DEPARTMENT OF THE AIR FORCE
AIR FORCE HISTORICAL RESEARCH AGENCY (AFHRA)
MAXWELL AIR FORCE BASE, ALABAMA

July 23, 2009
FOIA 09-01921-F
RFI # 2009-64981

AFHRA/RSA
600 Chennault Circle
Maxwell AFB, AL 36112-6424 USA

Mr. John Greenewald, Jr.
[redacted]

Dear Mr. Greenewald,

I have researched our archive in response to your request under the Freedom of Information Act pertaining to the document with call number MICFILM 31795, IRIS number 01014337, RASCAL (MX-778B). As a Freedom of Information Act request, it has been designated 2009-01921-F. The request for information number assigned by AFHRA is 2009-64981.

I have copied and enclosed the requested document.

Please be advised that under the Freedom of Information Act you can be charged $.15 per page copied. The first 100 pages are provided to you for free. However, the document was 129 pages. The additional 29 pages will equal a balance due of $4.35. Please send a check or money order payable to AFO MAXWELL AFB. Mail the check or money order to: AFHRA/RSA
ATTN: For FOIA
600 Chennault Circle
Maxwell AFB, AL 36112-6424

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It is my pleasure to give you any information we have and my sincere hope that the information provided serves you well.

Respectfully,

Cathy Cox

Cathy Cox, Archivist
AFHRA/Research

Enclosure:

1. Copy of original request
2. Copy of document with IRIS # 1014337

FOIA 2009-01921-F
RSA# 64981

Dear Sir,

This is a non-commercial request made under the provisions of the Freedom of Information Act 5 U.S.C. S 552. Pursuant to the U. S. OPEN Records Act of 2007, my FOIA requester status as a "representative of the news media" -- a status entitling me to an unlimited search processing my request, and the first 100 pages free of charge. For examples of my various publication credits in this regard, I refer you to my radio network, and my own personal radio show (syndicated on FM and AM stations) at http://www.blackvaultradio.com. My internet website http://www.theblackvault.com which holds a vast government document database, along with many freelance articles that I have written, which have also been published in magazines and websites, including OpEdNews.com, UFO Magazine, FATE Magazine, and others.

Additionally, I agree to pay only up to ten dollars for the requested material.

I respectfully request a copy of the following document:

IRIS Number: 01014337

Title: RASCAL (MX-776B)

Call: MICFILM 31795

If the document is considered currently and properly classified, I respectfully request a mandatory declassification review (MDR) of the document, as it is more than 25 years old and should be considered for declassification.

Thank you so much for your time, and I am very much looking forward to your response. Please know that electronic delivery of the requested material or correspondence related to this case is preferred and accepted in lieu of paper copies via snail mail.

Sincerely,

John Greenewald, Jr.

[redacted]

3-2-11 Rascal (MX-776B)

1014337

CONFIDENTIAL

CONFIDENTIAL

129 pages

SECRET

SECRET
AUTH: CG AFMTC
INIT: WLK/B/
DATE: 2 Jul 52

HEADQUARTERS
AIR FORCE MISSILE TEST CENTER
Patrick Air Force Base
Florida

SUBJECT: (Unclassified) Minutes of RASCAL Program Conference

TO: Commanding General
Air Research and Development Command
ATTN: Deputy for Development (RDDS)
Post Office Box 1395
Baltimore 3, Maryland

1. Reference:

a. Letter (Secret) from Hq ARDC, (RDDS), to CG, AFMTC subject as above, 19 May 1952.

b. Letter (copy inclosed) CG, AFMTC to CG, ARDC, subject: Personnel Support for Guided Missile Activities at AFMTC, 23 June 1952.

2. AFMTC concurs with RASCAL Program Conference Minutes as transmitted with reference 1.a., subject to remarks in following paragraphs.

