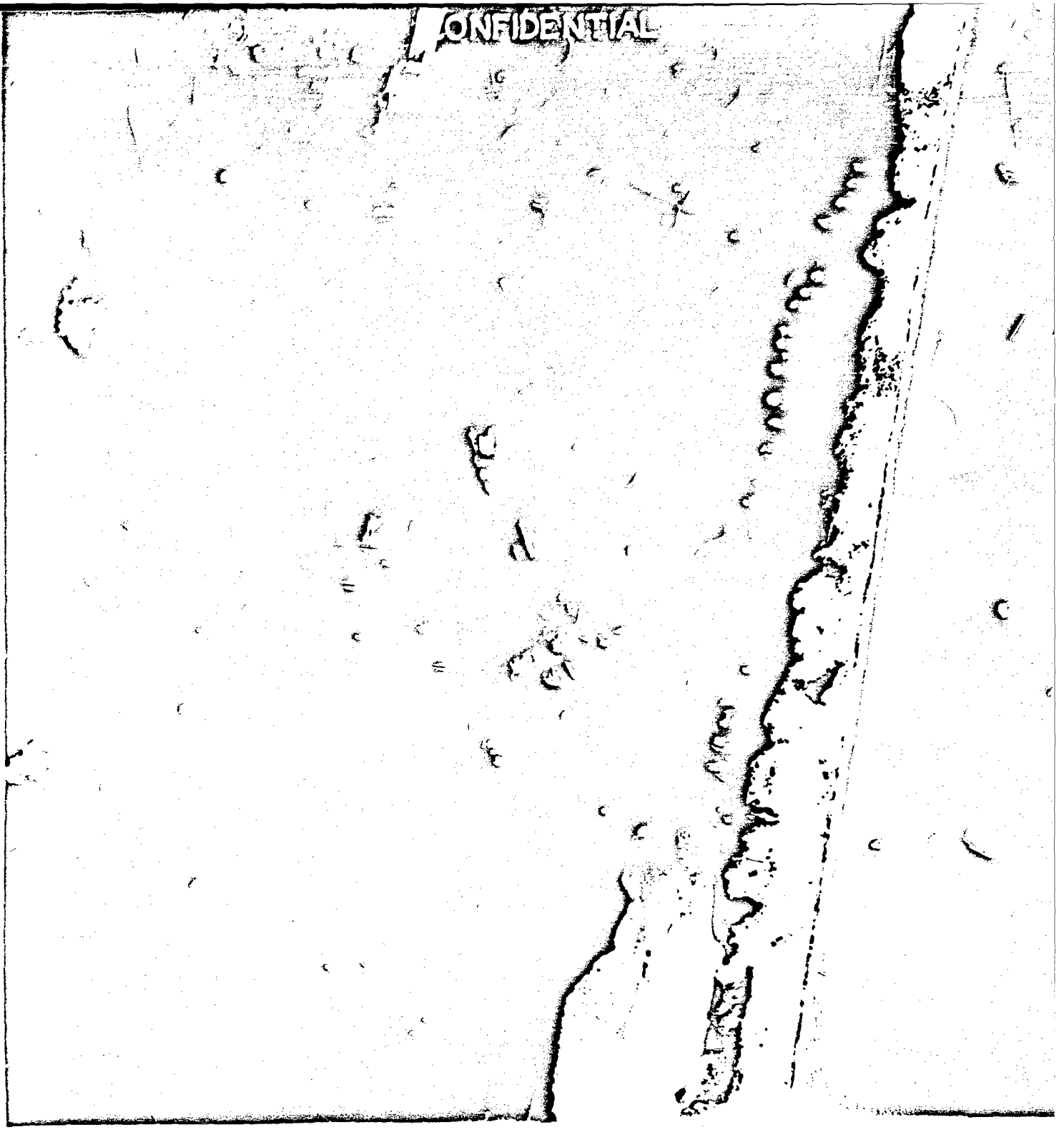
PROJECT NO. APG/TAT/122-A

SELECTED RB-57A AERIAL PHOTOGRAPHY

T-1 Bombsight visually controlled day photo. Vertical six-inch T-11, altitude 5000 feet.
TARGET - Resolution Target

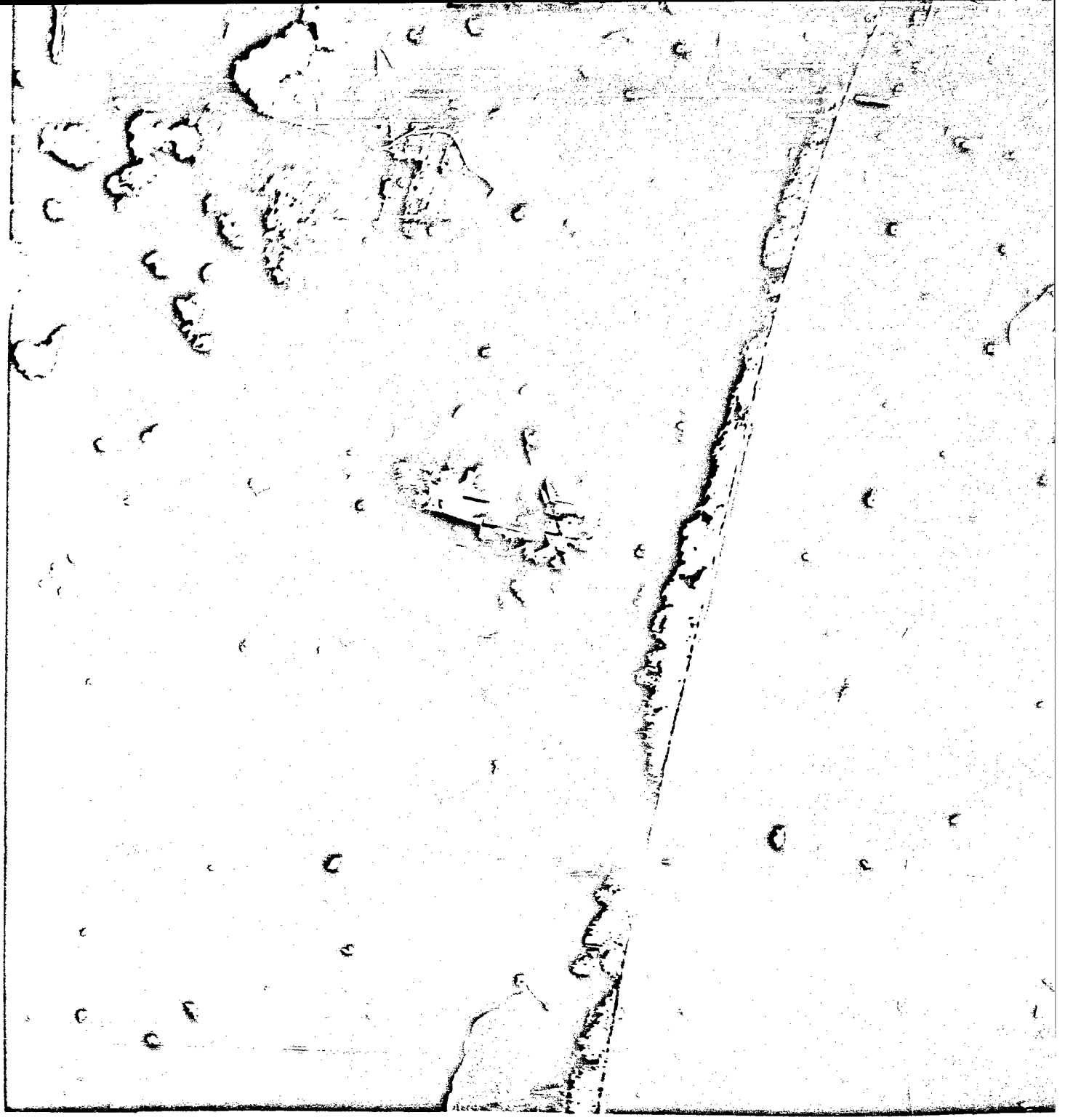


T-1 Bombsight visually controlled day photo. Vertical six-inch T-11, ..ltitude 10,000
TARGET - Resolution Target

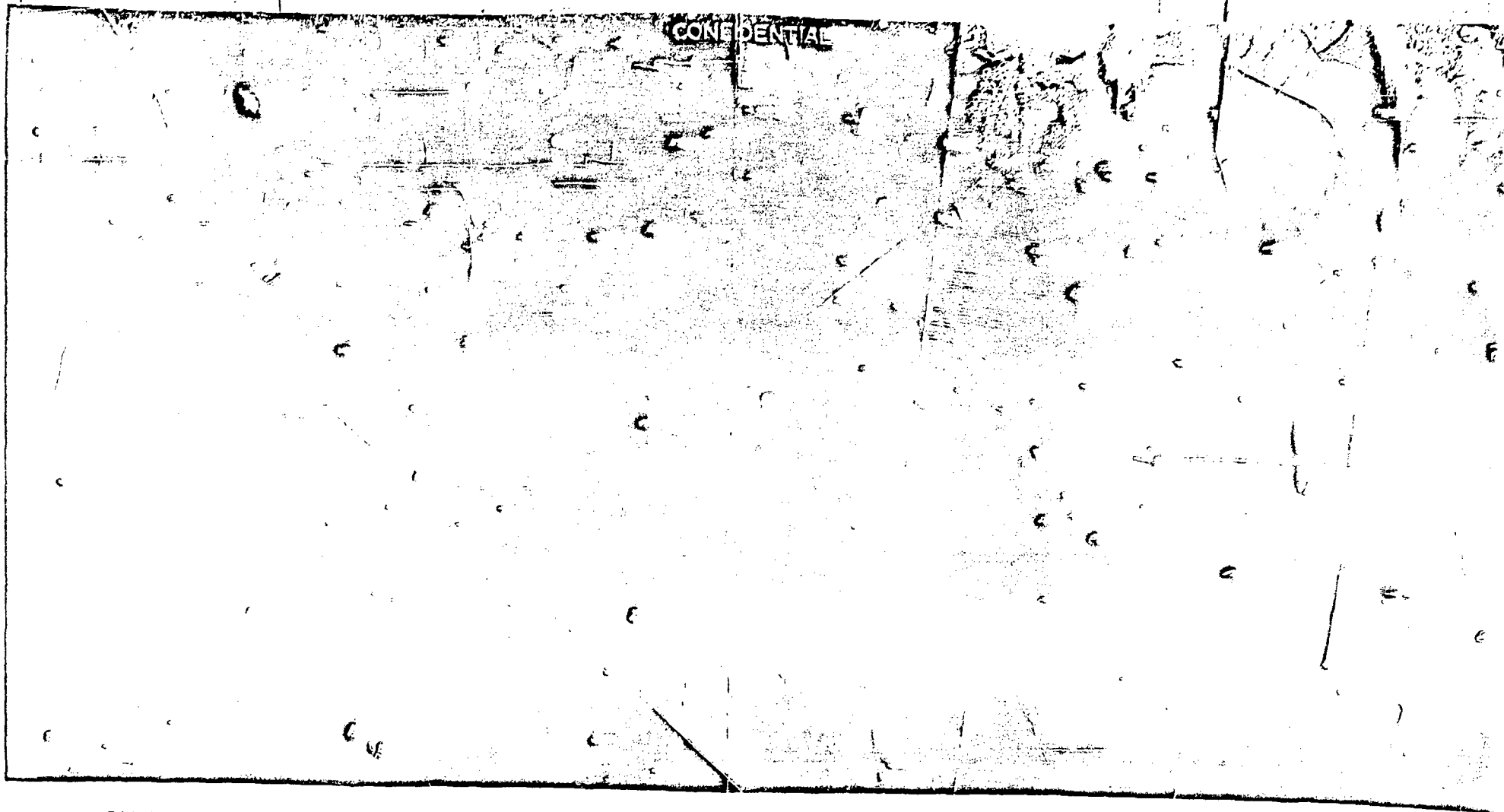


T-1 Bombsight visually controlled day photo. Vertical six-inch T-11, altitude 20,000 feet.
TARGET - Resolution Target

T-1 Bombsight visually controlled day photo. Vertical six-inch T-11, altitude 30,000 feet
TARGET - Resolution Target



T-1 Bombsight visually controlled day photo. Vertical six-inch T-11, altitude 40,000 feet.
TARGET - Resolution Target



T-1 bombsight visually controlled day photo. Right Split-vertical 24-inch K-38, altitude 30,000 feet.

TARGET - Resolution Target

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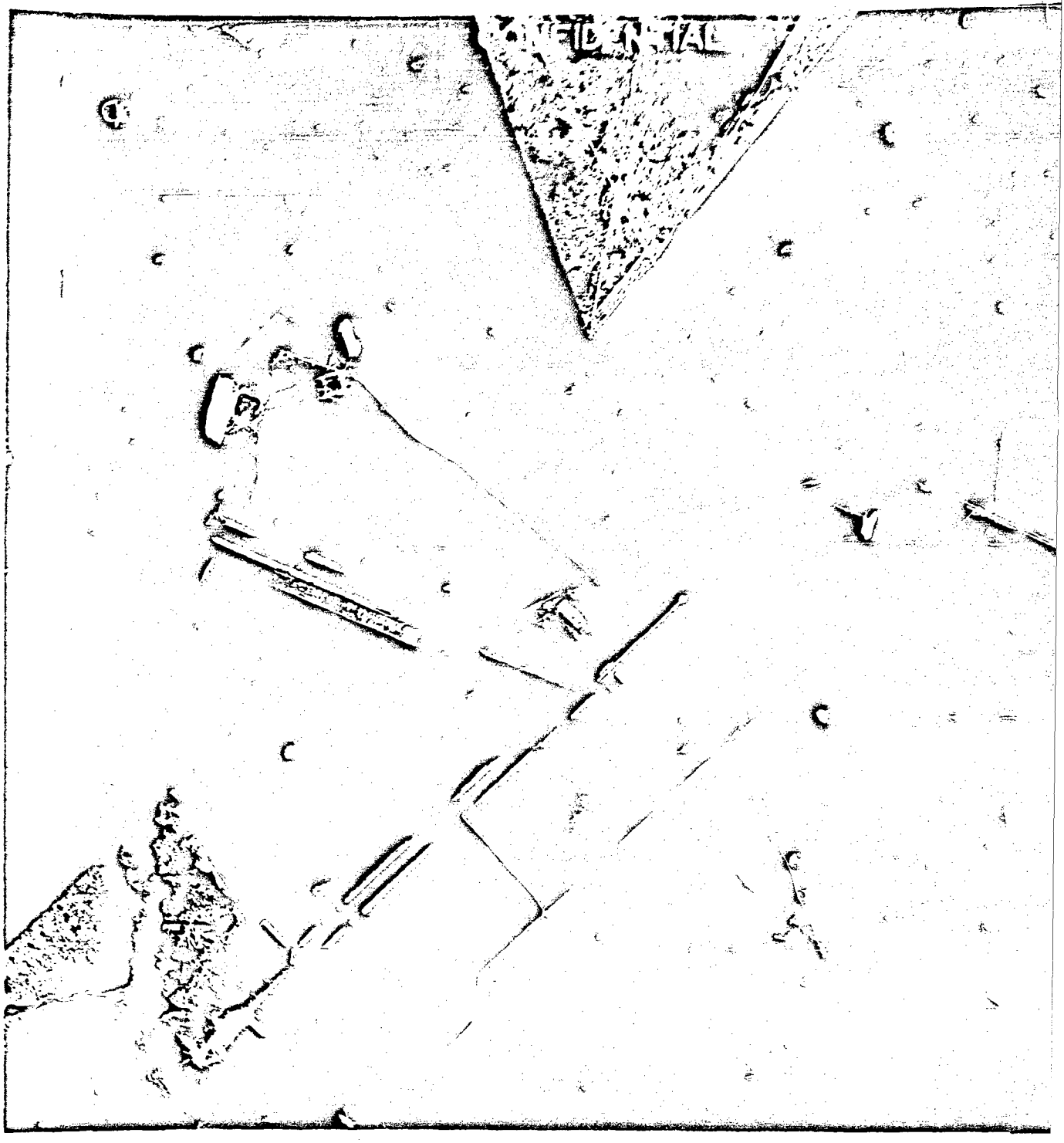
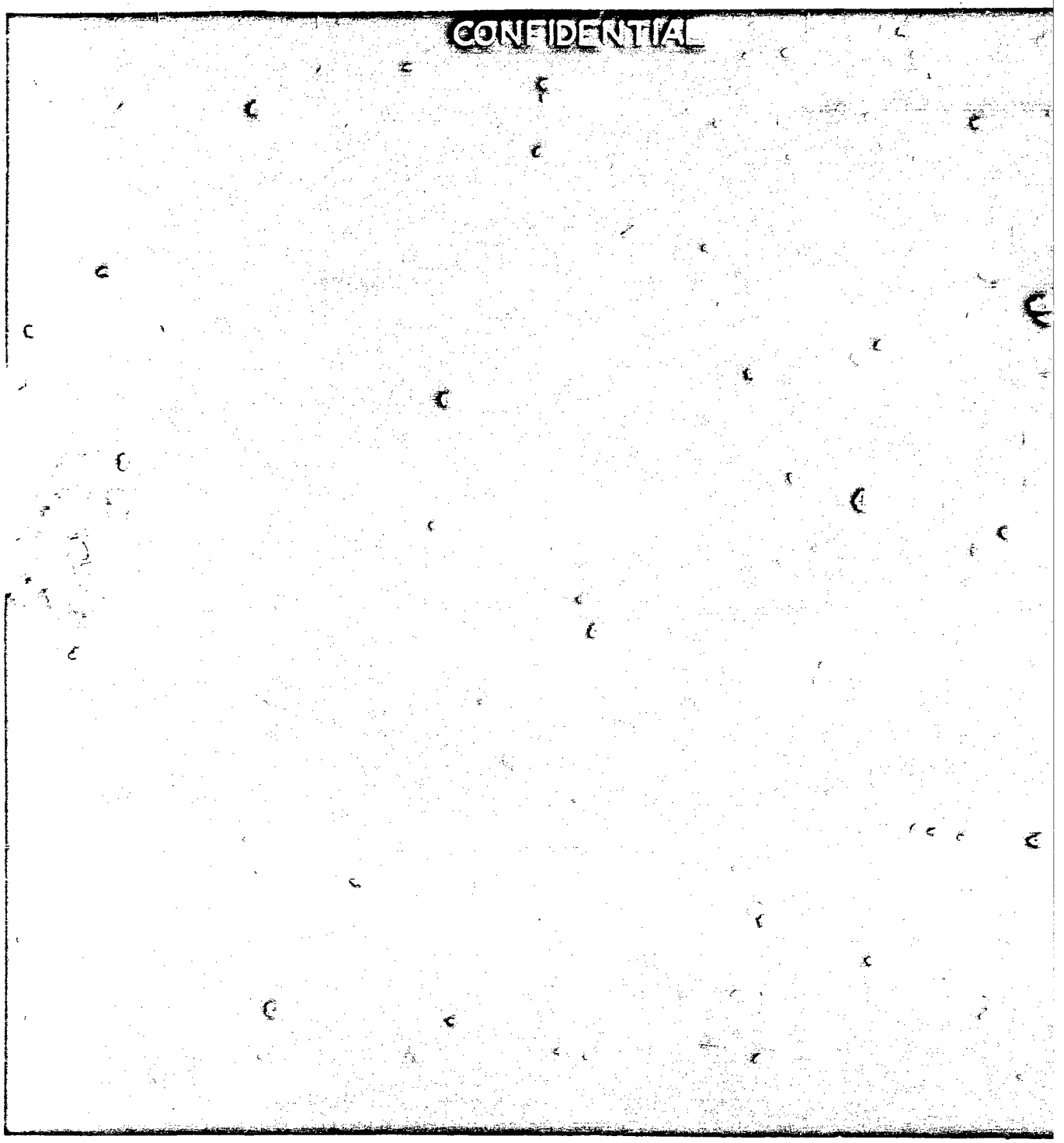
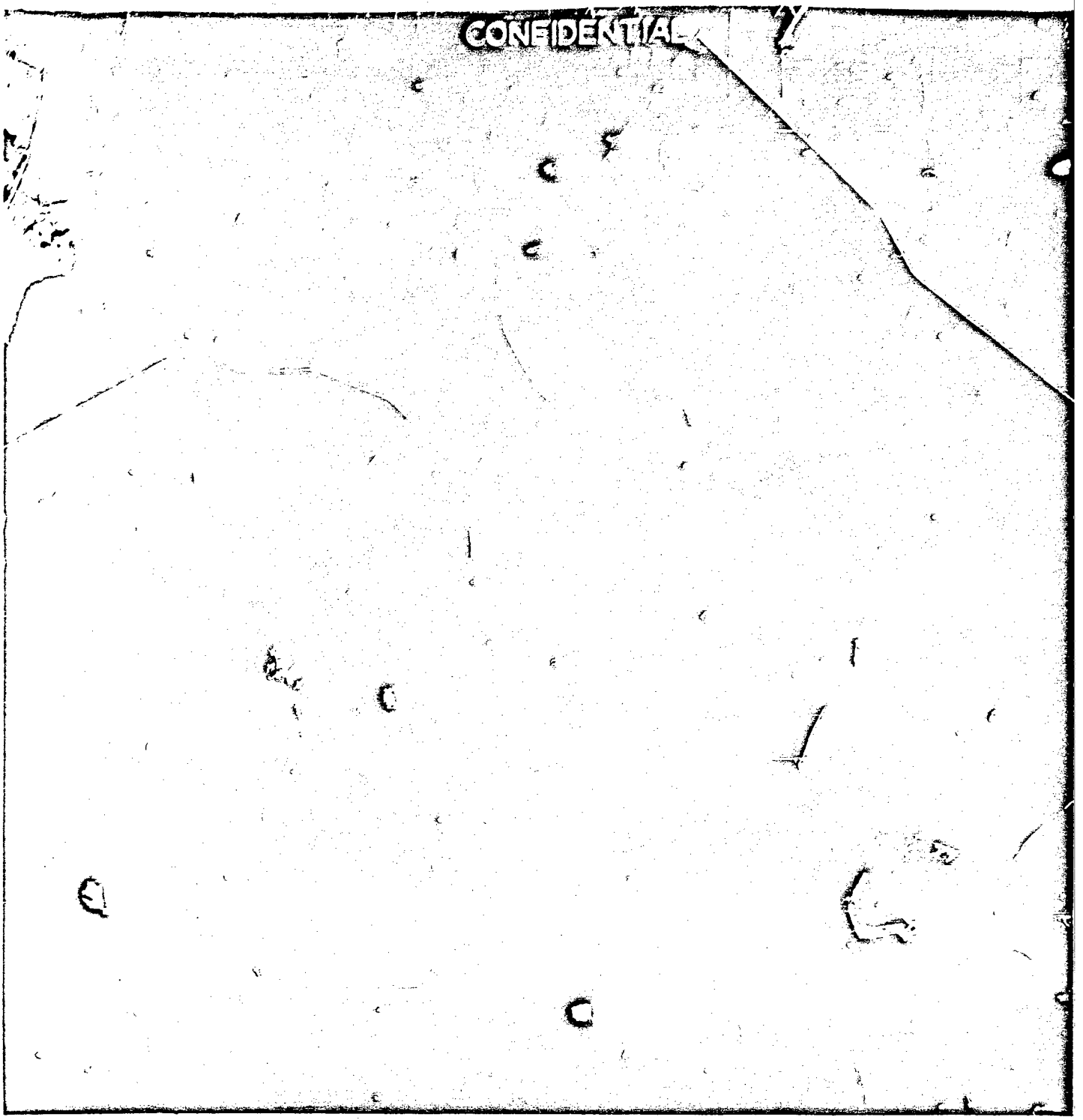
MSQ-1 controlled pinpoint photography using APN-11A and APA-90 Indicator Group.
Vertical six-inch T-11, altitude 3000 feet, range from station 50 statute miles.
TARGET - Saufley NAS, Florida