3. On the general subject of personnel support, reference 1.b., (Incl 1. herewith) applies. Specifically, with respect to RASCAL, Solution I can be partially implemented at this time. Currently this Center is maintaining the two B-50 RASCAL project airplanes assigned to Holloman AFB. During December 1952 this Center will start flying and maintaining two B-50 and three F-80 aircraft in conjunction with the RASCAL guidance training program with 6555th Guided Missile Wing at Holloman. It will be possible at that time to operate the two RASCAL B-50 project aircraft in addition to the B-50/F-80 guidance aircraft provided the trained crews are not drafted for service elsewhere. Current plans call for expanding the B-50/F-80 cadre to a point where unit training can be accomplished. By January 1954 the B-50/F-80 training cadre will be up to 17 officers and 102 airmen. To carry out the intent of Solution 1, it would be necessary to augment this cadre by adding 17 officers and 73 airmen for a total of 34 officers and 175 airmen. The B-50/F-80 cadre would then be capable of doing unit training as well as providing military

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ARDC 55-421

test crews. These military test crews would not completely replace the contractor's field test crew. It is expected that the contractor would still maintain technical responsibility and would have key individuals in the field.

4. This Center cannot provide for the necessary personnel to fly or maintain the B-47 and B-36 RASCAL carriers. This problem can be solved by either of the following means:

a. Increase of military and/or civilian personnel manpower ceiling to provide for additional spaces needed and sufficient manning priority recognized by both Hq ARDC and Hq USAF to insure the availability and retention of the required flight crews and maintenance personnel, to meet the Program Schedule.

b. SAC to furnish all maintenance and flight crew personnel.

5. To make flight operations feasible at Holloman AFB, funds must be provided in the amount of $964,000 in order to lengthen, widen, and re-surface one of the existing runways. To meet the requirement for re-surfacing a runway by February 1953 necessary for the B-50/B-63 operations, $200,000, as indicated in Par. 4 a. below, can be provided by re-programming AFMTC FY 52 funds. The remaining $764,000 required by January 1954 for widening and extending a runway, as indicated in paragraphs b. and c. below, should be provided from the Air Force FY 53 budget. Assuming that the longest runway, 8,400 x 150 feet, is selected for modification, the following is an estimated breakdown of the cost involved:

a. Re-Surfacing - $200,000.00. As brought out in the Minutes, existing runway surfaces are rolling and rough. Clearance of RASCAL during B-50/B-63 operations is so marginal that possibility of severe damage to missile and/or danger to the lives of the aircraft crews make re-surfacing desirable.

b. Widening - $364,000.00. This cost estimate is for the widening of the 8,400 ft. runway from 150 ft. to 250 ft. It is agreed that runways must be widened to 250 feet to keep the outboard engines of the B-47 aircraft inside the limits of the runways, and for operations of B-36 VHB aircraft.

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c. Lengthening - $400,000.00. This cost estimate is for lengthening of 8,400 ft. runway to 10,000 ft. at a width of 250 ft. The length of runway discloses that the shortest runway that can be used for the normal B-47B with J-47-25 engines at 100°F, 4,000 ft. altitude and 145,000 lbs. gross weight, water injection and 18 JATO bottles is about 8,000 ft. Considering a margin of safety to account for the abnormal configuration with the RASCAL carried externally and the possibility of optimistic estimates for the J47-25 engines, 10,000 ft. of runway is required.

6. The plan outlined in Par 5 above is not the optimum solution. A new runway, 10,000 by 300 ft. must be provided at a location farther away than existing runways from the housing and technical areas of the base to support the FALCON, NIKE, TERRIER, and other programs requiring drone operations. Request for funds for the drone runway, taxiways and aprons is being submitted in the Holloman FY 54 budget in the amount of $4,860,000. A savings of $764,000 can be realized if a new 10,000 by 300 ft. runway is provided for both drone operations and RASCAL flight tests prior to January 1954, and all items in Par. 5 above except the resurfacing are eliminated. This is the recommended action and the funds required will total $5,060,000 to be made available immediately.