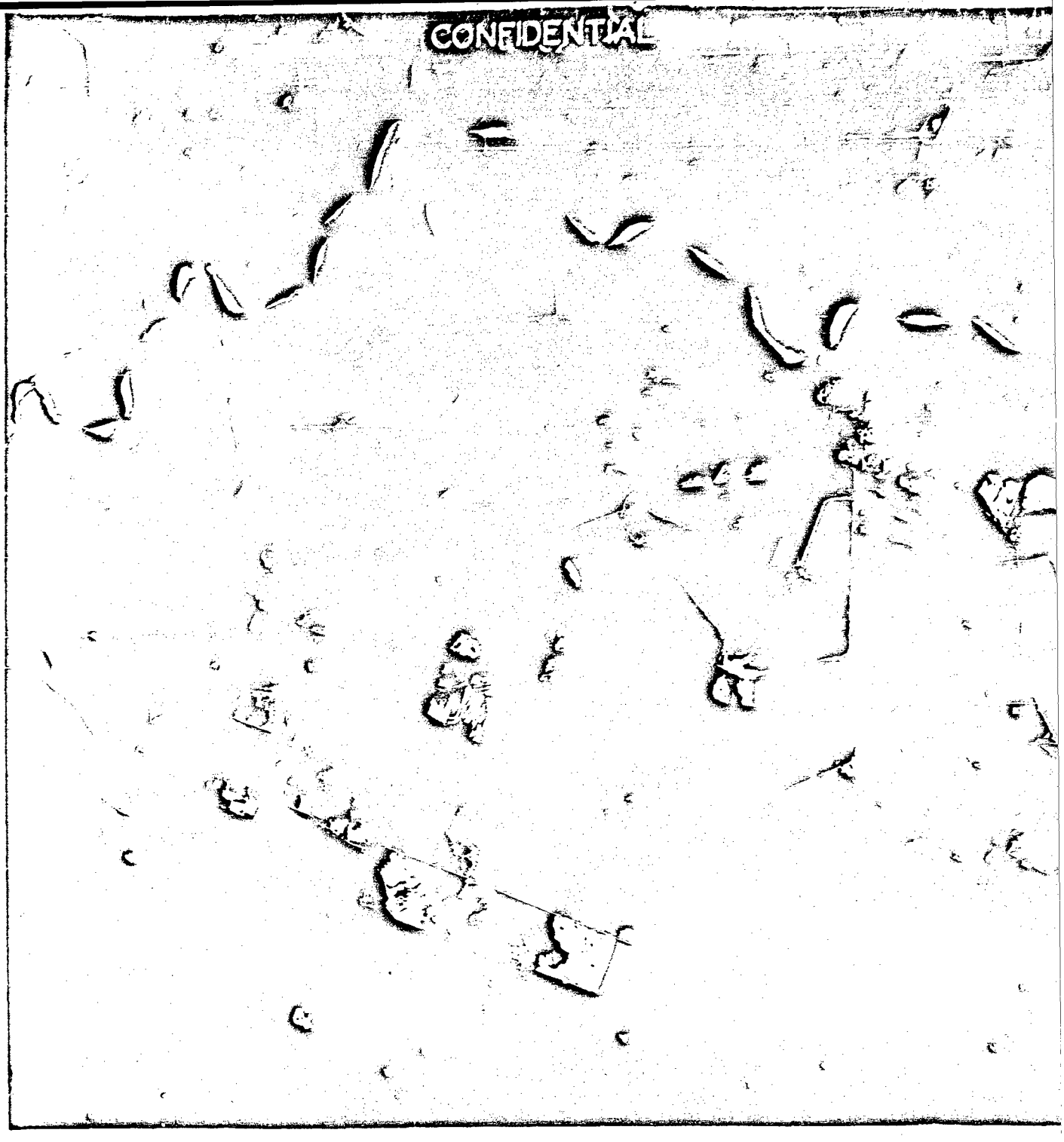
APN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 10,000 feet. Computed target distance 97.27432 statute miles.
TARGET - Resolution Target



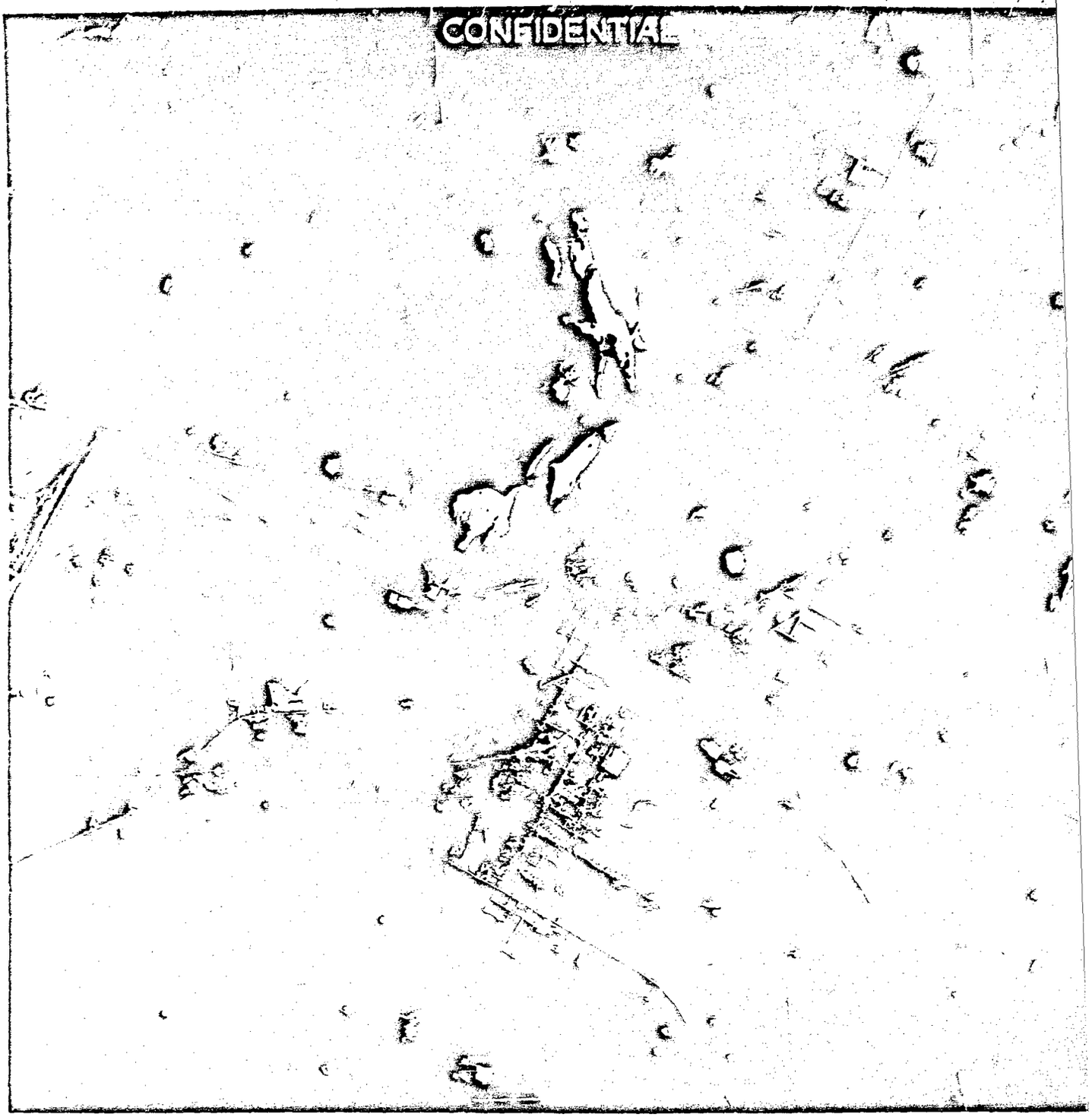
APN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 11,000 feet. Map-scaled target distance 94.8836 statute miles.
TARGET - De Funiak Springs, Florida



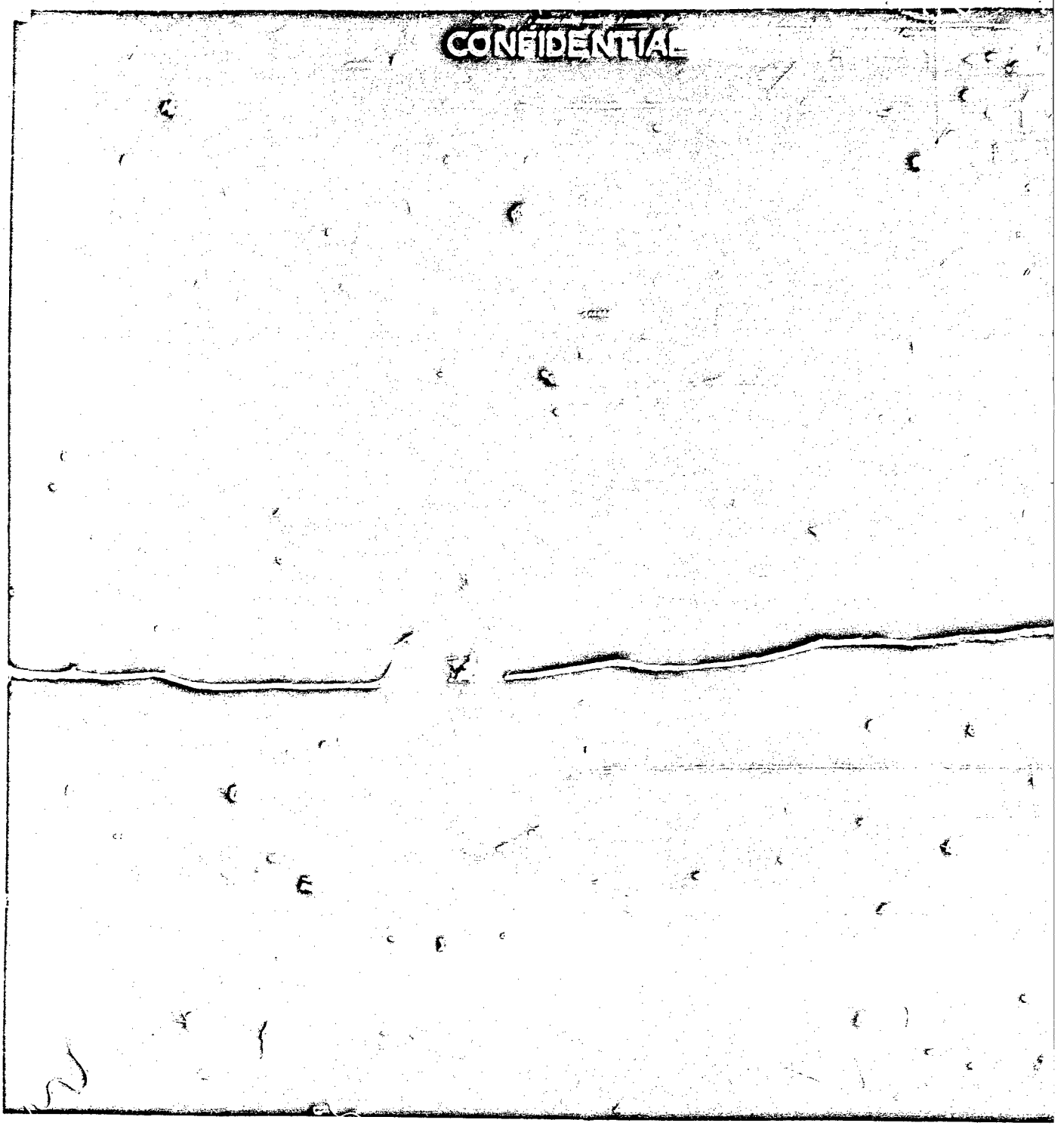
AFN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 12,000 feet. Map-scaled target distance 122.6347 statute miles.
TARGET - Railroad Underpass



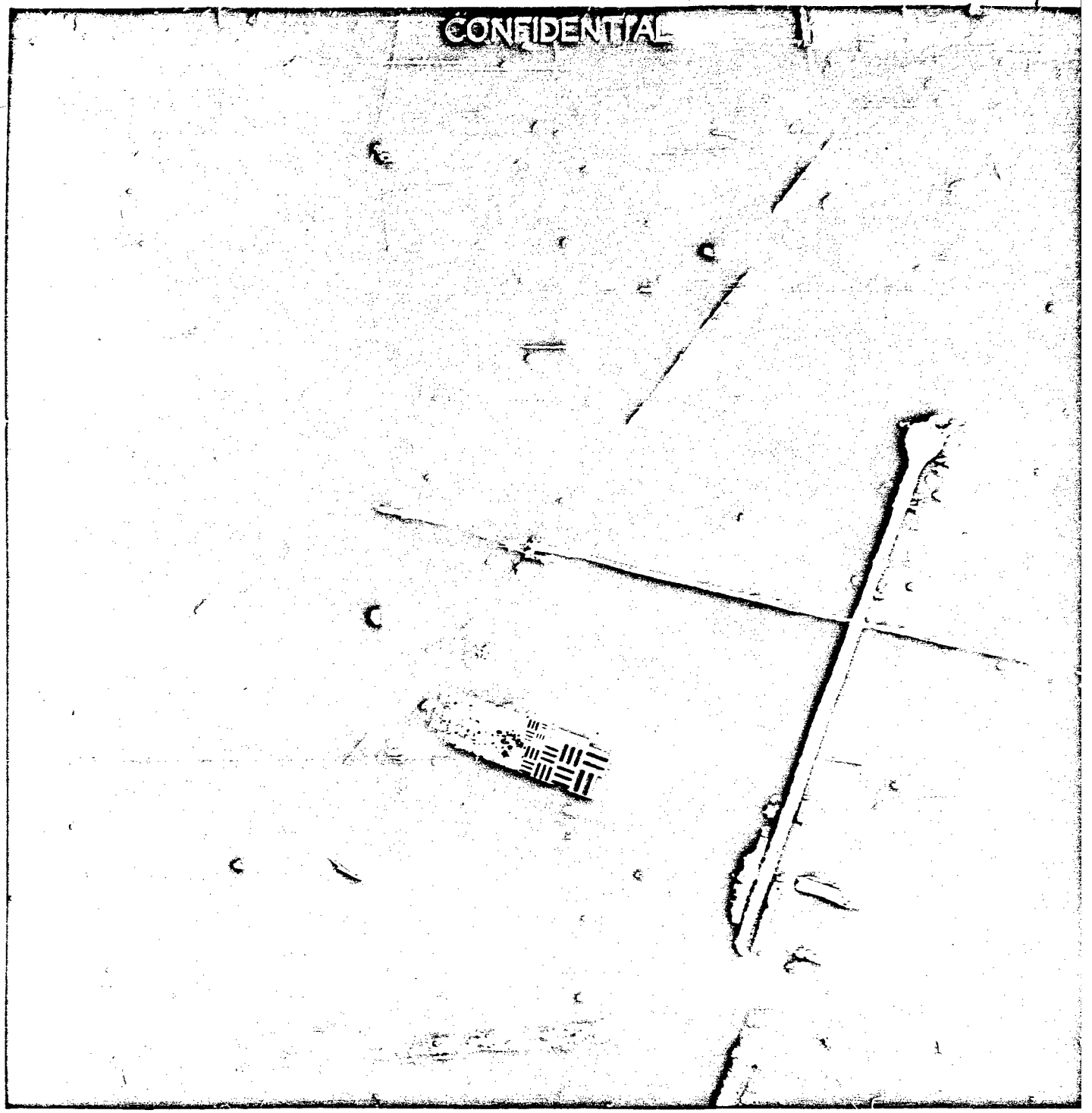
APN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 16,000 feet. Map-scaled target distance 154 statute miles.
TARGET - Brewton Airport, Alabama



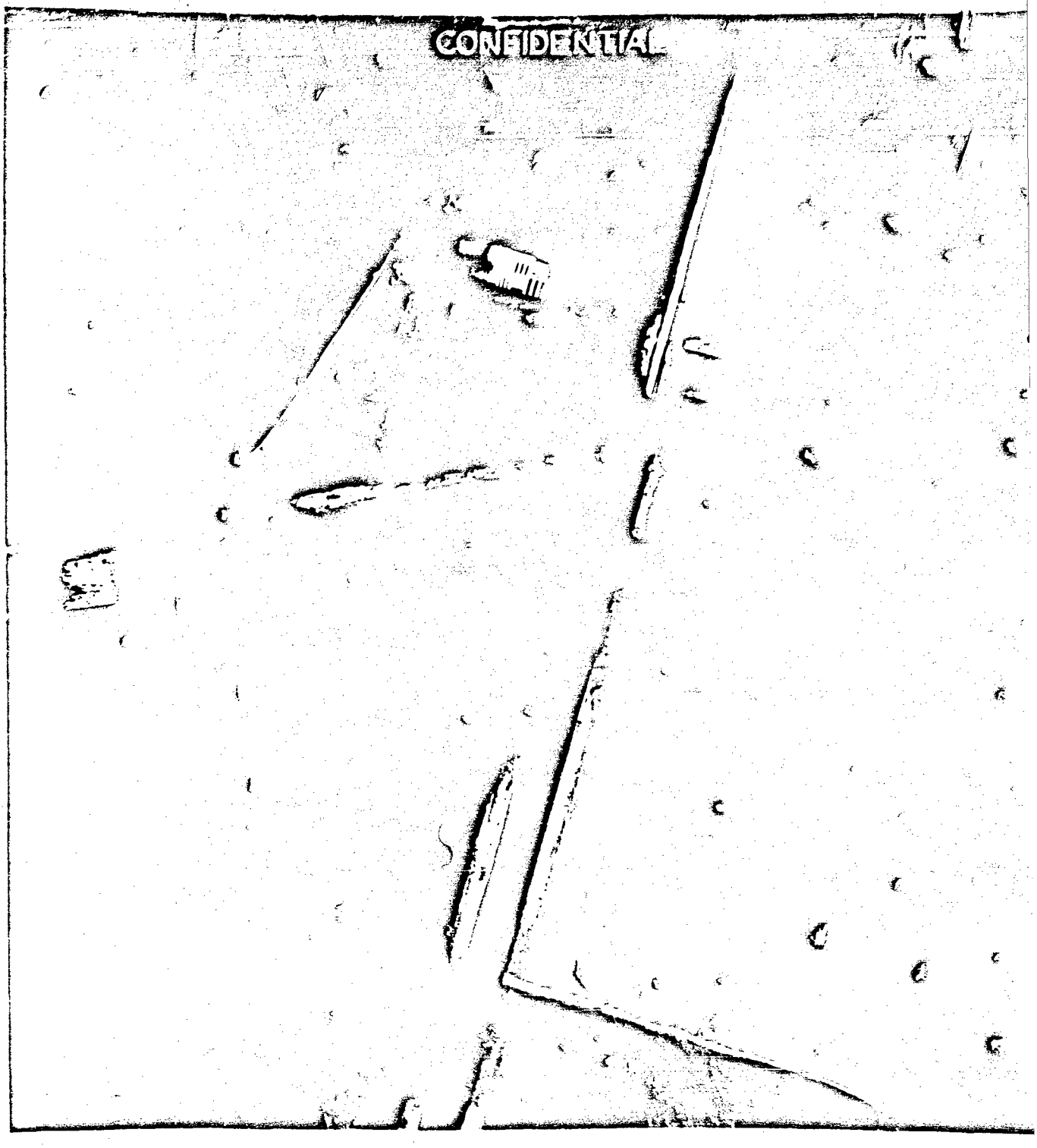
APN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 20,000 feet. Computed target distance 137.17064 statute miles.
TARGET - Courthouse at Milton, Florida