7. It is emphasized that development test requirements (Phase I - VI) must be known as soon as possible in order to allow this Center sufficient time for planning, programming, and procurement to meet requirements vital to the development test program. Accordingly, it is recommended that test diredtives be issued, in accordance with ARDC Reg. 11-3, as soon as possible on the B-62 development testing.

1 Incl:
cy Ltr CG AFMTC to
CG ARDC 23 Jun 52

WILLIAM L. RICHARDSON
Major General, USAF
Commanding

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HEADQUARTERS
AIR FORCE MISSILE TEST CENTER
Patrick Air Force Base
Florida

Office of the Commanding General 23 June 1952

SUBJECT: Personnel Support for Guided Missile Activities at Air Force Missile Test Center

TO: Commanding General
Air Research and Development Command
Post Office Box 1395
Baltimore 3, Maryland

1. Due to diverse concepts regarding the nature and extent of the personnel support which this Center should provide for contractor assistance, for Phase testing and for tactical training, and to conflicting requirements within those areas and between those areas and the range operations and maintenance and base support areas, difficulties have developed which require early resolution at a higher level.

2. Those agencies within WADC, Hq ARDC, and Hq USAF which are primarily interested in contractor success in the materiel development of guided missile systems are desirous of utilizing military personnel to (1) operate and maintain the Florida and New Mexico Missile Test Ranges and contractor support facilities, and (2) replace contractor personnel and thus save R&D funds for application to hardware development. Those agencies which are primarily interested in tactical matters are desirous of utilizing military personnel in contractor operations for training purposes only, for Phase testing which has tactical implications, for tactical experimentation and tactical unit training and manning. R&D contractors for the most part find that involving military personnel in any part of their R&D effort complicates and hinders that effort.

3. This Center has inadequate personnel to meet all these requirements. On the basis that the flight test ranges and supporting facilities and services must take first priority for manning, it will shortly be necessary to severely curtail our training activities and personnel support commitments in order to provide the necessary personnel spaces, personnel, facilities, equipment and services.

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MTG, AFMTC: Personnel Support for Guided Missile Activities at AFMTC

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4. Further discussion follows:

a. This Center agrees that it is highly desirable from a theoretical standpoint, to utilize Air Force personnel in lieu of missile contractor personnel to a considerable extent in flight test programs, in order to:

(1) Avoid delays in attaining operational effectiveness, by training Air Force personnel while the materiel is still in the research and development stage.

(2) Save funds, particularly research and development funds, by consolidating functions (such as the operation and maintenance of aircraft) and performing them with personnel whose salaries are not paid by the missile contractor from R&D funds.

(3) Maintain military control over and obtain the best results from Phase testing.

b. From a practical standpoint, however, there are serious difficulties which this Center has already encountered. Unless these practical difficulties are eliminated, the theory collapses and an emergency results. The principal practical difficulties as they pertain to AFMTC are:

(1) A significant deficiency in AFMTC personnel (military and civilian) to meet current commitments, which forces this Center to avoid new and additional commitments. This deficiency is in both the quantity and quality of personnel available. It results from inadequate authorizations, lack of properly trained or qualified individuals, and a high turn-over rate particularly in military personnel.

(2) Inadequate facilities, supplies and equipment, which further reduces the efficiency of the personnel available.

(3) Natural reluctance of a missile contractor to rely on an Air Force trainee, over whom he can exercise little or no authority, to perform tasks which are important to the advancement of the contractor's program.

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(4) Natural, and partially justified, tendency of missile contractors, when optimum program objectives are not attained, to lay the blame on the Air Force for not making good its commitments.

(5) A strong desire on the part of missile contractors to completely separate training activities from R&D activities.

(6) The belief of a number of key individuals in ARDC and USAF that the only solution to AFMTC personnel problems is to contract for the performance of some functions. This solution can be applied in the case of missile contractors by requiring them to provide all personnel required for the assembly, check-out and flying their missiles, and for manning and maintaining all the equipment (including manned aircraft) used by each contractor for his exclusive purposes.