AFN-84 controlled day pinpoint photography. Vertical six-inch T-11, altitude 34,500 feet. Map-scaled target distance 253.7967 statute miles.
TARGET - Docks at Gulfport, Mississippi



T-1 Bombsight visually controlled bomb run. Vertical twelve-inch K-37 altitude 4000 feet, M-120 Photoflash Bomb, burst altitude 2000 feet.
TARGET - Resolution Target



T-1 Bombsight visually controlled bomb run. Vertical twelve-inch K-37, altitude 6000 feet, M-120 Photoflash Bomb, burst altitude 3000 feet.
TARGET - Resolution Target

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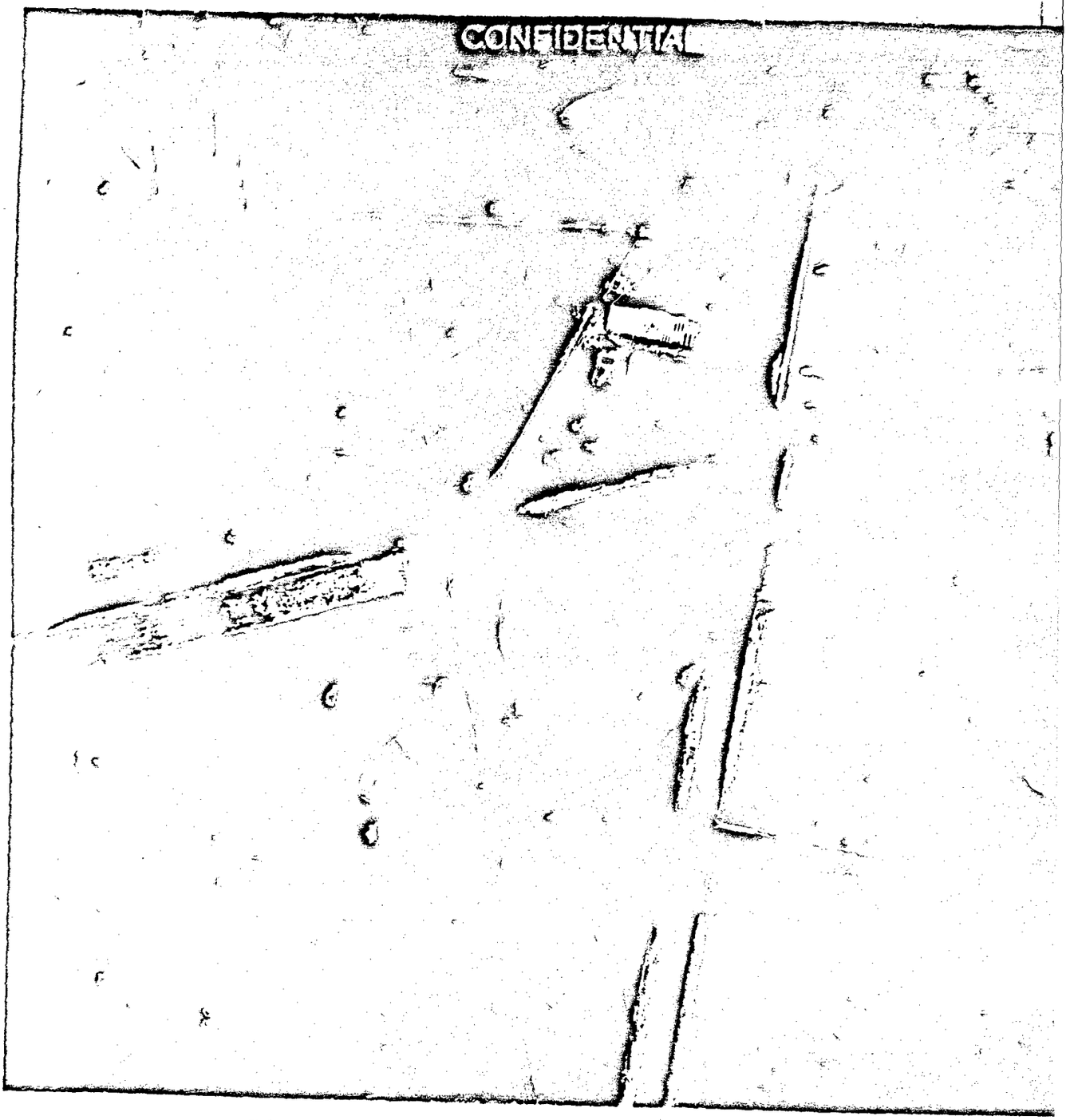
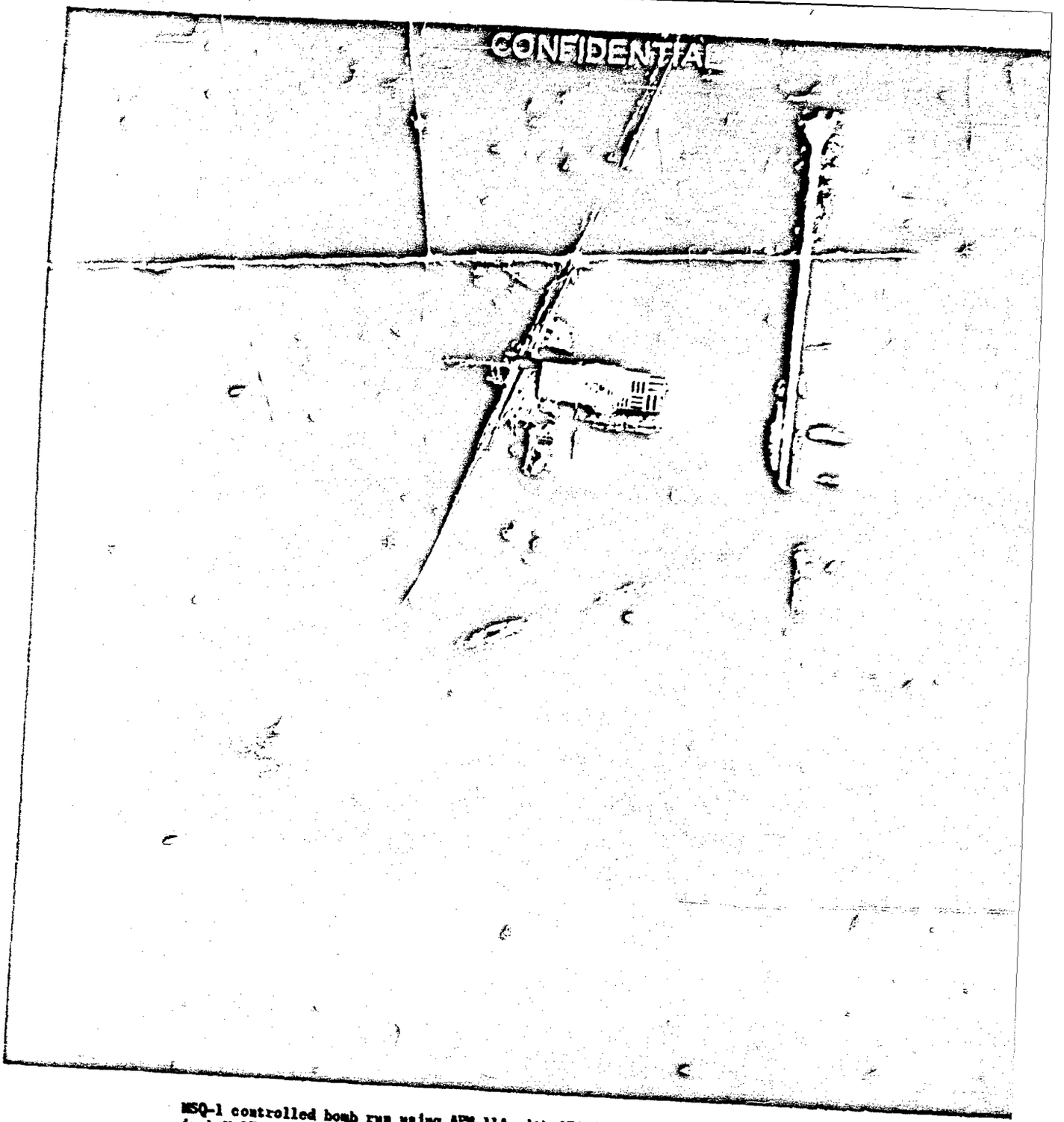
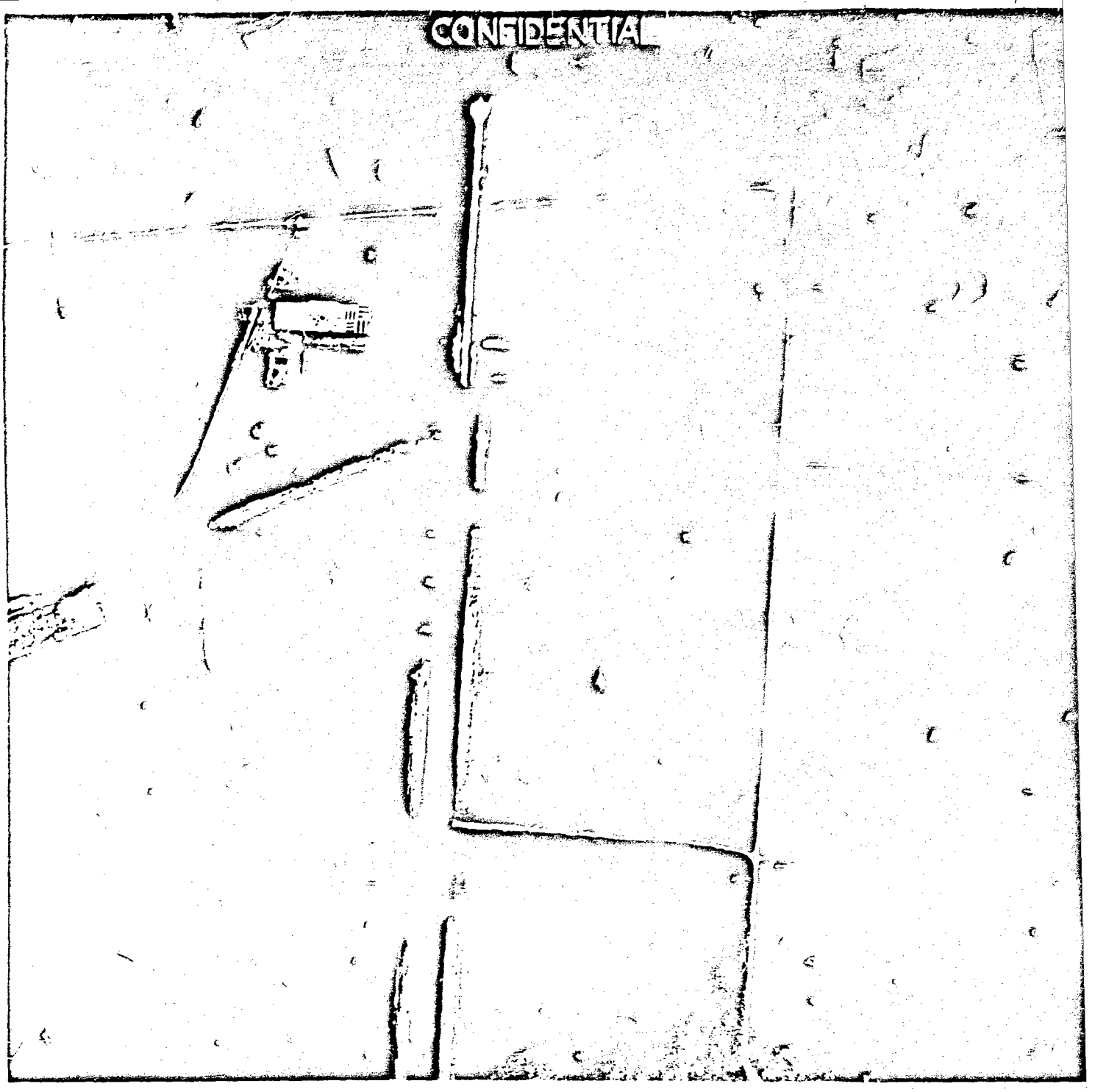


K-1 Bombsight visually controlled bomb run, Vertical twelve-inch K-37, altitude 8000 feet, M-120 Photoflash Bomb, burst altitude 4000 feet. TARGET - Resolution Target

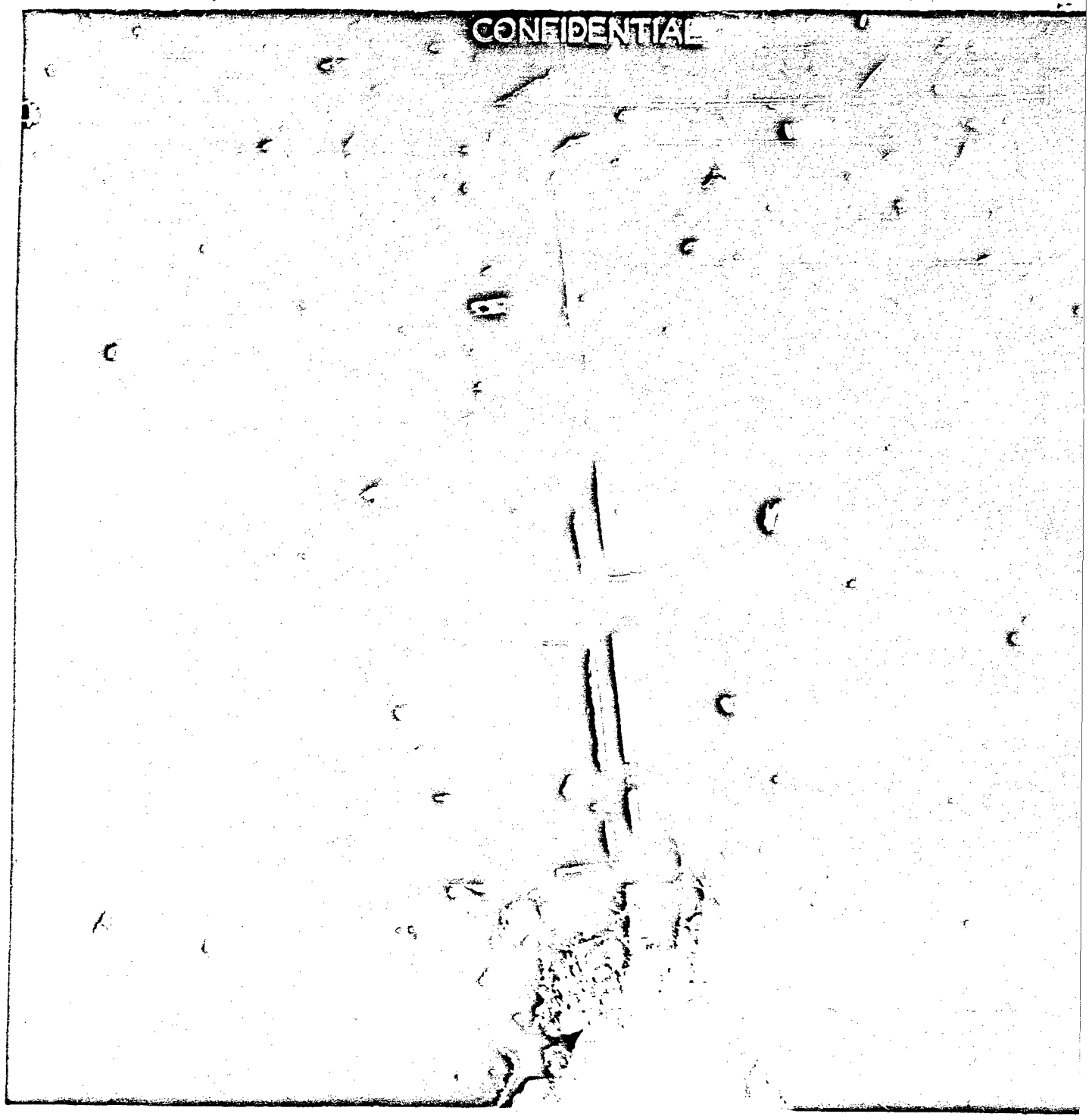
T-1 Bombsight visually controlled bomb run. Vertical twelve-inch K-37, altitude 14000 feet, M-120 Photoflash Bomb, burst altitude 7000 feet. TARGET - Resolution Target



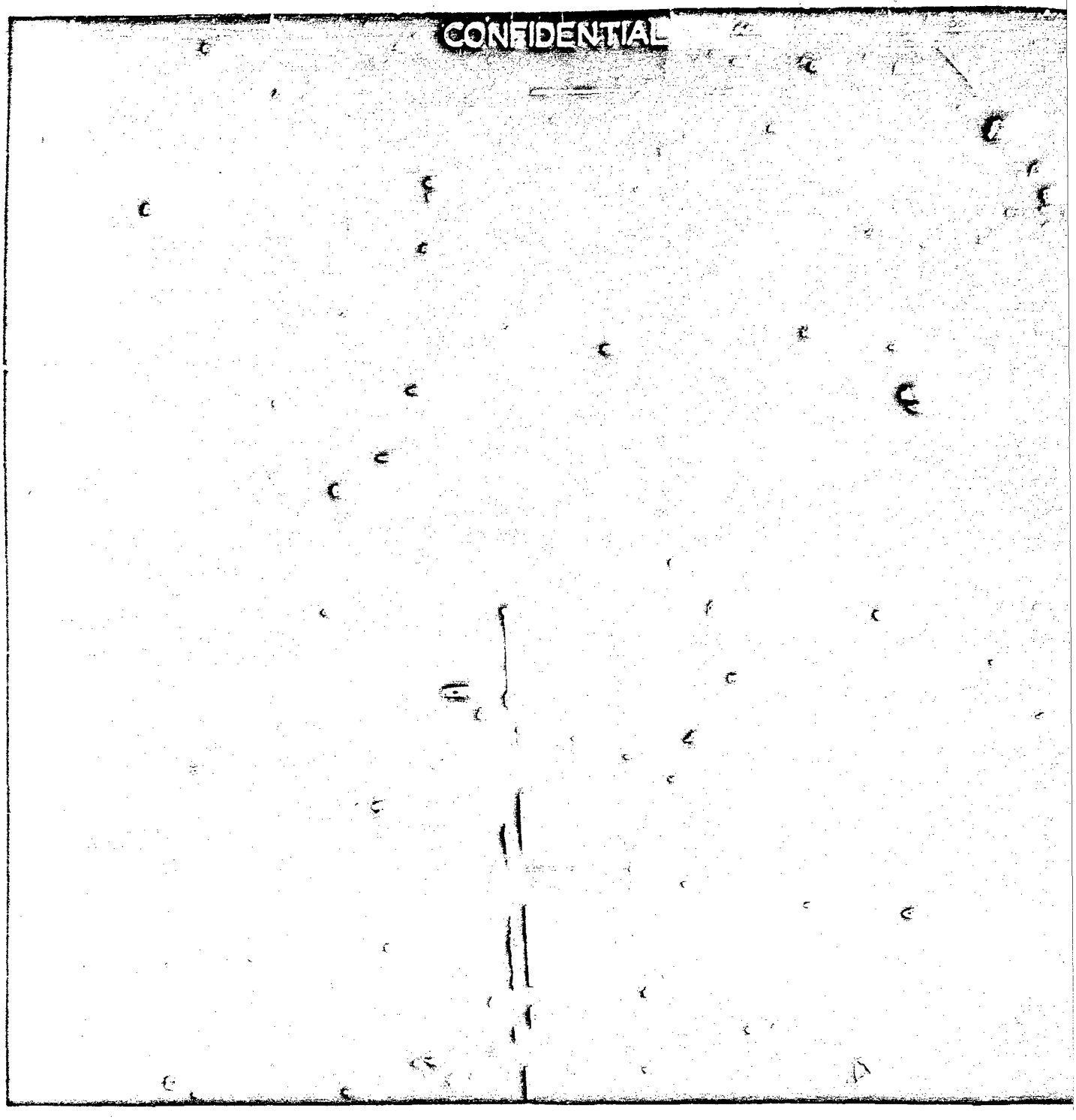
MSQ-1 controlled bomb run using APS-11A with APA-90 Indicator Group. Vertical twelve-inch K-37, altitude 6000 feet, M-120 Photoflash Bomb, burst altitude 3000 feet. TARGET - Resolution Target



MSQ-1 controlled bomb run using APN-11A with APA-90 Indicator Group. Vertical twelve-inch K-37, altitude 8000 feet, M-120 Photoflash Bomb, burst altitude 4000 feet.
TARGET - -Resolution Target



MSQ-1 controlled bomb run using APS-11A with APA-90 Indicator Group. Vertical twelve-inch K-37, altitude 14,000 feet, M-120 Photoflash Bomb, burst altitude 7000 feet. TARGET - Resolution Target



MSQ-1 controlled bomb run using APN-11A with APA-90 Indicator Group. Vertical twelve-inch K-37, altitude 22,000 feet, M-120 Photoflash Bomb, burst altitude 11,000 feet. TARGET - Resolution Target

PROJECT NO. APG/TAT/122-A

AIRCRAFT PERFORMANCE AND HANDLING CHARACTERISTICS

AIRCRAFT PERFORMANCE AND HANDLING CHARACTERISTICS

1. INTRODUCTION: Performance and handling characteristics are usually rated as excellent by pilots flying the RB-57A for the first time, and it has been noted that this evaluation remains high as more flying time is obtained in the aircraft. The aircraft is extremely simple and easy to fly and instills in the pilot a feeling of safety and confidence. This simplicity and ease of flying make it difficult for the crew to bear in mind at times that the RB-57A is a high performance jet aircraft and must be operated with many of the same precautions normally associated with jet aircraft. The nine pilots checked out in the RB-57A during this test were current in both jet and multi-engine aircraft at the time of check-out, and no difficulties were encountered. All check-outs were "fighter-type" and were made with no previous passenger or demonstration flying time in the aircraft.

2. MANEUVERABILITY:

a. Maneuverability of the RB-57A appears to be adequate to perform the primary mission of the aircraft. High speed operation at low altitude requires correspondingly high aileron and elevator forces, but no serious difficulty has been experienced in this respect. Operation in turbulent air at indicated airspeeds in excess of 300 knots causes considerable discomfort to crew members and should be approached with caution, as injury to the crew could conceivably result. The addition of control boost or more effective spring tabs to the aircraft would lessen the high control forces now experienced, but these forces have not been a serious problem in any testing accomplished to date.

b. Precision altitude control requires continual retrimming of the variable incidence stabilizer. It has proved to be an exceptionally easy aircraft to maintain on headings within plus or minus one degree. However, minor course corrections should always be made with a coordinated turn as skidding the aircraft is difficult. Erratic indications from the altimeter and vertical speed indicator have been experienced on two occasions during skids. No absolute altitude check was available at the time of these erratic indications, but the pilot reported that his actual flight path was level with no change in altitude. Pilots accustomed to making rapid corrections on a desired flight path should bear in mind the reduced rate of turn necessitated by high TAS operation. The addition of an autopilot to this aircraft would be a very desirable feature, especially on AFN-11A and Shoran missions, but addition of the equipment is not essential to aircraft operation.

c. Conclusions: The maneuverability of the RB-57A is adequate for normal reconnaissance operations under current airspeed limitations of 450 knots IAS or .78 Mach.

3. COCKPIT AIR CONDITIONING: The fixed canopy of the RB-57A permits a large amount of radiation heating on sunny days and often results in excessively high cockpit temperatures. This condition has not been a serious factor during this phase of testing, but could become quite serious with high ambient temperatures and prolonged ground operation. Local airfield operating procedures should recognize this problem and expedite take-off of RB-57A aircraft on warm, sunny days. The use of the RB-57A canopy sun shade during

ground operations until engines are started will also minimize this problem. The only corrective operation measure found to be effective to date is the use of the aircraft pressurization system in full cold position and engine operation at or above 70 per cent RPM. A definite recommendation will not be made until the problem has been given further study.

4. FUEL MANAGEMENT:

a. Technical Order No. AN 01-35EAB-1 does not specify a fuel management program. The project team, therefore, adopted the program recommended by the factory, with slight modifications. This consisted of start, taxi, and take-off on No. 1 and No. 2 fuselage tanks; switch to wing tanks when No. 2 fuselage tank was depleted to 2000 pounds; when wing tanks are empty, switch back to No. 2 fuselage tank. In all cases, fuel was transferred to the engines through No. 1 fuselage tank. Start, taxi, and take-off were accomplished by transferring from No. 2 fuselage tank to provide a positive check on the No. 1 fuselage tank float valve operation while still on the ground, and to move the aircraft center of gravity within more desirable limits for take-off. Technical Order No. AN 01-25EAB-1 specifies that the corresponding booster pump will be shut off as soon as a tank empties to prevent damage to the pump. The fuel system, however, does not incorporate warning lights to indicate when a tank is empty.

b. Two flights using tip tanks half full and one flight using full tip tanks have been flown to date. Except for increased take-off roll required by the heavier gross weight, handling characteristics of the aircraft remain unchanged. The tip tanks do not feed fast enough to support the fuel consumption rate at low altitude and high IAS. This consumption rate can be in excess of 11,000 pounds per hour for two engines. On the other hand, at 15,000 feet one tip tank supplied sufficient fuel to both engines while operating at 83 per cent RPM. In all cases, one tank would feed much faster than the other. A satisfactory aileron trim condition was maintained by occasionally turning off the valve to the light tank. Under no circumstances was the aileron trim allowed to exceed two-thirds of maximum. This procedure was considered u necessary safety precaution in the event the heavy tank would not feed.

c. Conclusions: The RB-57A fuel system is adequate for tests accomplished to date with the possible exception of a lack of fuel quantity or fuel flow warning lights to indicate empty tanks.

d. Recommendations:

(1) A standard fuel management system be included in Technical Order No. AN 01-35EAB-1.

(2) Warning lights be installed to indicate when No. 2 fuselage tank and wing tanks are empty provided that dry operation of fuel booster pumps in these tanks creates a hazard.

5. BOMB DOOR OPERATION:

a. RB-57A flying characteristics during bomb door operation vary from a slight pitch-up during rotation at 250 knots IAS to an almost uncontrollable condition during rotation at 450 knots IAS. It is recommended that the bomb door not be rotated at indicated airspeeds over 400 knots for high speed drops. This is not intended, however, to recommend against increasing the indicated airspeed and dropping bombs at higher airspeeds after the door has been fully rotated.

b. To obtain a desired "over the target" airspeed on bomb runs, several methods were tried. An attempt was first made to anticipate the decrease in airspeed during bomb door rotation by starting the bomb run at a higher airspeed than required. This was unsatisfactory as the airspeed fell off too slowly. Some success was realized by setting up the desired airspeed with dive brakes extended, then retracting them as bomb door was opened. The most suitable method appeared to be to rotate the door at designated bomb drop speed and increase power as required to maintain airspeed and altitude.

c. Specific results obtained during bomb door rotation at varying indicated airspeeds are as follows:

(1) 250 knots: Slight pitch-up and buffet during door rotation, which smoothed out when door was open. No longitudinal trim change required with door full open. The additional drag imposed reduced IAS 15 knots.

(2) 325 knots: Definite pitch-up with controllable buffet during door rotation. Mild buffet with no longitudinal trim change required with door open. Airspeed dropped 20 knots.

(3) 400 knots: Increasingly pronounced pitch-up and buffet during door rotation, becoming a nose heavy condition as door moves to full open position. Continuous buffet while door is open. Airspeed decreased 25 knots.

(4) 434 knots: Severe buffet with pitch-up action maximum controllable by pilot during door rotation. Considerable nose-up trim was required to maintain level flight when door was full open. Airspeed decreased 25 knots. When carrying a full bomb load with doors open at 5000 feet, 96 per cent RPM was required to maintain airspeed (434 knots) and altitude.

(5) 450 knots: Pilot was unable to avoid gaining as much as 500 feet altitude during rotation of bomb door. Maximum nose-up tendency appears to occur at 90 degrees of door travel, with a rapid change to nose heavy condition at 180 degrees of rotation.

d. Caution: The pilot must determine that all personnel are clear of open bomb door or that the bomb door shut-off valve is in the "Safe" position prior to turning on

the aircraft battery switch. The bomb door automatically moves toward the closed position when the battery switch is turned on. The amount of door travel is dependent upon the pressure in the aircraft hydraulic system.

e. Conclusions: RB-57A bomb door operation is very good up to and including 325 knots IAS and satisfactory for operation up to 400 knots IAS.

f. Recommendations:

(1) The bomb door not be rotated at speeds over 400 knots IAS until this equipment has been thoroughly flight tested for functional suitability.

(2) Technical Order AN 01-35EAB-1 call attention to the automatic movement of the bomb door toward the closed from the open position when the battery switch is turned on, the amount of movement depending upon the hydraulic system pressure.

(3) The bomb door system be redesigned to eliminate the above automatic closing feature.

6. VISIBILITY:

a. The pilot's forward visibility is fair to good at 8000 feet or lower. At higher altitudes the only useful ground visibility the pilot retains is through the left side of the canopy. No difficulty was experienced flying at night completely by visual means at 1000 feet, over unlighted terrain with a quarter moon. Forward visibility was found to be good during a night landing in moderate rain, using the landing light. Heavy fog in the cockpit from the pressurization system has been experienced upon flying into light rain in the traffic pattern. This condition was corrected immediately by switching to "RAM" air. Visibility to the rear of the aircraft wing is nonexistent at any altitude or from any flight position in the aircraft. There is no method by which the aircraft landing gear can be visually checked in the down and locked position.

b. Conclusions: The visibility of the RB-57A is sufficient for normal flight operations of the aircraft, but is inadequate for high altitude visual navigation by the pilot.

7. RADIO EQUIPMENT:

a. Installations include the ARN-6 Radio Compass and the ARC-27 Receiver-Transmitter. The antenna installation for the ARN-6 allows excessive interference whenever flight is through visible moisture conditions. During station passages, a momentary 30 degree deflection of the radio compass needle was noted, then the needle returned to a nose position. After station passage, a delay of one minute was experienced at 20,000 feet before the needle assumed a tail position. At 25,000 feet, this delay was one minute and thirty seconds. Reliable station passage indication in this aircraft must include

aural signal interpretation and visual "Z" marker. The usefulness of the ARC-27 as a radio navigation aid at this time is discounted, because of the continuing shortage of UHF-DF ground stations. Installation of VHF Omnirange equipment would improve the radio navigation capabilities of this aircraft and is definitely recommended.

b. A signal mixer box is required at both navigator stations similar to the one provided for the pilot. In addition to giving the navigator more flexibility in use of radio equipment, it would make crew coordination much easier. Under the present situation, unless the navigator is already on "Interphone", the pilot must leave the controls of the aircraft, and depress the mike button with one hand while holding the interphone selector in "Call" position with the other hand to establish communication. This procedure would not be feasible in a combat situation.

c. Conclusions: Present RB-57A radio navigation equipment is inadequate.

d. Recommendations:

(1) VHF Omnirange equipment be installed in the aircraft.

(2) A signal mixer box be installed at both navigator positions.

(3) Consideration be given to providing a "hot microphone" interphone system.

8. COCKPIT ARRANGEMENT:

a. The following items are considered unsatisfactory in their present location:

(1) Oxygen Warning Light: This was found to be satisfactory for night operation, but the light is shielded and too dim for adequate warning during day flights, especially when the sun is shining in the cockpit.

(2) Oxygen Quantity Gage and Oxygen Regulator: A pilot wearing full equipment finds it difficult to see these instruments and to constantly cross-check the oxygen quantity and flow.

(3) Trim Indicators: The trim indicators are located too low and too far aft for the pilot to read accurately without lowering his head into the cockpit.

b. Conclusions: The cockpit arrangement of the RB-57A is generally good.

c. Recommendations: The oxygen warning light, oxygen quantity gage and regulator, and all trim indicators be relocated so that they may be more easily read.

9. NIGHT LIGHTING:

a. Instrument lighting appeared to be satisfactory in all respects except that

the APN-22 warning light, and the synchronization and film transport lights on the pilot's camera control panel are excessively brilliant and become a distracting influence when on. A method of controlling the brilliance of these lights is required. Lamp, Incandescent T Bulb, No. 955, Dimmer Top with Knurled Sleeve, Tungsten Filament, Plastic Cap P/N 8870-892000-355 (GE No. 321R) has been recommended to replace Lamp, Incandescent T Bulb, BCM Base, No. 952 and 952A, Tungsten Filament, Plastic Cap P/N 8870-880000-825 (GE No. 32CR) as a fix for the APN-22 warning light in Eglin UR No. 54-556. The single landing light installation eliminates the "range finding" characteristics of dual landing lights normally installed in aircraft and makes depth perception somewhat more difficult, since ground details must be recognized during the landing approach. This is especially noticeable in right-hand traffic since the landing light is on the left wing. It is felt that dual landing lights are desirable, but are not essential for normal operations. The wing tip taxi lights are of limited value under all but the darkest conditions since they provide sufficient light to dimly illuminate the ground path directly in front of the wing tips, but not enough to safely eliminate the possibility of collision with parked aircraft. The taxi lights have been supplemented during this program by use of the landing light.

b. The curved canopy picks up light reflections from outside lights during night take-offs, but this has not presented a serious problem. Some glare was also noted inside the cockpit, although dimming the instrument lighting seems to correct this difficulty. The plastic canopy appears to be less efficient for night landings than the normal plate glass windshield since it appears to have more of a light loss. Grease, dirt, scratches, etc., appear to show up more readily at night on the plexiglass canopy than on a plate glass surface. Therefore, it is recommended that the canopy be as clean as possible for night operation.

c. All bomb station indicator lights on the armament panel should be dimmed prior to take-off on night bombing missions to avoid excessive light in the cockpit when the armament switch is turned on.

d. Conclusions: Night lighting is generally satisfactory.

e. Recommendations:

(1) A method of dimming the APN-22 warning light, camera control synchronization light and the film transport light be developed and installed.

(2) Consideration be given to installing an additional landing light in the RB-57A to provide a safety margin in the event of a single landing light failure and to provide more effective lighting for landing.

(3) The taxi lights of the RB-57A be modified to provide better illumination for taxi operations.

10. CARTRIDGE STARTER SYSTEM:

a. This system has many operational advantages. It eliminates the requirement for an auxiliary power unit for normal starts and is extremely simple to operate. The system, however, incorporates a high speed turbine fed by exhaust gases to turn the engine drive shaft. This turbine can become a lethal weapon if the starter shaft shears or does not engage and the safety throw-out feature of the starter fails to operate properly and remove the starter turbine from the exhaust gas stream. For this reason, the starter cannot allow any appreciable margin for failure and still be operationally acceptable. Its operational suitability, therefore, is, and will remain, dependent upon the functional dependability of the system and the cartridges used by the system.

b. The S-12 Cartridge used in the starter was classified as Class 9 explosive by AMC. This required that the safety criteria for Class 9 high explosives be observed in starting test aircraft. This requirement involved establishing a special "starting area" for the RB-57A, special handling procedures for the cartridges and prevented the cartridges from being stored in the aircraft. These restrictions created operational difficulties. APGC recently conducted a test to determine the characteristics of the S-12 Cartridge with a view to possible reclassification of the cartridge to permit the removal of the current operational restrictions. APGC has completed the tests and has recommended to AMC that the cartridge be reclassified to Class I.

c. Conclusions: The cartridge starter system would be operationally suitable provided that:

(1) The functional reliability of the system is brought up to a level that will effectively preclude the possibility of starter turbine failure.

(2) The cartridge used in this system be modified and/or reclassified to eliminate the present requirement for unusual precautionary measures to be taken when starting the aircraft or storing the starter cartridges.

d. Recommendations: Appropriate precautions be taken to reduce the hazard to ground personnel during RB-57A starting operations until the system has been suitably improved.

11. INFLIGHT DIFFICULTIES: Very few inflight difficulties were encountered during the accelerated phase. In one aircraft a consistent binding of the throttle at altitudes above 25,000 feet was noted during which the throttle could not be brought back past approximately a 90 per cent RPM position. Investigation disclosed moisture in a throttle linkage cable housing. This moisture was apparently freezing at higher altitudes and binding the cable. A J-8 Attitude Gyro went out of commission during one flight. Precision altitude control then became difficult, as the RB-57A presents a minimum of visual reference with the horizon. It was impossible to complete the requirements of the accelerated phase for operation of the aircraft at altitudes above 32,000 feet, due

to instability of the engine fuel control system at such altitudes. For instance, the RPM droop encountered made it difficult, if not impossible, to maintain 40,000 feet for the extended period necessary to accomplish a day mosaic or other similar mission. The engine fuel control incorporates an emergency system which is brought into operation by manual selection by the pilot. Placing the emergency fuel control switch in "Take-Off" position alerts a pressure switch, which automatically transfers operation to the emergency system when the fuel flow falls below that required for 80 per cent thrust at sea level. Thus, if the emergency switch is left in the "Take-Off" position above approximately 6000 feet, or when throttles are retarded, operation is automatically transferred to the emergency system. This change could quite possibly cause damage to the engine. The emergency switch was not used in "Take-Off" position for take-offs accomplished during the accelerated phase. Further study will be devoted to evaluation of the emergency system in the final report.

12. PROFILE MISSION CRUISE CONTROL AND TAKE-OFF AND LANDING DISTANCES: Profile mission cruise control data for several typical reconnaissance profiles and take-off and landing distances for various configurations will be furnished as a flash report when available. However, eight sample take-offs from 39,460 pounds to 43,758 pounds had take-off rolls from 2700 feet to 4426 feet when reduced to a NACA standard day with no-wind condition.

13. GENERAL CONCLUSIONS:

a. The maneuverability of the RB-57A is adequate for normal reconnaissance operations under current airspeed limitations of 450 knots IAS or .78 Mach.

b. The RB-57A fuel system is adequate except for the possible addition of fuel flow warning lights to indicate when tanks are empty.

c. The RB-57A bomb door operates very good at indicated airspeeds up to and including 325 knots and is satisfactory for operation up to 400 knots.

d. Visibility of the RB-57A is adequate for normal flight operations of the aircraft, but is inadequate for high altitude visual navigation by the pilot.

e. Present RB-57A radio navigation equipment is inadequate.

f. The cockpit arrangement of the RB-57A is generally good.

g. Night lighting is generally satisfactory.

h. The cartridge starter system is presently unsuitable from an operations standpoint.

14. RECOMMENDATIONS:

a. A standard fuel management system be included in Technical Order No. AN 01-35EAB-1.

b. Warning lights be installed to indicate when No. 2 fuselage tank and wing tanks are empty provided that dry operation of fuel booster pumps in these tanks creates a hazard.

c. The bomb door not be rotated at speeds over 400 knots IAS until this equipment has been thoroughly flight tested for functional suitability.

d. Technical Order AN 01-35EAB-1 call attention to the automatic movement of the bomb door toward the closed from the open position when the battery switch is turned on, the amount of movement depending upon the hydraulic system pressure.

e. The bomb door system be redesigned to eliminate the above automatic closing feature.

f. Visual Omnirange equipment be installed in the aircraft.

g. A signal mixer box be installed at both navigator positions.

h. Consideration be given to providing a "hot microphone" interphone system.

i. The oxygen warning light, oxygen quantity gage and regulator, and all trim indicators be relocated so that they may be more easily read.

j. A method of dimming the APN-22 warning light, camera control synchronization light and the film transport light be developed and installed.

k. Appropriate precautions be taken to reduce the hazard to ground personnel during RB-57A starting operations until the system has been suitably improved.

PROJECT NO. APG/TAT/122-A

AN/APN-22 RADAR ALTIMETER

AN/APN-22 RADAR ALTIMETER

1. The radar altimeter measures terrain clearance of an aircraft, and provides reliable indications from 0 to 10,000 feet over land and 0 to 17,000 feet over water. Altitude indications are displayed on a pointer-type height indicator, which is covered in the sector between 320 and 360 degrees by opaque glass. Whenever there is insufficient return for a correct indication, "drop out" occurs, and the pointer moves behind this covered sector. A limit light is provided to indicate when the aircraft is below a preselected altitude. The limit light is also on when "drop out" occurs or when the set is turned off. "Drop out" occurs at approximately 50 degrees of bank from 0 to 2000 feet, and at lesser bank angles as the altitude is increased. Maximum bank angle is 30 degrees at 10,000 feet and 14 degrees at 17,000 feet. Satisfactory operation without "drop out" is possible up to 30 degrees of pitch attitude at any altitude.

2. Operating Procedure: To turn equipment "On", turn knob at lower left of indicator clockwise. With the same knob set the adjustable altitude limit index to the desired minimum altitude by further clockwise rotation of the knob. Red limit light will indicate when aircraft is below a preset absolute altitude.

3. It is strongly recommended that pilots use this instrument extensively for absolute altitude indications, especially when operating at low altitudes and high indicated airspeeds. In flight, the error between the aneroid altimeter and the radar altimeter was found on one occasion to be approximately 150 feet at 350 knots, with the aircraft actually lower than indicated by the aneroid altimeter. This error was negligible at 250 knots, and increased as the airspeed increased to 350 knots. Further tests were not conducted due to current airspeed restrictions on the aircraft. This error may, and probably does, increase with higher indicated airspeeds. Using organizations should approach low altitude operation with extreme caution until the altimeter system has been thoroughly flight tested.

4. While the AN/APN-22 radar altimeter should prove to be a useful instrument during low approaches, the pilot should be familiar with the terrain during final approach as sudden dips or rises of the terrain will tend to confuse the pilot due to irregular fluctuations of the altimeter pointer.

PROJECT NO. APG/TAT/122-A

ARMAMENT

ARMAMENT

1. INTRODUCTION:

a. The armament phase of the RB-57A program began upon the receipt of three test aircraft. The aircraft were thoroughly inspected armament-wise and found to be in serviceable condition. Immediate steps were taken to establish a thorough on-the-job training program for all armament personnel that would be primarily assigned to the aircraft for the duration of the testing program. This training consisted of practice and familiarization with the bomb loading configuration kits and with the electrical bombing system from the AN-A1 Selector Bomb Group (SN 6400-691570) to the S2A Rack Assembly, Bomb (SN 6400-612984) by Weapons Supervisors and Mechanics (AFSC 46270, 46250, 46230).

b. Many of the points of discussion submitted herein are not primarily associated with the RB-57A operational suitability test, but are included because they were encountered during the accelerated phase of the test and are pertinent not only to the RB-57A type aircraft but also to the B-57.

2. LOADING THE DOOR WITH 21 M-120 PHOTOFLASH BOMBS: The loading procedure for the RB-57A is performed in reverse order of the usual method with other type aircraft. The bomb door is loaded in stowage position which is 180 degrees from its position at time of bomb release. In order to provide proper tension and vertical alignment of the bomb, some type of mechanical hoisting equipment must be used. The equipment found to be most suitable was the M1C8 Truck, Crane, 6 x 6, 2½-ton capacity.

a. Loading Procedure:

(1) Position the Truck, Crane M108 and the bomb door assembly about four or five feet apart and parallel to one another. (See Photo 1.)

(2) Position the axis of the lifting boom on the crane with the center of the front section. Always start from the front and progress to the center and rear sections. This allows personnel to install the required fuzes and arming wires in the front section without interfering with the sections being loaded in the rear. (See Photo 3. Although this photo shows bombs with inert fuzes, it is not to be assumed that bombs are to be fuzed prior to loading.)