5. In view of the above, it is recommended that ARDC:

a. Adopt the policy of providing military participation in AFMTC flight test programs to the extent necessary to secure maximum training benefits from such participation. A necessary prelude to such participation is specialized training of some individuals in ATRC and the contractor's factory.

b. Adopt a policy of operating and maintaining all aircraft utilized at AFMTC by contractors engaged in flight testing in order to conserve contract R&D funds.

6. It cannot be too strongly emphasized that implementation of either or both of the above policies is contingent upon ARDC:

a. Providing to AFMTC the personnel authorizations necessary. (Approximately 1000 military and 1300 civilian additional by FY 54).

b. Securing properly trained military personnel when such are required for 5 a and b, and assure a high degree of stability of all military personnel.

c. Providing facilities, equipment and spare parts.

d. Making specific contractual provisions with each

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MTG, AFMTC: Personnel Support for Guided Missile Activities at AFMTC.

contractor with respect to 5a and b above, with view of minimizing difficulties, assigning specific responsibilities between the USAF and the contractor, and providing for simple and practical adjustment procedures when either is unable to fully live up to its commitments.

WILLIAM L. RICHARDSON
Major General, USAF
Commanding

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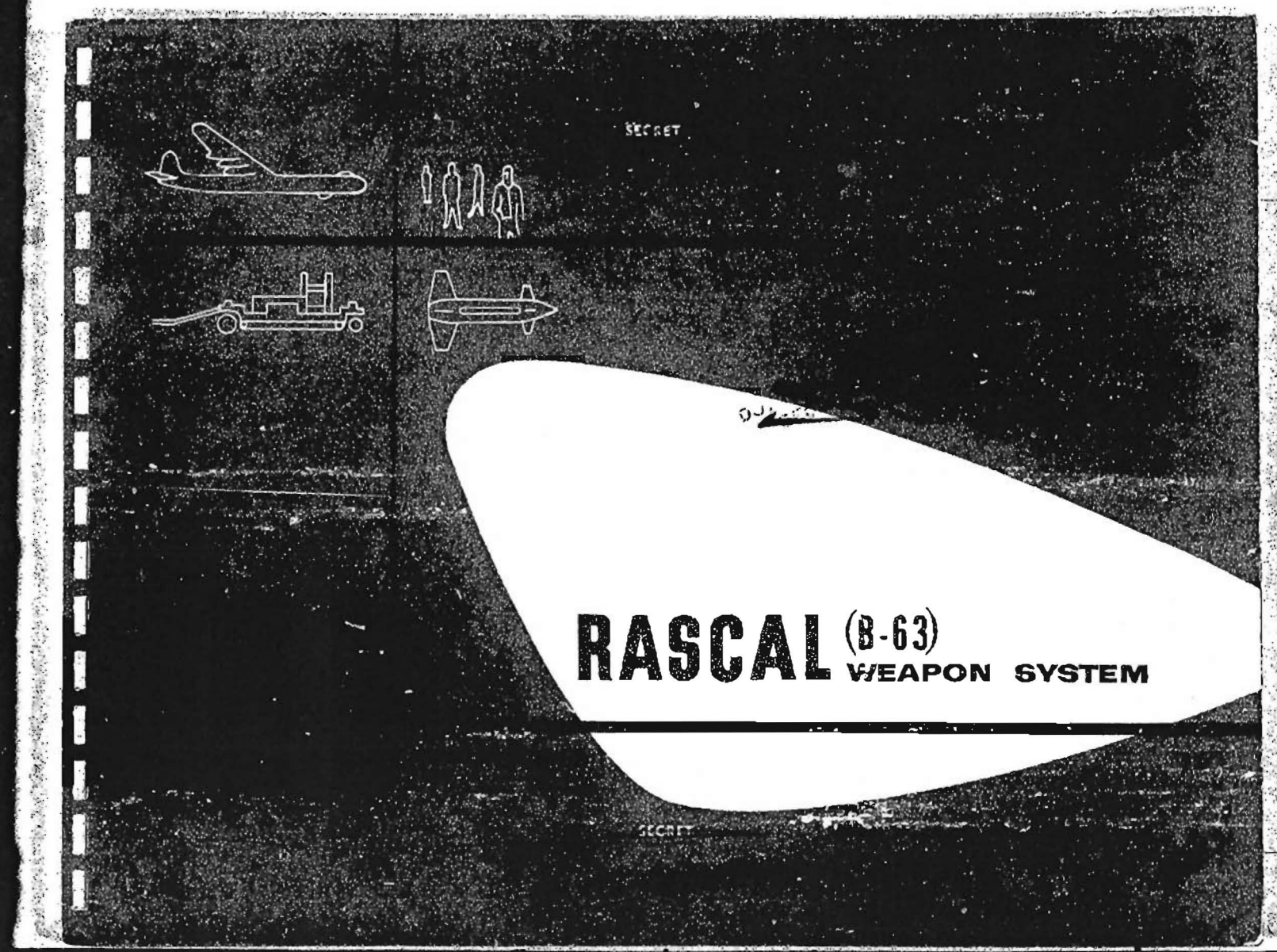
HADC 59-421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RASCAL (B-63)
WEAPON SYSTEM
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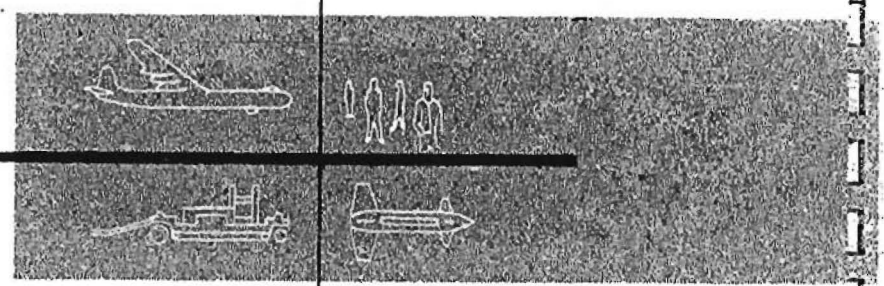