(3) Install the first bomb starting from the left-hand side of the bomb door assembly. This is necessary to allow the insertion of the loop swivel on the arming wire into the arming solenoid in the S2A Bomb Rack Assembly. (See Photo 2.) If loading is attempted from right to left, the space between the bomb and the S2A Bomb Rack Assembly is not sufficient to allow the fingers and the loop swivel to pass through. The initial handling of the bombs onto the door for latching to Rack Assembly should be accomplished by manhandling. This can be easily

done by utilizing a two-man bomb handling bar. (See Photo 3.) This leaves the crane available for aligning and providing necessary tension on the bombs for alignment of sway bracing.

(4) When all of the lower four bombs have been latched to the bomb rack assembly, the crane operator aligns the boom over the first bomb to be sway braced. It is again best to progress from left to right. Attach the hook on the bomb sling (local manufacture) in the Navy carrying lug on the bomb and lift up gently until the bomb carrying lugs are tight against the carrying hooks of the S2A Bomb Rack Assembly. Be sure the cable and boom are near 90 degrees to center of boom. Assign one man to act as a guide to the operator. Proceed to screw the sway brace bolts hand tight. (See Photo 6.) Do not tighten too tight as it is possible to freeze the mechanism in the S2A Bomb Rack Assembly, creating a failure to release. Repeat this process on the remaining three bombs.

(5) Manhandle and latch the three upper bombs into the racks. The operator then centers the crane's boom over the first bomb to be chocked. Starting from left to right, attach the hook on the bomb sling to the Navy lug and lift gently until the bomb carrying lugs are tight up against the carrying hooks on the S2A Bomb Rack Assembly. Again, be sure that center of bomb approximates 90 degrees to the center of the boom. Adjust the chocking assembly on each side hand tight. Repeat this process on two remaining upper bombs. (See Photo 7.)

(6) Munitions Specialists (AFSC 46150, 46130) can start installing the desired fuzes, adjusting and cutting arming wires. The required length of the arming wires will be three inches beyond fuze.

(7) To load the center and rear sections repeat the instructions mentioned above. The crane will have to be moved to insure proper alignment of the boom to the corresponding bay.

b. Loading Personnel and Time Required:

(1) Personnel:

(a) One - T/Sgt (46270) Weapons Supervisor.

(b) One - S/Sgt (46250) Weapons Mechanic.

(c) Three - A/1C or A/2C (46250) Weapons Mechanics.

(d) One - S/Sgt (46150) Munitions Specialist.

(e) Four - A/1C or A/2C (46150) Munitions Specialist.

(2) Time Required: To date, the time using the above personnel has averaged one hour and ten minutes. However, it is believed that with continued practice this can be reduced to less than one hour.

c. The completed package is shown in Photos 10 and 11.

3. TRIAL LOADS WITH OTHER BOMBS:

a. Bomb, GP, M30 (100 Pounds):

(1) Trouble was encountered in an attempt to load the M30 bombs in the forward bay of the door. The distance between the front and rear sway bolts (PN 272-704201-3, PN 272-7040201-1) was 19-3/4 inches, and thus too great to allow the front bolts to be snugged against the ogive of the bomb. (See Photo 12.) In all cases the bolts were extended to their full limits. Because of this trouble, attempts in loading the M30 bomb in forward bay were unsuccessful.

(2) The center and rear bays presented no trouble of this nature. The distance here between the front and rear sway bolts was 16-3/4 inches and was not too great. (See Photo 16.)

(3) Loading procedures did not differ from those with M-120 Photoflash Bombs.

b. Bomb, Fragmentation, AN-M81 (260 Pounds):

(1) No unusual circumstances were encountered with loading this bomb. This type bomb makes a good tight package. (See Photo 19.)

(2) Loading procedures did not differ from those with M-120 Photoflash Bombs.

c. Bomb, GP, AN-M64 (500 Pounds):

(1) The major difficulty encountered in this operation was in changing the bomb door assembly configuration from 21 M-120 Photoflash Bombs to the 500-pound GP AN-M64.

(a) It required four men approximately 2½ hours to perform the change in bomb door configuration.

(b) The nine AN-M64 bombs were loaded in 18 minutes.

4. PLACING THE LOADED DOOR INTO THE AIRCRAFT:

a. The bomb door assembly is manually positioned under the aircraft, and aligned as squarely as possible. The aft bomb door steering bar may be attached to the left-hand or right-hand dolly and then the locking pin may be disengaged, allowing the wheel to be turned freely in the direction desired for finer alignment.

b. The four hoists, MK8, 2240-pound capacity are installed in the forward and aft support bomb hoist fittings, and the cables are attached to the bomb door assembly. Take up the slack in the hoisting cables removing the weight of the door from the ground handling dollies. The forward truck is then removed from the bomb door assembly. One man is used to operate each hoist. Each man has a sling around his hips that is attached to the hoist. The sling supports the weight of the hoist and leaves the operator's hands free to operate the cranks provided. The hoists are not fast in their operation, but their speed is considered adequate for their purpose. The aft dollies are not removed until bomb door assembly is locked in place and a safety inspection completed.

c. Six men are required to safely mount a fully loaded door.

d. Caution: All personnel must be clear of open bomb door or bomb door shut-off valve must be in "Safe" position prior to turning on the aircraft battery switch due to the automatic movement of the door toward the closed position when this switch is turned on, providing that there is pressure in the aircraft hydraulic system.

5. LOCKING THE BOMB DOOR ASSEMBLY TO THE AIRCRAFT:

a. When alignment is correct, the bomb door mechanism is locked into the Gimbals by pressing on external leverage parts until flush with the surface of the bomb door assembly.

b. Safety the lever with fastener (airpack).

c. By visual inspection through the inspection windows built into each end of the bomb door assembly and in line with each of the two Gimbals, check the alignment of the door locking mechanisms with the Gimbals. The light switch to the inspection lights is located inside the right, lower access door of the forward end of the bomb bay.

6. ARMAMENT TEST MISSIONS:

a. Eight sorties were flown exposing a full load of M-120 Photoflash Bombs and inert fuzes to the slip stream for five minutes at the following airspeeds: 250, 325, 400, and 434 knots. The results indicated that arming wires of front bombs were bent when exposed at airspeeds of 400 knots and above. The reason for this condition was not determined. It was concluded that it was caused by either slip stream or by interference by improper stowage of the bomb bay door electric cable installation (PN 272-708002) during rotation of door. (See Photos 31, 32, 33, and 34.) Appropriate photos are included to show the amount of bending to the arming wire, and illustrations of cable stowage mentioned above. (See Photos 28, 29, and 30.)

b. Four sorties were flown with the full load of M-120 bombs to determine the release characteristics of the bombs and the door. Airspeeds were: 250, 270, 325, 400, and 450 knots. Bombs were dropped singly and in train. Results indicated no unusual difficulties. However, at highest airspeeds the bombs of the forward upper station (No. 21) seemed to drop tail first and delay in separating from the door. The reason for this was undetermined. All other bombs dropped clean and fell true.

7. EXTERNAL STORES:

a. Mounting the AN-M76, 500-pound, Incendiary Bomb:

(1) The hoist, bomb, M06, Mod 0 (1100-pound capacity) was utilized and proved to be the ideal equipment for this operation.

(2) The only real difficulty encountered was installing the wire, arming, M5, loop swivel in the arming solenoid of the S2A Bomb Rack Assembly. No access plate is provided to allow free movement of the fingers and the loop swivel. It was necessary to use a pair of long nose pliers and a common screwdriver to insert the loop swivel in the arming solenoid. Repeated attempts were necessary before the loop swivel was inserted.

(3) The time required to load one bomb on each of the four pylons was 30 minutes.

(4) Twelve 500-pound GP bombs were dropped from the external stores at an airspeed of 300 knots. All bombs dropped clean and detonated properly upon impact.

b. Installation of the E-74 Fire Bomb (Napalm) Utilizing the M-116 Tank:

(1) An empty M-116 Tank was loaded on the left outboard pylon by hand and then filled with water. No difficulties were encountered.

(2) A test mission was flown, dropping two such napalm tanks at an airpseed of 300 knots and altitude of 300 feet. This drop resulted in damage to the aileron cove covering 12 inches aft and immediately to rear of rear tip of M-116 Tank. It was assumed that upon release the tank nosed down and the tail struck the cove covering, thus causing the damage.

(3) It was decided that the installation of a "kickoff brace" similar to the type used on the F-86F would solve the problem. The Armament Division designed such a brace, and it was installed on one of the pylons. (See Photos 22, 23, and 24.)

(a) The upper mounting bracket of the "kickoff brace" is attached on both sides of the pylon with a common aircraft bolt, measuring 3/8 x 2-1/4 inches. The 2-1/4 inch length is required to insure adequate threading surface in the self-locking nut device in the wing structure. (See Photo 24.)

(b) The lower mounting bracket of the "kickoff brace" is attached on both sides of the pylon by removing the lock nut from the adjusting sway brace bolt on the bomb pylon chock, placing the

lower mounting bracket over the threaded area of the bolt, replacing nut, and then adding another locking nut to insure a more secure installation.

(c) When adjusting the pad on the rear end of the "kickoff brace", it is essential that sufficient pressure is exerted down against the tank. This will tend to thrust the aft end of the tank away from wing upon release. However, excessive pressure at the point mentioned could prove detrimental to the tank and possibly create an unsafe condition.

(d) Three test sorties were flown with four M-116 Tanks per sortie filled with water. Again the drops were at 300 knots and 300 feet. One aircraft returned with a cut in the right aileron immediately aft of right outboard pylon. The rear fairing of the M-116 Tank was believed to have separated from the body of the tank and caused the damage.

(e) Three additional sorties were flown in the Firepower Demonstration for JCOC No. 18, 9 May 1954, with same configuration mentioned in paragraph (d) above, but tanks were filled with proper explosive instead of water. Altitudes and airspeeds mentioned in paragraph (d) above apply. All tanks dropped clean. A minor cut was discovered in the aileron of one aircraft. The appearance indicated only that damage was probably inflicted by an unknown object and not by the tank itself. The "kickoff brace" was considered effective.

8. CONCLUSIONS:

a. The bomb loading configuration kits are such that the average weapons supervisor and mechanic (AFSC 46270, 46250, 46230) can easily learn to install and use them, but alterations in configuration take excessive time to accomplish.

b. The electrical bombing system is simplified to the degree that it is within the realm of understanding of weapons supervisors and mechanics.

c. The forward bay of the bomb door assembly will not accommodate the M30 GP Bomb (100 pound) because of the distance between the front and rear sway bolts, (PN 272-7040201-3, and -1).

d. The left-hand dolly, bomb door assembly (PN SE-10020-19), right-hand dolly, bomb door assembly (PN SE-10020-20), bar, steering steel bar bomb door aft dolly (PN SE-10040) and bomb door forward tow truck (PN SE-10010) are considered to be highly satisfactory with the following exceptions:

(1) There is no braking facility built into the parts previously noted.

(2) A friction type brake is needed.

e. The hoist, MK8, is considered entirely satisfactory. Its simplicity is its best feature.

f. The wing pylons do not provide an access plate to allow free movement of the fingers and the loop swivel to install the M5 arming wire in the arming solenoid of the S2A Rack, Bomb Assembly.

g. No provisions are made for "bombs only" salvo without also releasing the tip tanks.

h. No provisions are made for bombardier or navigator release of external stores.

i. All wing pylons are unsatisfactory for napalm bombing in that:

(1) They store the munitions too close to wing and wing damage often results upon release.

(2) They are located too close together and chances of two bombs colliding under the wing is possible.

(3) They contain no "kickoff braces" for use with napalm tanks.

j. The bomb door has a satisfactory capability for carrying and dropping M-120 Photoflash Bombs. The door, however, lacks flexibility in that the configuration kits require considerable time to install and will only accommodate a limited number of bomb types.

9. RECOMMENDATIONS:

a. The M108 Truck, Crane, 6 x 6, 2½-ton, be utilized as standard bomb loading equipment.

b. Modifications be made to accommodate the M30 GP Bomb (100 pound) in the forward bay of the bomb door assembly if a requirement for use of such a bomb with this aircraft is planned by Tactical Air Command.

c. A "bombs only" salvo feature be incorporated into the present bomb release system.

d. A braking facility be incorporated onto the bomb door dolly and tow truck assembly. Further, a leverage action, friction type brake be installed on the tow bar of the assembly noted above. This would provide braking with wheels at any angle and would be effective on PSP or sod type hardstands.

e. Provisions be made for bombardier-navigator release of external stores.

f. The bomb pylon be manufactured with an additional eight inches of depth; the manufacturer develop a more permanent and streamlined "kickoff brace"; and. the bomb pylons be positioned farther apart if this aircraft is to have a napalm-carrying capability using the M-116 Tank.

g. The rear fairing and attaching bracket of the M-116 Tank be removed prior to its use with this aircraft. (See Photos 25 and 26.) These items are not considered an essential part of the tank.

PROJECT NO. APG/TAT/122-A

ARMAMENT PHOTOGRAPHS

PHOTO 1

Recommended positioning of the bomb door assembly and the M108 Truck, Crane. Crane and door are placed parallel and 4 to 5 feet apart.

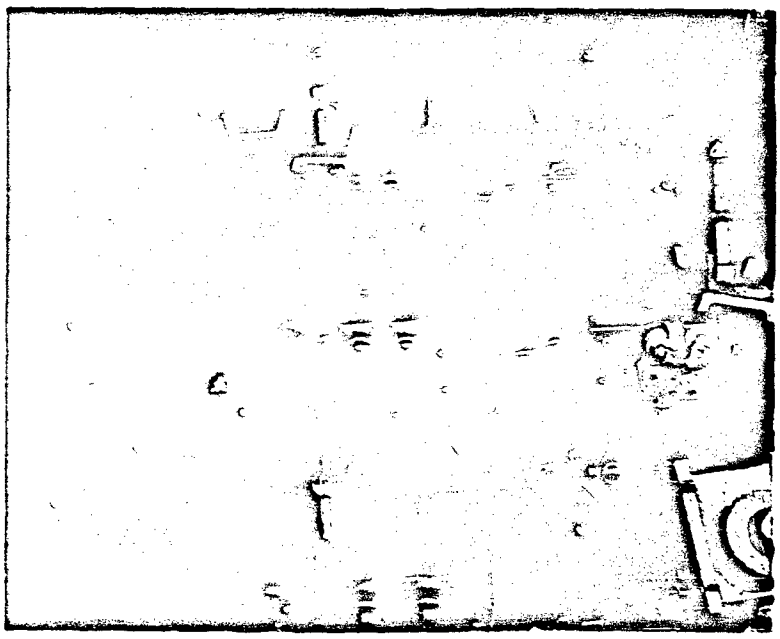


PHOTO 2

Loop Swivel of Arming Wire being installed in S2A Bomb Rack. Note restricted working space. Space restriction is prohibitive if loading is started from right side.

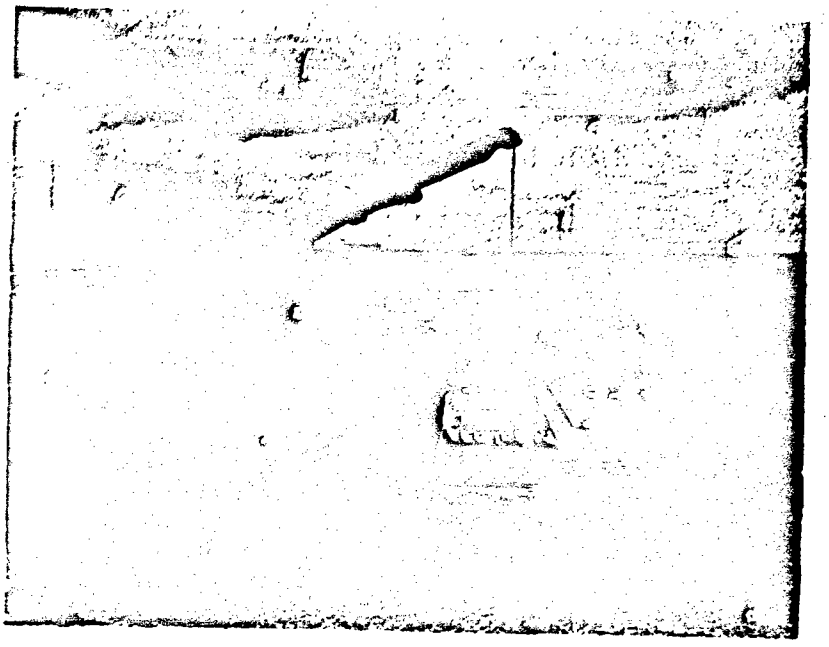


PHOTO 3

To effect better utilization of personnel, manhandling crew works in advance of crane crew. Bomb door loading sequence is always front to rear.

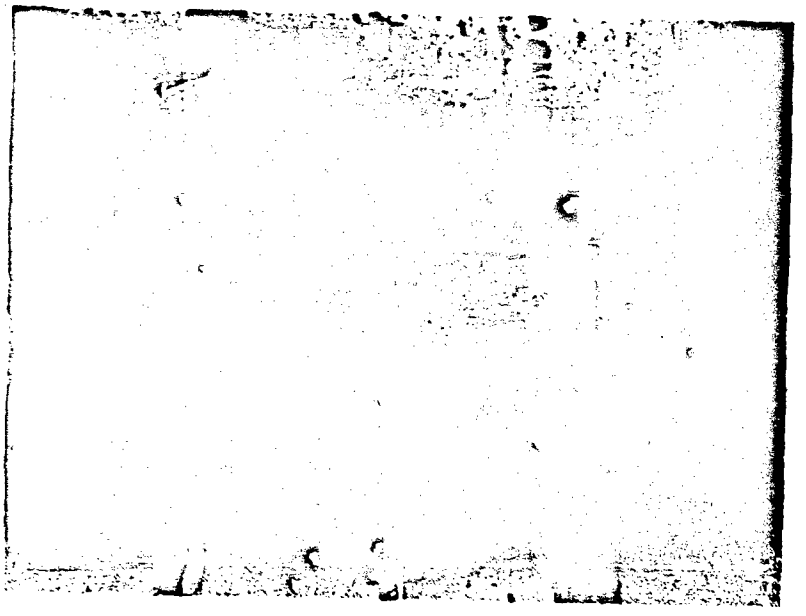
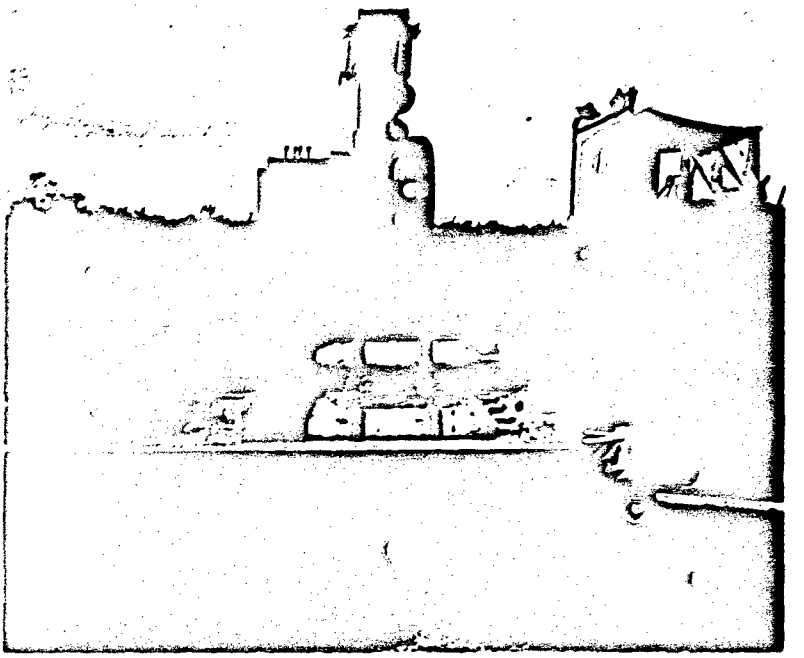


PHOTO 4

Top view of forward seven M-120 Bombs. Note how chocks are staggered to prevent wedging together and to allow more access for adjusting proper chock tension.

PHOTO 5

Side view showing proper position of door and crane. Note the positioning of the crane mount to provide proper alignment of the bomb during the sway-bracing operation.



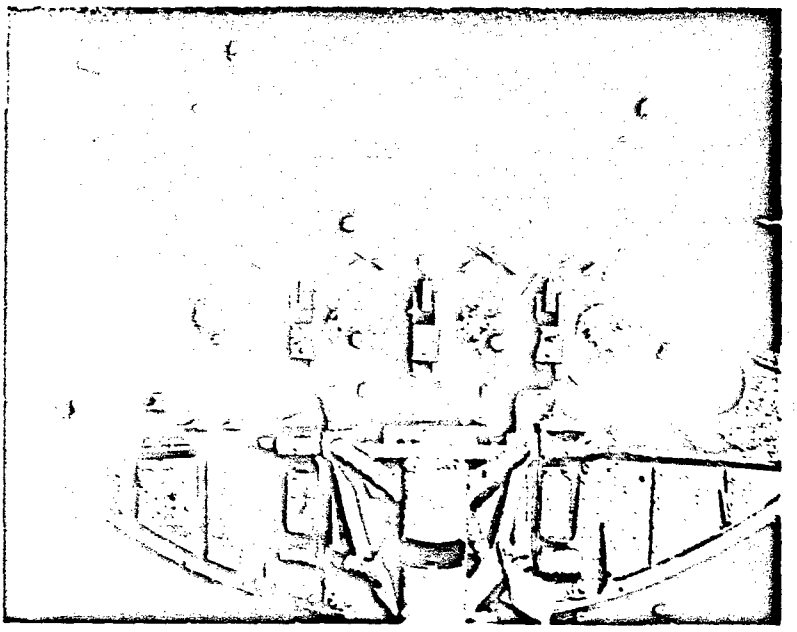
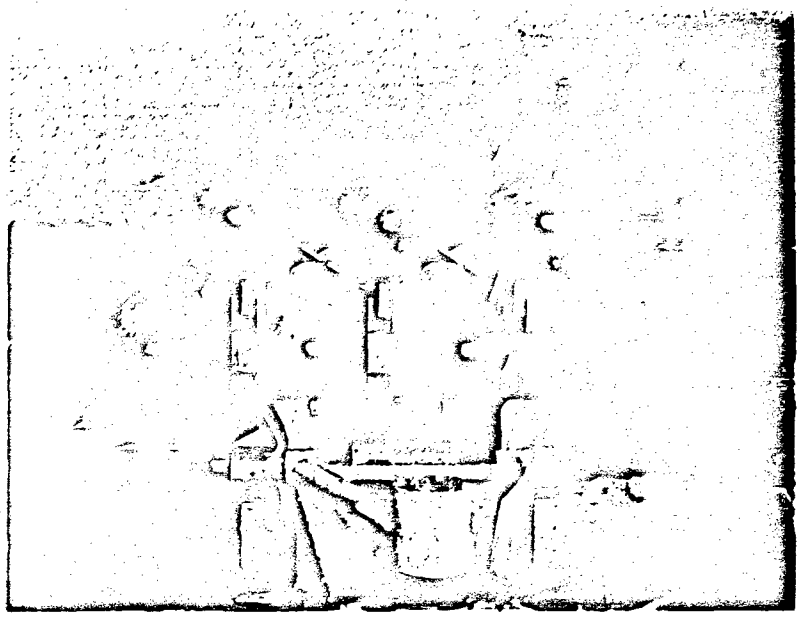


PHOTO 6

Front view of bottom four M-120 Bombs with sway braces fully tightened.

PHOTO 7

Front view of forward bay loaded with M-120 Bombs locked to bomb rack and fully chocked.



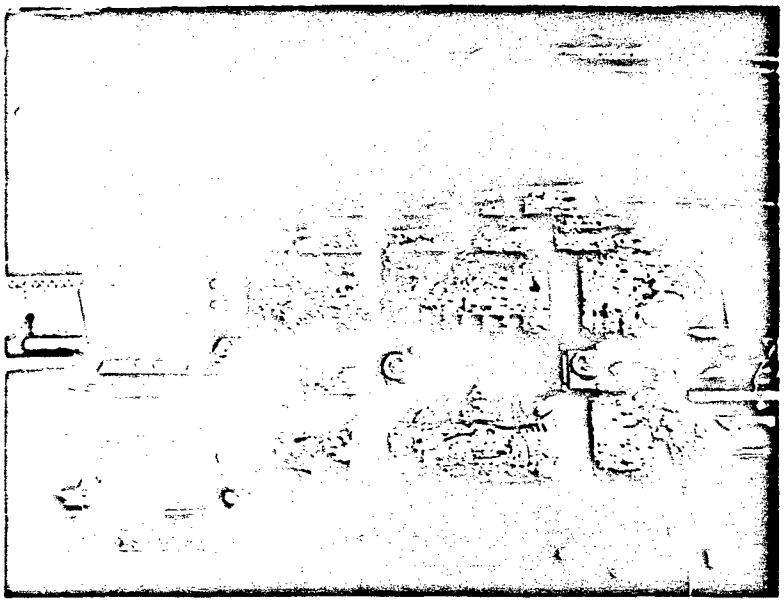


PHOTO 8

Side view of forward seven M-120 Bombs with full trail plates.

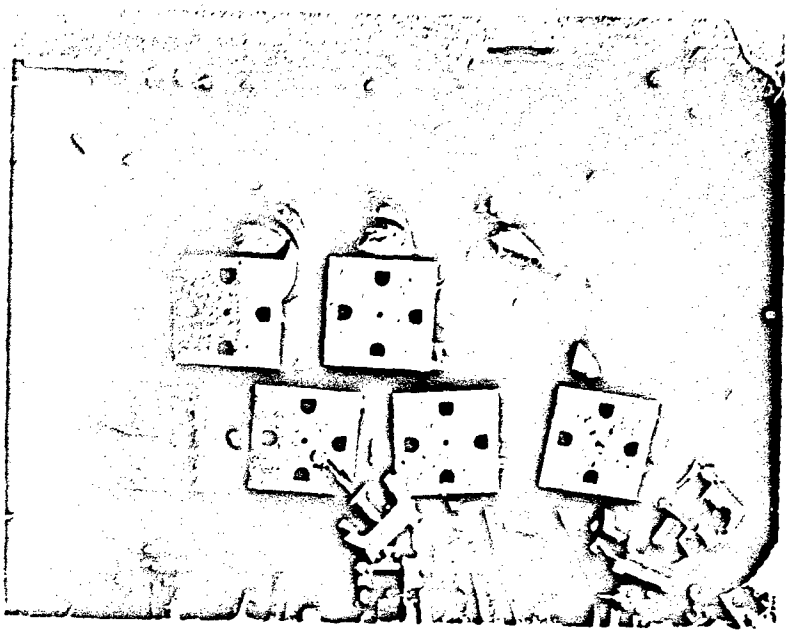


PHOTO 9

Rear view of forward seven M-120 Bombs with full trail plates.

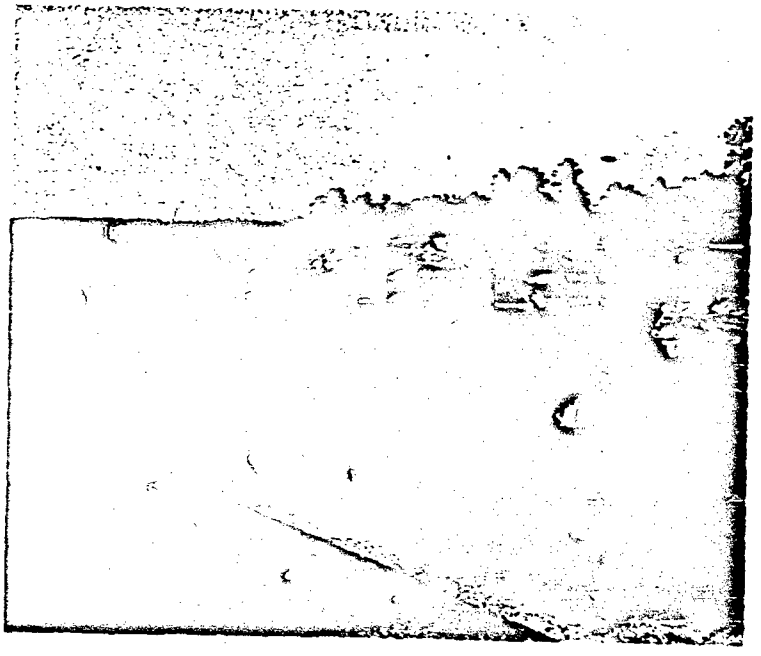
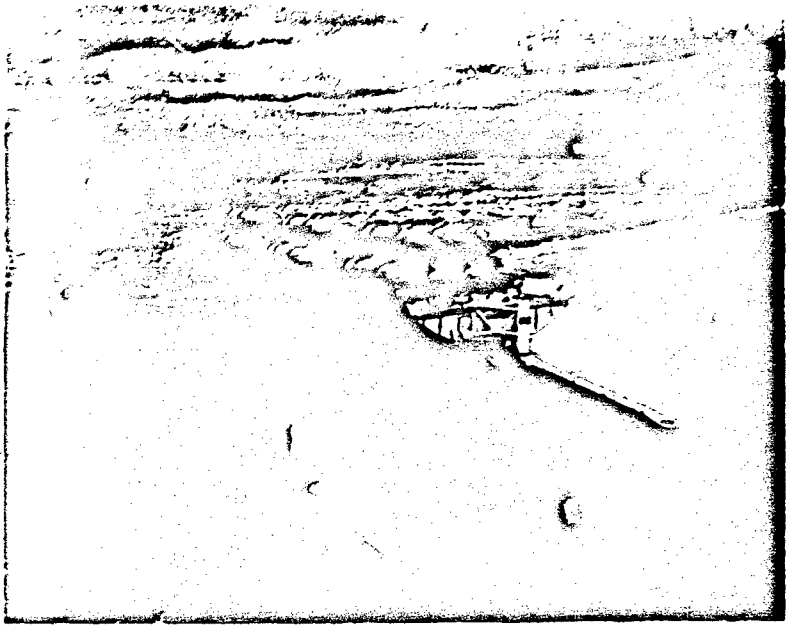


PHOTO 10

Bomb door fully loaded with 21 fuzed M-120 Photoflash Bombs and ready for installation in aircraft.

PHOTO 11

Another view of fully loaded bomb door.



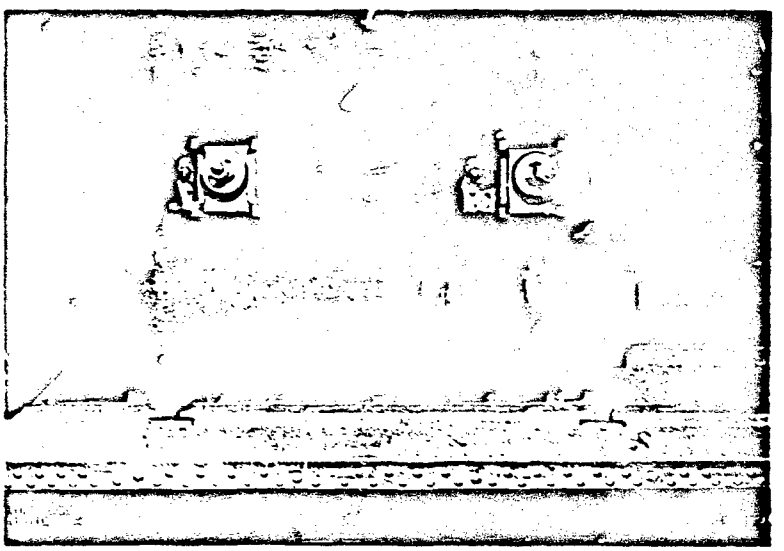


PHOTO 12

M30 GP Bomb (100 pound) installed in forward bay. Note position of forward bolt assembly. Distance between bolt assemblies does not allow installation of this bomb in forward bay. Also note that forward chock assembly does not rest all of its friction surface on bombs.

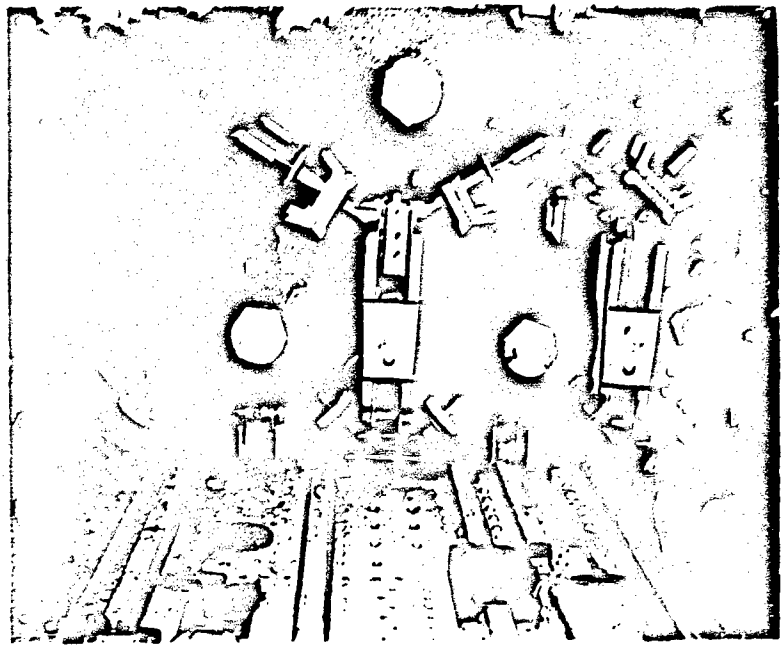


PHOTO 13

Front view of M30 GP Bomb in forward bay showing sway braces fully extended yet barely touching ogive of bomb.

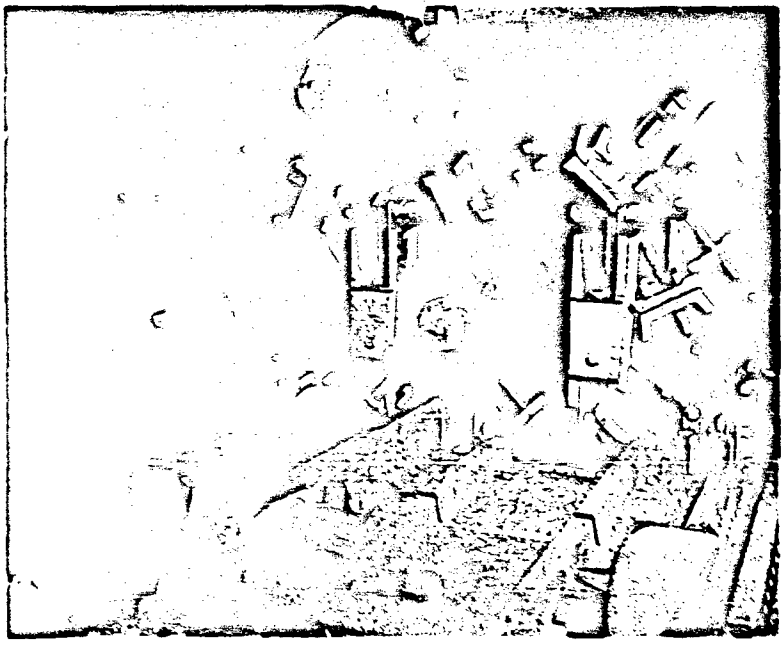


PHOTO 14

Another view of M30 GP Bomb installation in forward bay.

PHOTO 15

M30 GP Bomb properly installed in center bay. Center and rear bay installations of this bomb are satisfactory.

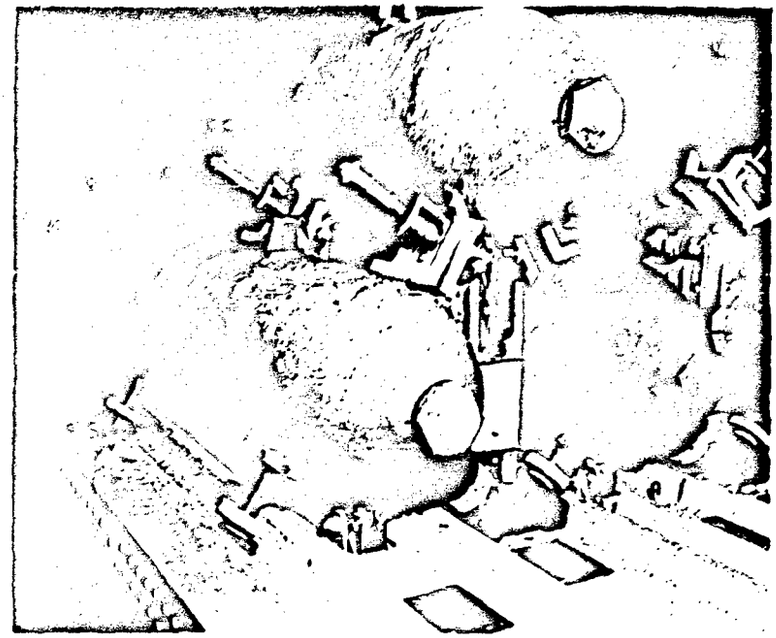


PHOTO 16

Side view of M30 GP Bomb in center bay installation.

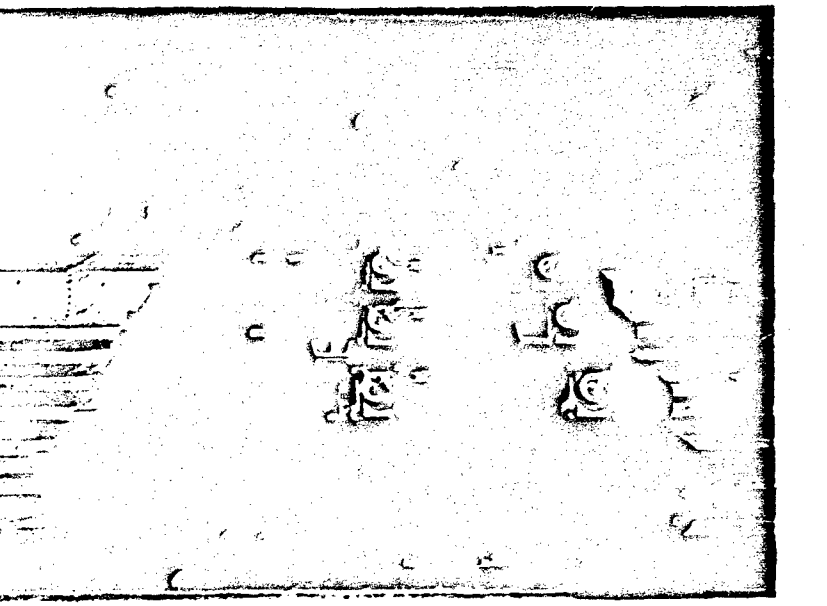


PHOTO 17

AN-M81 Fragmentation Bomb (260 pounds) installed in forward bay.

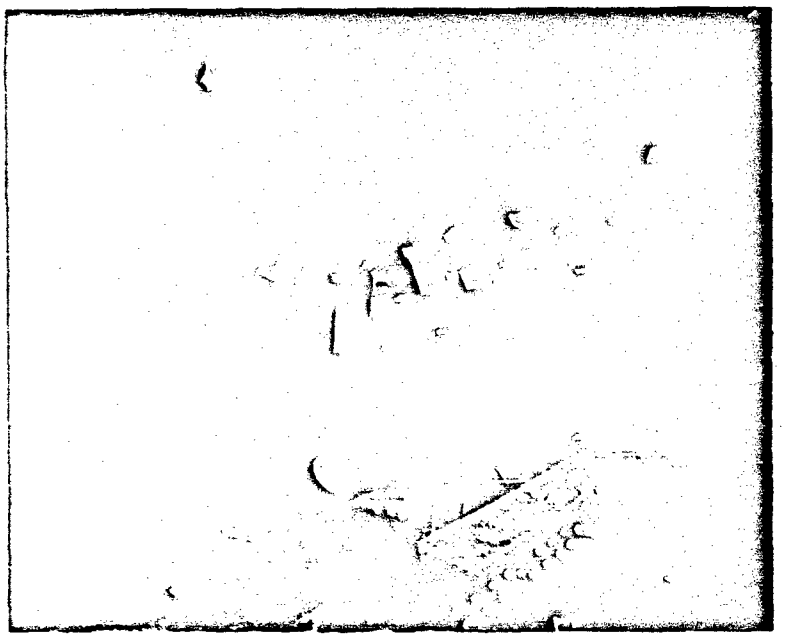
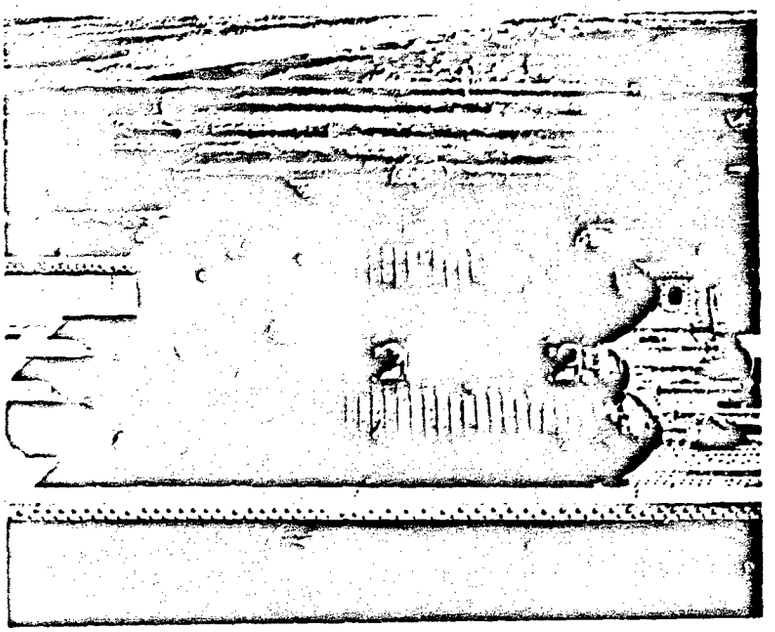


PHOTO 18

Forward oblique view of AN-M81 Fragmentation Bomb installation.

PHOTO 19

Forward bay fully loaded with AN-M81 Fragmentation Bombs.



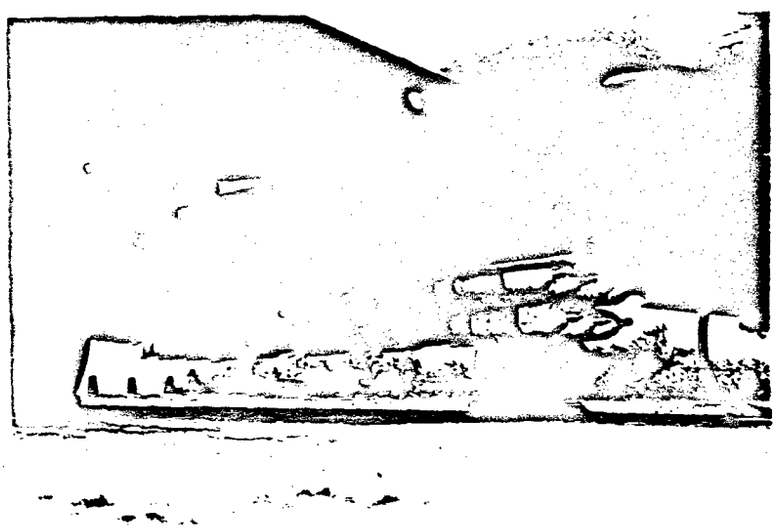


PHOTO 20

Bomb door fully loaded and in open position.

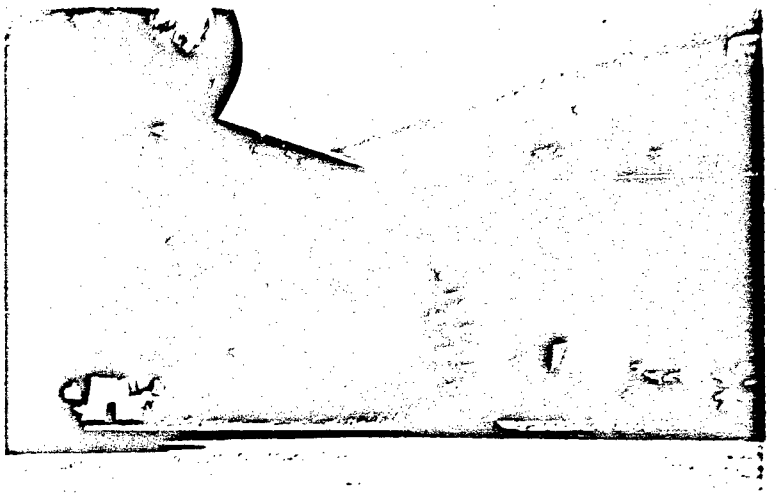


PHOTO 21

Fully loaded bomb door rotating toward closed position.

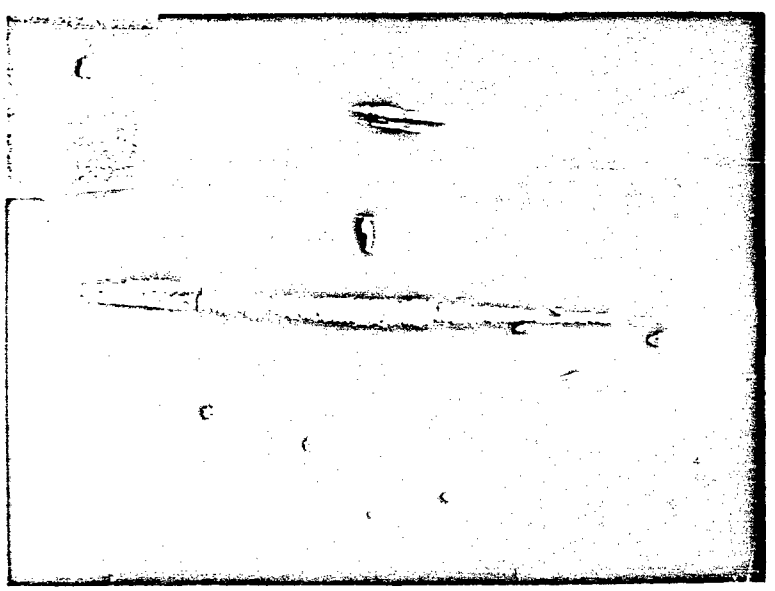


PHOTO 22

E-74 Fire Bomb (M-116 Tank) installed with locally manufactured kickoff brace.

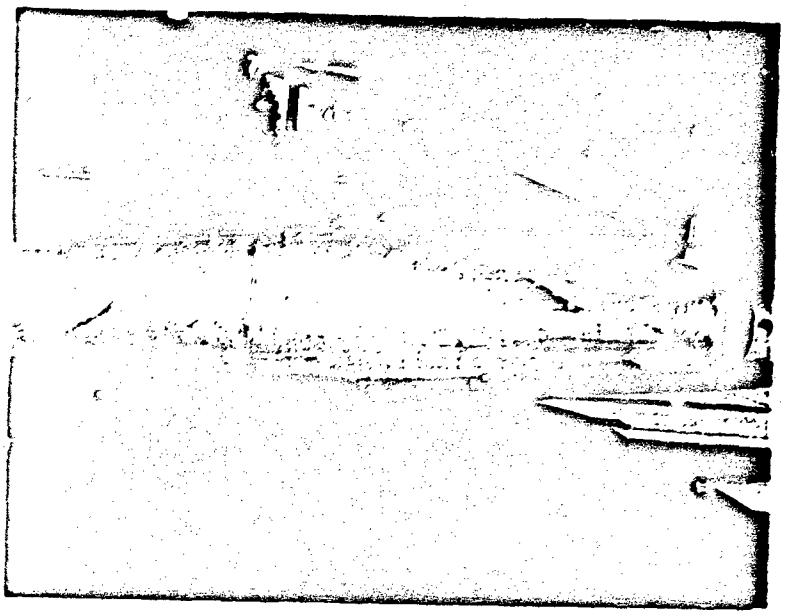


PHOTO 23

Locally manufactured kickoff brace attachment. This installation moved normal pivot point of the tank from carrying lug plate to a point 60 inches aft.

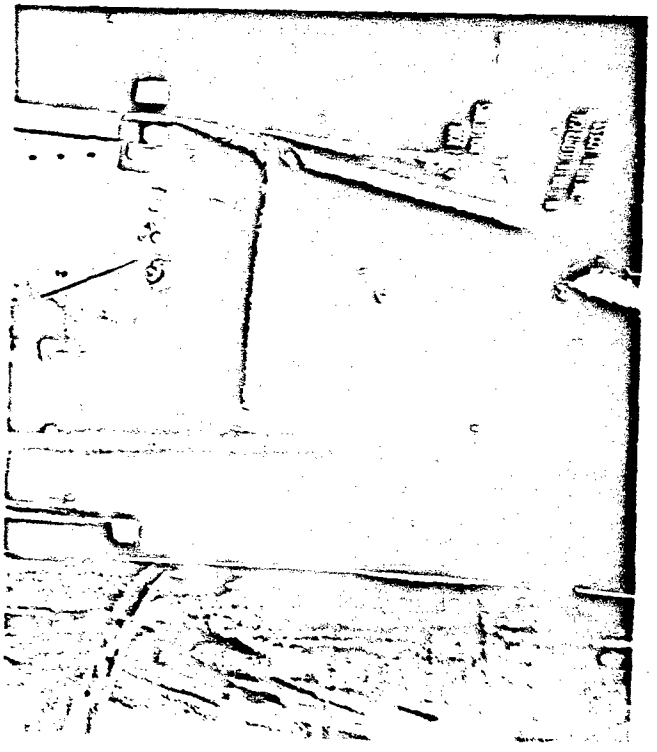


PHOTO 24

Upper attachment of kickoff brace to bomb pylon assembly.

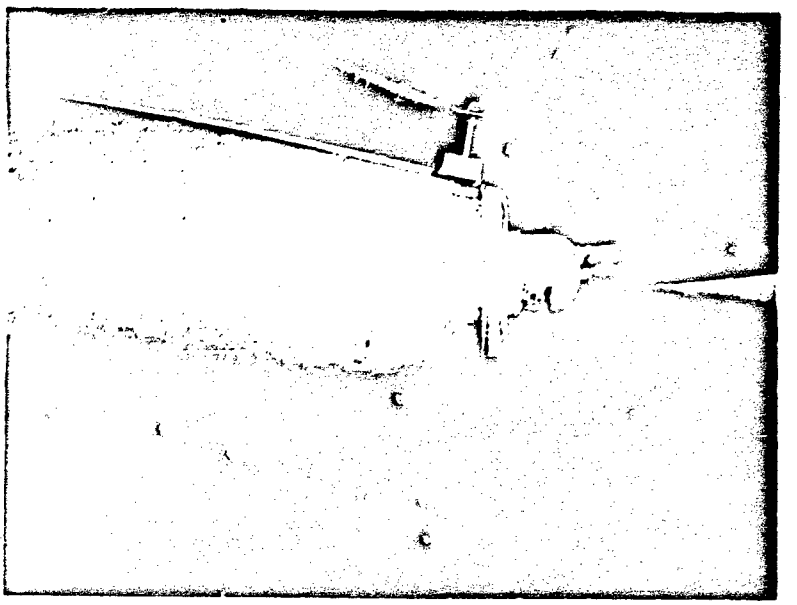


PHOTO 25

M-116 Tank with rear fairing and attaching bracket removed. This arrangement is considered satisfactory and safe for flight.

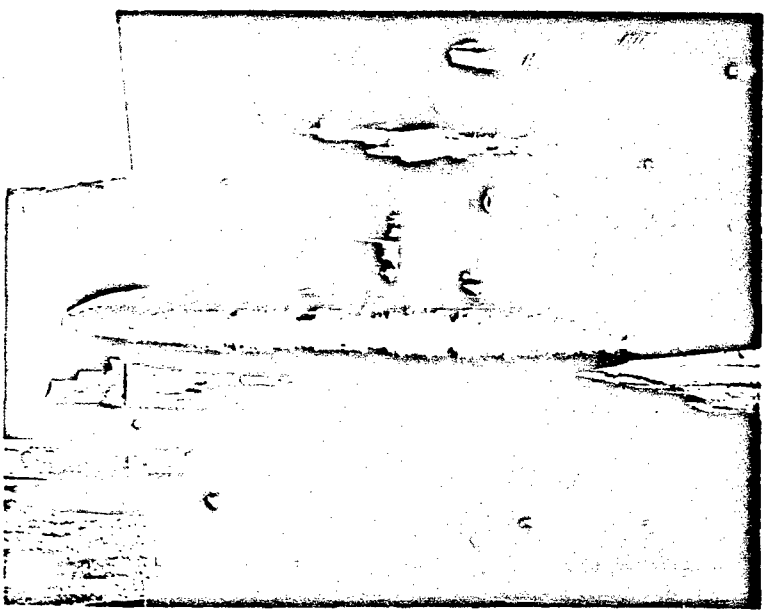
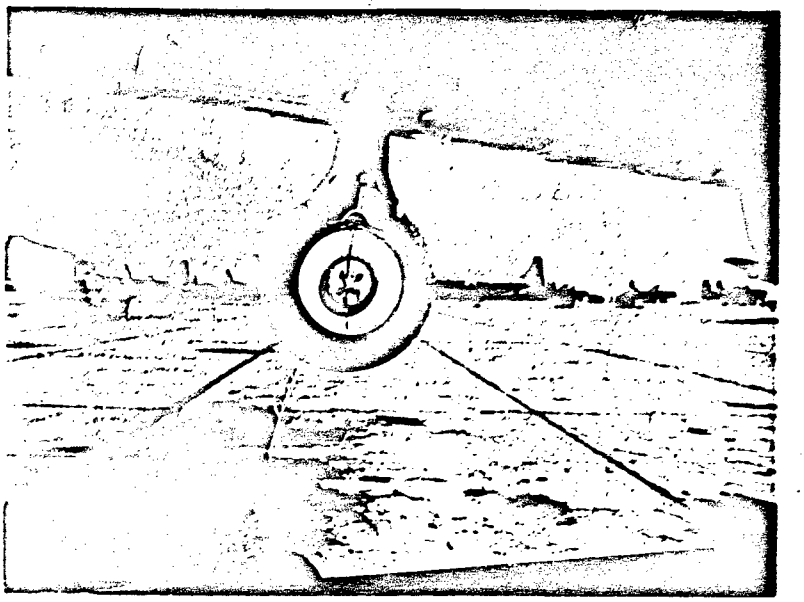


PHOTO 26

Full view of M-116 Tank with rear fairing and attaching bracket removed. It is believed that removal of these items will eliminate the possibility of aileron damage.

PHOTO 27

End view of M-116 Tank with igniter and arming wire exposed.



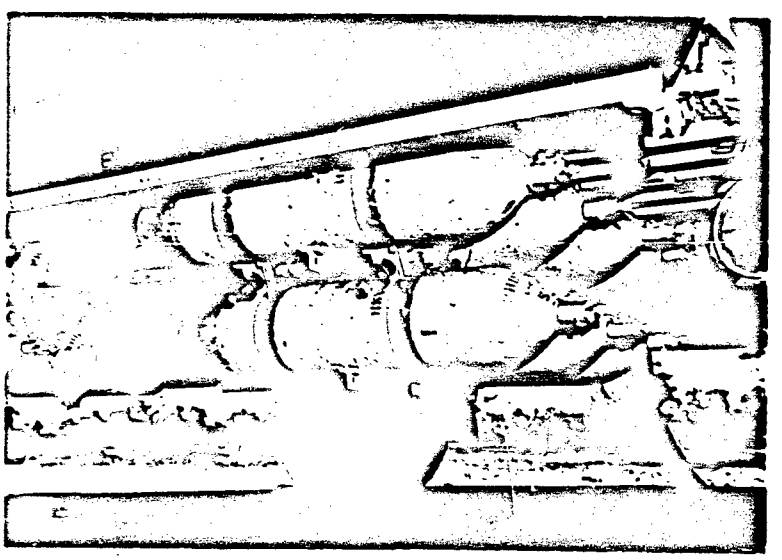
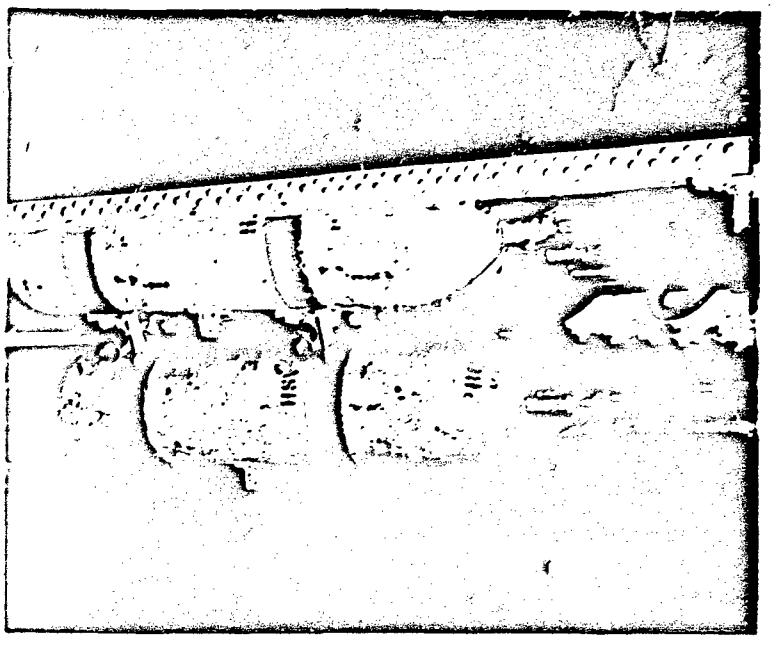


PHOTO 28

M-120 Bombs, fuzes and arming wires after exposure in slip stream for five minutes at 250 knots.

PHOTO 29

View of arming wires after exposure in slip stream for five minutes at 325 knots.



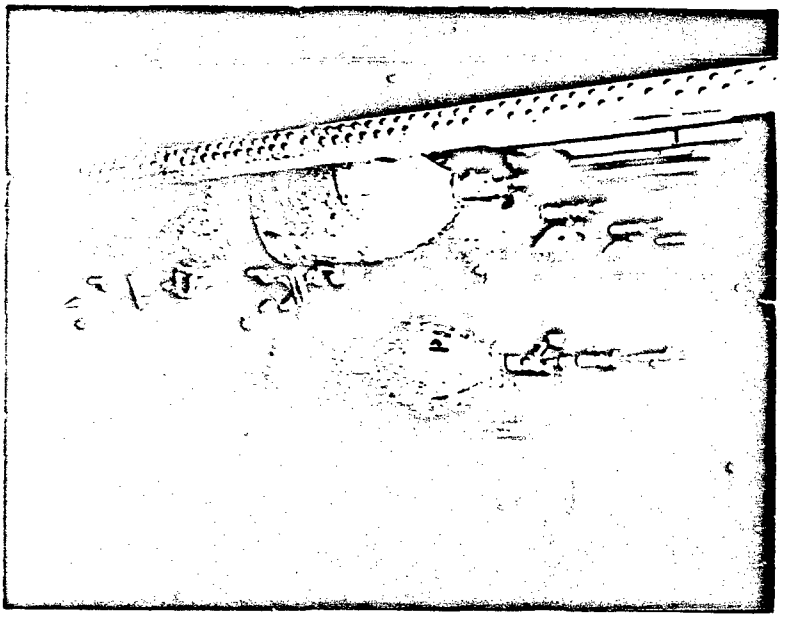


PHOTO 30

View of arming wires after exposure in slip stream for five minutes at 400 knots.

PHOTO 31

Incorrect stowage of bomb door cable installation.

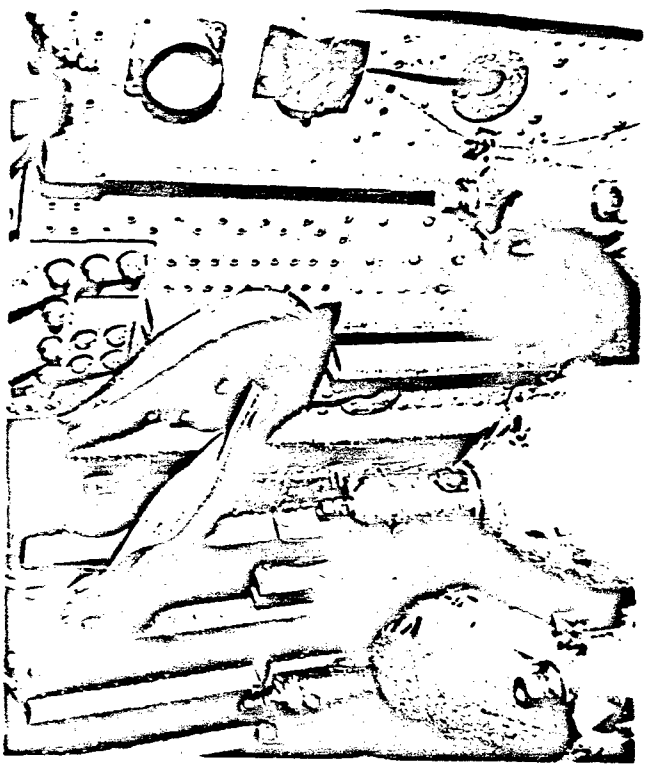


PHOTO 32

Correct stowage of bomb door cable installation.

PHOTO 33

Cable installation fully extended to represent the close proximity of cable and bomb fuze when cable is not properly stowed.

PHOTO 34

Possible unsafe condition that could result from improperly stowed cable installation.

PROJECT NO. APG/TAT/122-A

MATERIEL

MATERIEL

1. GENERAL:

a. Introduction: This appendix includes all data collected from 20 April 1954 through 23 May 1954 relative to the materiel and personnel functions of the operational suitability test of the RB-57A.

b. Description: The RB-57A is a light bombardment, night reconnaissance aircraft manufactured by the Glenn L. Martin Company of Baltimore, Maryland. The aircraft is equipped with two J65-W-5 turbojet engines. The fuselage structure is of all metal, semi-monocoque construction, divided into three sections: nose, center, and aft. The wings are of the full cantilever type, mono-spar construction consisting of integral structure from the fuselage to the removable wing tip. The wings are of box-type construction with one main spar extending the entire length of the wing and auxiliary spars to the leading and trailing edges. The empennage is composed of the horizontal, variable incidence stabilizer, elevator, vertical fin, and rudder. These surfaces are all-metal, single-spar, box-type construction.

2. OBJECT: To determine the capabilities and limitations of the RB-57A concerning the materiel and personnel requirements.

3. TEST PROCEDURES:

a. Data was collected by utilizing the following:

(1) AF Form 533, "Spare Parts Consumption Data for Initial Operation - New Aircraft."

(2) APGC Form 0-519 (Test), "Daily Maintenance Record."

(3) APGC Form 0-33, "Daily Aircraft Status Report."

(4) DD Form 535, "Unsatisfactory Report."

(5) Daily notations made from observations and discussions with maintenance and supply personnel.

(6) Weekly compilation of the field maintenance required to support the three test aircraft.

b. During the reporting period the following were investigated:

(1) Aircraft availability rate.

(2) Scheduled and unscheduled maintenance requirements.

(3) Aircraft systems.

(4) Support equipment.

(5) Supply support requirements.

(6) Personnel requirements.

(7) Training requirements.

(8) Publications.

4. TEST RESULTS:

a. Aircraft Availability Rate:

(1) From the period 20 April 1954 through 23 May 1954 two RB-57A aircraft (52-1432 and 52-1433) were available for 816 hours each, and one RB-57A (52-1430) aircraft was available for 812 hours.

(2) The following figures reflect the calendar hours that the aircraft were "in commission" and "out of commission."

Aircraft Serial No.	In	Out	Total
52-1430	505	307	812
52-1432	353	463	816
52-1433	198	618	816

(3) From the figures reflected in paragraph 4a(2), above, the following "in commission" and "out of commission" rates were computed:

Aircraft Serial No.	% In Commission	% Out of Commission
52-1430	62.2	37.8
52-1432	43.2	56.8
52-1433	24.3	75.7

(4) The calendar hours and commission rates are based on entries on APGC Form 0-33, "Daily Aircraft Status Report."

b. Scheduled and Unscheduled Maintenance:

(1) Scheduled Maintenance: During the reporting period an average of 499.7 man-hours per aircraft was expended on scheduled maintenance.

(a) An average of 8.53 man-hours per aircraft was expended to accomplish a preflight inspection.

(b) An average of 9.43 man-hours per aircraft was expended to accomplish a postflight inspection.

(c) An average of 256 man-hours was expended to accomplish a periodic inspection.

(2) Unscheduled Maintenance: An average of 224 man-hours per aircraft was expended on unscheduled maintenance for this reporting period. The difficulties encountered with the systems are noted below.

c. Aircraft Systems: The following systems were investigated, and these results were noted:

(1) Power Plant: It requires approximately 160 man-hours to build up a J65-W-5 engine. Utilizing this built-up engine, it requires approximately 20 man-hours for organizational maintenance personnel to accomplish an engine change. A four-man crew was utilized for the engine change.

(a) The engine starter proved to be the most troublesome item in this system. The starter accounted for many of the man-hours expended on unscheduled maintenance.

(b) The following trouble areas were encountered and reported on DD Form 535, "Unsatisfactory Report."

1. Transfer tube failure - Eglin AFB UR S/N 54-326.

2. Turbo starter assembly - Eglin AFB UR S/N 54-354.

3. Starter cartridge - Eglin AFB UR S/N 54-366.

4. Starter exhaust clamp - Eglin AFB UR S/N 54-382.

5. Turbo starter breech assembly - Eglin AFB UR S/N 54-394.

6. Nose assembly, starter fairing - Eglin AFB UR S/N 54-426.

7. Turbo starter failure - Eglin AFB UR S/N 54-505.

8. Turbo starter clutch failure - Eglin AFB UR S/N 54-514.

(2) Hydraulic: A malfunction occurred in the hydraulic system because the pilot valve in the camera door selector valve (P/N AV14B1128) was being neutralized by the solenoid spring when the camera door was not actuated for a prolonged period of time. The hydraulic pressure fluctuated between 2700 and 3100 PSI after the bomb door was cycled. When the

the Table of Organization alleviates, to some degree, the possibility of a serious time delay which could affect the assigned mission.

(f) Caution should be exercised to assure that all personnel are clear of open bomb door or that bomb door shut-off valve is in the "Safe" position prior to turning on aircraft battery switch. The bomb door automatically moves toward the closed position when the battery switch is turned on, the amount of door travel being dependent upon the hydraulic system pressure. This information is also covered from the pilot's viewpoint in Appendix B of this report.

(5) Communications: No discrepancies were encountered in this system during the reporting period. The scheduled maintenance required does not impose any workload in addition to that which is required to maintain the system on a proven aircraft. The Sound Recorder Reproducer Set (AN/GNQ-14) was used as a playback facility for the RB-57A Voice Recorder Set (AN/ANH-2).

(6) Photographic: The bomb release control malfunctioned during the reporting period. This was the only discrepancy noted. The average preflight inspection required one hour for a two-man team. The average postflight inspection required one hour for a two-man team. All cameras used in the test were explosion-proofed. K-37 cameras and A-18 magazines were explosion-proofed at this Base. It is recommended, however, that this be accomplished at a depot.

(7) Electronics: This system did not require any unscheduled maintenance. No spare parts were required. The average preflight inspection required one hour for a two-man team. The average postflight inspection required one hour for a two-man team.

d. Support Equipment: The following support items were investigated:

(1) Tow Bar: In its present configuration this item could damage the pitot tube shaft. This condition is aggravated when the aircraft is towed over uneven terrain and/or when the tug makes a left turn. A new tow bar has been redesigned by the manufacturer, but is not ready for use at this time.

(2) Oxygen Refilling Cart: Difficulty was encountered with the filler valve on the liquid oxygen refilling cart. The low temperature of the liquid oxygen (-297°F) freezes the filler valve which causes the Phenolic Washer (P/N 52A3994) to move away from the phenolic shield when torque is applied to remove the filler valve. The phenolic washer (3/32 inch thick) becomes disengaged from the phenolic shield which makes it impossible to remove the filler valve. A sufficient amount of the phenolic shield was removed to allow the installation of a 1/4 inch thick phenolic washer. This temporary fix proved satisfactory.

(3) Debris Guard: This item could not be attached to the engine cowling without sheet metal rework of the engine cowling. Holes were drilled in the engine cowling, and bungee cords were used to secure the debris guard to the aircraft.

(4) Bomb Rack Charger: The cable assembly of the item snapped on several occasions. Replacement by a like item was made since more durable cable was unavailable.

(5) Bomb Door Tow Truck: The bomb door forward tow truck was not provided with a locking device. This condition constituted a safety hazard. A locking device was locally manufactured and installed on this item.

(6) Elevator Locking Clamp: Difficulty was experienced with this item. The hole in the locking clamp was not aligned with the hole on the stabilizer. This caused undue shearing stress on the locking pin. Research is being conducted locally to devise a new type locking device.

(7) Test Equipment and Special Tools: See paragraph 5g, below.

e. Supply Support Requirements:

(1) Spare Parts Consumed: A list of the spare parts consumed is attached as Inclosure 1.

(2) Table of Equipment: See paragraph 5h, below.

(3) Equipment Component List: See paragraph 5h, below.

f. Personnel Requirements: The Table of Organization appears to be adequate in most cases. This is based on testing and discussions with maintenance personnel of the various systems. However, because of the accelerated phase more personnel were utilized to maintain the test aircraft than were authorized by the Table of Organization. The assignment of personnel in accordance with Table of Organization 1-1457P, 1 November 1953, will be accomplished in the next phase of this test. This will insure an accurate evaluation of the personnel requirements and AFSC authorizations.

g. Training Requirements: The following career fields were investigated relative to the training requirements:

(1) Photographic: The maintenance of K-37, K-38, and T-11 type cameras and the maintenance of the photo system which is used in this aircraft does not require special training of personnel. The airmen at the apprentice level in this career field can become proficient within thirty days by means of OJT.

(2) Armament: Due to the complexity and newness of this system, there is a requirement for factory training for the supervisory personnel in this career field. The factory training should include a course on handling the equipment, trouble shooting the system and a short yet comprehensive electrical course. Recommended length of course is 20 academic days.

(3) Maintenance: A requirement exists for factory training for the crew chief of the aircraft. The information obtained from a general course encompassing the aircraft, engine, and systems can be absorbed by airmen at the 71 and 51 level in this career field. Recommended length of course is 20 academic days.

(4) Hydraulic: The maintenance of this system does not reflect a need for special training of the maintenance personnel. Airmen with AFSC 42550, Senior Aircraft Hydraulics Mechanic, can train the airmen at the apprentice level by means of OJT.

(5) Communications: There is no requirement for personnel in this career field to undergo special training to adequately maintain this system. Airmen at the senior level (30150) can train the airmen at the apprentice level by means of OJT.

(6) Electronics: A Senior Electronics Mechanic (AFSC 30250) is considered proficient or can become proficient in a minimum amount of time by means of OJT.

h. Publications: The following aircraft and engine technical orders have been investigated. The discrepancies found are being compiled in order that the unsatisfactory conditions can be reported on DD Form 535, "Unsatisfactory Report."

(1) AN 01-35EAB-1, "Flight Handbook," does not include sufficient information on fuel management. The technical order should include the best fuel tank sequence. All discrepancies found to date will be reported on DD Form 535, "Unsatisfactory Report."

(2) AN 01-35EAB-2, "Handbook of Maintenance Instruction," has been adequate during the reporting period.

(3) AN 01-35EA-3, "Handbook of Structural Repair," was not available in sufficient copies to satisfy the needs of all using agencies. This publication has been requisitioned and will be evaluated in later reports.

(4) AN 01-35EAA-4, "Parts Catalogue," was found inadequate during this reporting period. All discrepancies discovered thus far in this publication are being reported on DD Form 535, "Unsatisfactory Report."

(5) Technical Order No. 01-35EAB-5, "Handbook, Basic Weight Check List and Loading Data," is referenced in paragraph 5j, below.

(6) AN 01-35EA-6, "Handbook of Inspection Requirements," proved to be incomplete and unrealistic during this testing period. The handbook does not include all of the items to be inspected, and the times allotted for inspection of certain items were unrealistic. All discrepancies found during the reporting period will be reported on DD Form 535, "Unsatisfactory Report."

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

(8) Technical Order No. 2J-J65-4, "Illustrated Parts Breakdown, Models J65-W-3, J65-B-3, J65-W-5 Aircraft Engines," has been unsatisfactory. All discrepancies found during this testing period will be reported on DD Form 535, "Unsatisfactory Report."

(9) Technical Order No. 2J-J65-6, "Handbook, Minor Repair, and Replacement, Jet Engine Components, Models J65-W-3, J65-B-3, J65-W-5 Aircraft Engines," has been adequate for this testing period.

5. DISCUSSION: Due to the accelerated phase and the limited time allotted to this reporting period, all of the materiel and personnel functions have not been fully investigated. A representative of the reporting agency visited the 363rd Tactical Reconnaissance Wing at Shaw Air Force Base which is presently equipped with the RB-57A type aircraft.

a. Reference to paragraph 4a(2), the small number of calendar hours that aircraft 52-1433 (hereafter referred to as 1433) was in commission was due to a consolidation of supplies in order that the other two aircraft could be more readily available for testing. No. 1433 was undergoing maintenance and could not be considered AOCP (aircraft out of commission for parts). Therefore, this aircraft was not recorded as being AOCP.

b. Reference to paragraph 4a(3), the average "in commission" rate for the three test aircraft is 43.2 per cent. This figure appears to be valid when consideration is given to the amount of time that the aircraft were restricted from flying. The data collected by the 363rd Tactical Reconnaissance Wing at Shaw Air Force Base indicates that this figure of 43.2 per cent is realistic.

c. Reference to paragraph 4b(1)(c), the man-hours expended for the periodic inspection are not excessive considering the new equipment. It is believed that this figure can be reduced by 20 per cent (51.20 hours) as the maintenance personnel become more familiar with this aircraft.

d. Reference to paragraph 4c(1)(a), the manufacturer of the engine starter (General Electric) is developing modifications in answer to the discrepancies found on

this item. New parts for the starter have been delivered on a priority basis to keep the starter operating. It is anticipated that these starters will answer all of the discrepancies encountered. The starter cartridge is presently classified as "Class 9 Munitions." This classification imposes an additional workload on the maintenance personnel in that the aircraft must be towed to a remote area for starting in accordance with the current instructions for the handling of munitions in this class. Tests have been conducted by the Armament Section on this installation to investigate the possibility of declassifying this item. The results of the test and recommendations made as a result of the testing have been forwarded to AMC.

f. Reference to paragraph 4c(4)(a), a portion of the unscheduled maintenance man-hours expended on the Armament System was due to the armament personnel being unfamiliar with the equipment.

g. Reference to paragraph 4c(7), all of the test equipment and special tools were not utilized during the reporting period. A continuing investigation is being conducted on these items and will be reported on in later reports.

h. Reference to paragraphs 4e(2) and 4e(3). The Table of Equipment and Equipment Component List have not been investigated to the degree which would justify a report. However, they will be fully investigated and discussed in a later report.

i. In reference to paragraph 4h(1), the Pilot's Handbook does not include operating instructions for the APN-22 (Radar Altimeter). Information on the APN-11 (Roger Button) and the automatic movement of the bomb door should be included.

j. Reference to paragraph 4g(3), the Handbook for Structural Repair had not been received when structural repair on the aircraft was being accomplished. Sufficient copies of this item have not been distributed to satisfy the needs of all interested agencies. Copies have been requested and this item will be investigated and reported on in a later report.

k. Reference to paragraph 4g(5), the "Handbook, Basic Weight Check List and Loading Data" has not yet been published. However, in reference to weight and balance, a problem area has arisen. A discrepancy of 126 gallons of fuel exists between the manufacturer's fuel capacity specifications and the actual capacity of the fuel tanks:

(1) Manufacturer's Specifications:

No. 1 Tank - 1040 gallons
No. 2 Tank - 654 gallons
Wing Tanks - 319 gallons, each
Total Fuel
Capacity - 2332 gallons.

(2) Actual Capacity:

No. 1 Tank - 993 gallons
No. 2 Tank - 633 gallons
Wing Tanks - 290 gallons, each
Actual Total
Capacity - 2206 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 of 50 gallons from each 1000 gallons was weighed. The tanks were then filled to capacity, using a total of 2206 gallons. The discrepancy has been covered in an Unsatisfactory Report.

6. CONCLUSIONS: The following conclusions are tentative in nature due to the accelerated phase and the time allotted to the reporting period:

a. The RB-57A aircraft is apparently suitable from a maintenance standpoint.

b. A more positive conclusion cannot be made until the following items have been corrected:

(1) The engine starter is presently unsuitable.

(2) The starter cartridge is unsuitable because of its present classification.

(3) The technical orders are unsuitable.

7. RECOMMENDATIONS: It is recommended that:

a. The engine starter be modified.

b. A suitable starter cartridge be provided.

c. The engine cowling be provided with a suitable means for securing the debris guard.

d. The modified tow bar and associated adaptors be distributed at the earliest date.

e. A more durable cable be installed on the bomb rack charger.

f. A braking device be installed on the bomb door dolly and tow truck assembly.

g. An M108 Truck, Crane, be added to ECL 20-00-5 for the armament section.

h. A 20-day factory training course prior to receipt of aircraft be provided for each aircraft crew chief and armament supervisor.

PROJECT NO. APG/TAT/122-A

LIST OF UNSATISFACTORY REPORTS

LIST OF UNSATISFACTORY REPORTS

54-309	5 April 1954	Battery Installation
54-326	8 April 1954	Transfer Tube Failure
54-330	8 April 1954	Transfer Tube Failure
54-347	12 April 1954	Wing Fuel Tank Venting Equipment
54-354	12 April 1954	Turbo Starter Assembly
54-362	14 April 1954	Clamp, Elevator Locking
54-366	14 April 1954	Starter Cartridge
54-382	16 April 1954	Exhaust Clamp - Starter
54-394	20 April 1954	Failure of Turbo Starter Breech Assembly
54-397	21 April 1954	Leakage of Reducer Valve in Purging System
54-400	21 April 1954	Fitting Assembly - Attachment for Side Stay - Main Landing Gear
54-409	22 April 1954	Engine Debris Guard
54-420	23 April 1954	Canopy Jettison System
54-423	23 April 1954	Valve Assembly, Filler, Liquid Oxygen Female
54-425	26 April 1954	Paint Peeling from Engine Nacelles
54-426	26 April 1954	Nose Assembly, Starter Fairing
54-432	30 April 1954	Improper Installation of Canopy Ejection Mechanism in right-hand armrest of pilot's seat
54-447	30 April 1954	Installation of Napalm on Bomb Pylon Assembly
54-449	30 April 1954	Fire Detector Lead Wire Pulled from Thermocouple
54-455	3 May 1954	Lack of Warning Stenciled on Outside of Fuselage for Starter Cartridges

54-456	3 May 1954	Handle Installation - Forward Entrance Door
54-459	3 May 1954	Technical Order No. 1B-57A-6, 15 February 1954
54-464	5 May 1954	Cable Assembly
54-468	6 May 1954	Chafing, Pilot's and Navigator's Ejection Seat Hose Assembly
54-483	9 May 1954	Valve - Hydraulic, Solenoid Operated
54-488	10 May 1954	Outlet, Fuel Vent
54-492	10 May 1954	Pipe Assembly - Eng. Tail
54-505	19 May 1954	Turbo Starter Failure
54-506	17 May 1954	No Caution Note on Danger of Turbine Starter Exploding in Technical Order No. 1B-57A-1, 1 October 1953
54-508	17 May 1954	Pylon Assembly, left-hand and right-hand, Inboard and Outboard
54-511	17 May 1954	Connector, Receptacle
54-514	24 May 1954	Turbo Starter Clutch Failure
54-517	19 May 1954	Bomb Door Forward Tow Truck
54-524	21 May 1954	Failure of Turbo Starter
54-537	26 May 1954	Oxygen Hose, Navigator's Too Short
54-541	27 May 1954	Latch Assembly Eng. Cowl
54-542	27 May 1954	Spring, Lower Aft Cowl Assembly

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SPARE PARTS

SPARE PARTS

Stock Number	Nomenclature	Quantity
4305-NISL-221400NI	Control, Fuel	1
4936-NILS-1328417G3	Transfer Fuel Tube	5
4221-NISL-A533AWZY	Light Assembly	1
4109-NISL-9560182	Brake Assembly	2
0242-606906	Cone, Tail	4
J65-E4-5	Engine	1
0242-NISI -210233	Bearing	2
0242-220739N2	Seal	2
0242-2067D195	Washer	112
2366-1616013-71	Simulator	2
1 AKC-272-5052050	Latch Assembly	6
1 AKC-272-5053001	Tail Pipe	1
1 AKC-NISL-AN124013	Seal	2
52EFA	Cartridge	254
6400-612984	Rack Assembly J-2A-241	13
1 AKC-272-7040204-29	Cable Assembly	7
1 AKC-272-7040261	Chock Assembly	2
1 AKC-272-7040227	Fitting	2
1 AKC-272-3040114	Bomb Pylon Cover Assembly	1
8400-244640	Ejector, Photoflash, Type B-4	1
8400-NISL	Ejector, Photoflash, Type A-6	1

Stock Number	Nomenclature	Quantity
1 AKC-272-505200-9	Cowling Panel	1
1 AKC-5052050-	Latch Assembly	4
0242-NILS-A14123989	Seal	1
0242-D0670195	Washer Fork	4
0242-21-D-233	Bearing	2
0242-606906	Exhaust	1
4936-7T-AS-12A2	Starter	2
6500-303100	Nuts	4
2343-AM17-817C2	Gage, Pressure	1
2266-1616013-71	Simulator	1
6700-613915-32	Screws	20

CONFIDENTIAL

PROJECT NO. APG/TAT/122-A

REPORT OF FIELD MAINTENANCE SUPPORT

CONFIDENTIAL

REPORT OF FIELD MAINTENANCE SUPPORT

Aircraft	Description	Man-hours	Parts
1430	Replace rivet in trailing edge of right wing outboard flap.	8	None
	C/W Interim T.O. 1B-57-216 Prevention of fuel entry into wing section.	8	None
	Fabricate four each special locking screws.	4	None
	Repair as needed one each aileron cove cover.	5	None
	Check and repair as needed one each simulator	3	None
	Replace loose rivets trailing edge both wings	21	None
	Weld crack as needed one each vent, fuel.	1	None
	Repair one each door handle as necessary.	15½	None
	Fabricate as per sample of heavier material six each strap assembly	2	None
	C/W T.O. 1-1B-50 Weighing of Jet Type Aircraft. Install Ballast as needed.	12½	None
	C/W T.O. 1-1B-50 Weighing of Jet Type Aircraft. Install Ballast as needed.	6	Six each strap assy fabricated by fabric shop on W.O. 422-1694.
1432	Align and repair one each Receiver and Transmitter RT-178/ARC-27.	15½	None
	Fabricate four each cable retaining straps	2	None

Aircraft	Description	Man-hours	Parts
1432 (Cont'd)	C/W Interim T.O. 1B-57-216	8	None
	Fabricate three each bag assembly.	3	Cloth, webbing and fasteners @ cost $1.36.
	Repair damage around door.	53	None
	Repair one each cowl assembly.	1	None
	Repair damage right aileron.	32	None
	Manufacture two pieces of flexible flame and aromatic resistant hose Spec. MIL-R-5511 fittings supplies.	2	6600-380624-87, 8 ft No. 16 Hydraulic Hose.
	Repair as needed one each blackout curtain	2	None
	T.O. 1-1B-51 para 2 weight and balance of jet type aircraft. Fabricate clamps and install ballast.	24	None
1433	Replace locking block as needed.	1	None
	Replace popped rivets and repair as needed.	1	None
	Repair as needed - one pin, locking.	3	None
	C/W Interim T.O. 1B-57-216 Prevention of Fuel Entry into Wing Section.	8	None
	Check and repair as needed one each pressure regulator.	2	None
	Check and repair as needed one each valve, bomb bay camera door.	4	None
	Fabricate one each air seal, aileron.	2	None
	Replace loose rivets on trailing edge both wings.	24	None

Aircraft	Description	Man-hours	Parts
1433 (Cont'd)	Replace broken stud in fuel pump mounting pad No. 1 engine.	4	None
	Repair as needed crack around dzus	2	None
	C/W T.O. 1-1B-51 para 2 weight and balance of jet type aircraft.	4	None
	Replace inboard pylon rear mounting lock nuts.	20	None
	Replace pulled rivets as needed.	4	None
	C/W T.O. 1-1B-51 para 2 weight and balance of jet type aircraft.	9	None
	Repair hole in right aileron.	26½	None
	Repair left elevator damage.	82	None
	Repair damaged cowl as needed.	46	None
	Repair left elevator damage.	80½	Four sq ft 6800-141860 SNR .271 aluminum alloy.
	Repair damaged cowl as needed.	25	None
	Repair handle as needed (landing gear).	7½	None
	Fabricate clamps and install ballast.	8	None
	Erratic operation. Check and prepare for turn in one each 6034-14602-1J-C1 Attitude Gyro J-8.	2	Two sq ft 6800-14198.
All three aircraft 1430, 1432 and 1433	Manufacture one each exhaust cover plate.	2	One sq ft C50 stainless steel 6800-451200.
	Manufacture indicator markers to be used on APN-11's installed in RB-57, 430, 432, 433.	26	None

Aircraft	Description	Man-hours	Parts
All three (Cont'd)	Motor cover explosion-proofed. This necessary for RB-57A test and for AF-wide information.	38¼	None
	Fabricate 20 each bolts.	4	20 each bolts fabricated by machine shop.
	Repair of jet engine motoring dolly P/N 272-0410002 to be used on repair of RB-57A aircraft.	2½	None
	Manufactu.e two each test unit for bomb door.	78½	None
All three aircraft for fire-power demon-stration.	Manufacture four each pylon brace adapters, two inboard, two outboard. Organization furnishing one inboard, one outboard and one napalm tank for physical dimensional fitting.	14¾	One each welding rod 6800-304104. Paint 7300-511000, three quarts.

Project APG/TAT/122-A

This project has been distributed in accordance with standard Air Proving Ground Command distribution lists numbers 1 and 17. Any inquiries with regard to distribution should be directed to The Commander, Air Proving Ground Command, Eglin Air Force Base, Florida, attention: DCS/O-TR.

AF-Eglin AFB, Fla.

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

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

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~~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

atch 2