BELL Aircraft CORPORATION REPORT NO. 62-989-005 DECEMBER 1953

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SECRET

VISUAL AIDS

DESCRIPTION OF SLIDES

Slide #1 — Exterior View of Shrike Missile

Slide #2 — Exterior View of Rascal Missile X

Slide #3 — Dimensional View of Rascal X

Slide #4 — View of Rascal Mounted on B-36

Slide #5 — View of Rascal Mounted on B-47

Slide #6 — Diagram of Flight Path of Rascal X

Slide #7 — X-Ray View of Rascal Showing Locations of Guidance Equipment

Slide #8 — View of PPI Presentation in Director X

Slide #9 — X-Ray View of Rascal Showing Locations of Servo Equipment

Slide #10 — View of Power Plant by Itself

Slide #11 — View of Aft End of Rascal Showing Power Plant Mounted

Slide #12 — X-Ray View of Rascal Showing Locations of Fuel & Oxidizer Tanks

Slide #13 — X-Ray View of Rascal Showing Location of Warhead Compartment

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RASCAL (B-63)

WEAPON SYSTEM

PROJECT MX-776

OS-1

FOREWORD

This report presents a brief description of the Rascal (B-63) Weapon System being developed by the Bell Aircraft Corporation for the United States Air Force.

The Rascal program began as a missile feasibility under Project MX-776.[1] Originally conceived as a subsonic air-to-surface missile to be launched from bombardment aircraft, Rascal is now a long-range strategic weapon system employing a supersonic air-to-surface pilotless parasite bomber.[2]

The Rascal program is well into the hardware stage.[3] XB-63s are being flight-tested, director aircraft and support equipment are in use, and training programs are being planned.

[1] [illegible]

RASCAL

WEAPON SYSTEM DESCRIPTION

The mission of the Rascal Weapon System is to carry out air-to-surface bombardment of strategic targets without exposing the bombardment aircraft to the local defenses of the target.

The Rascal Weapon System comprises four principal types of equipment:

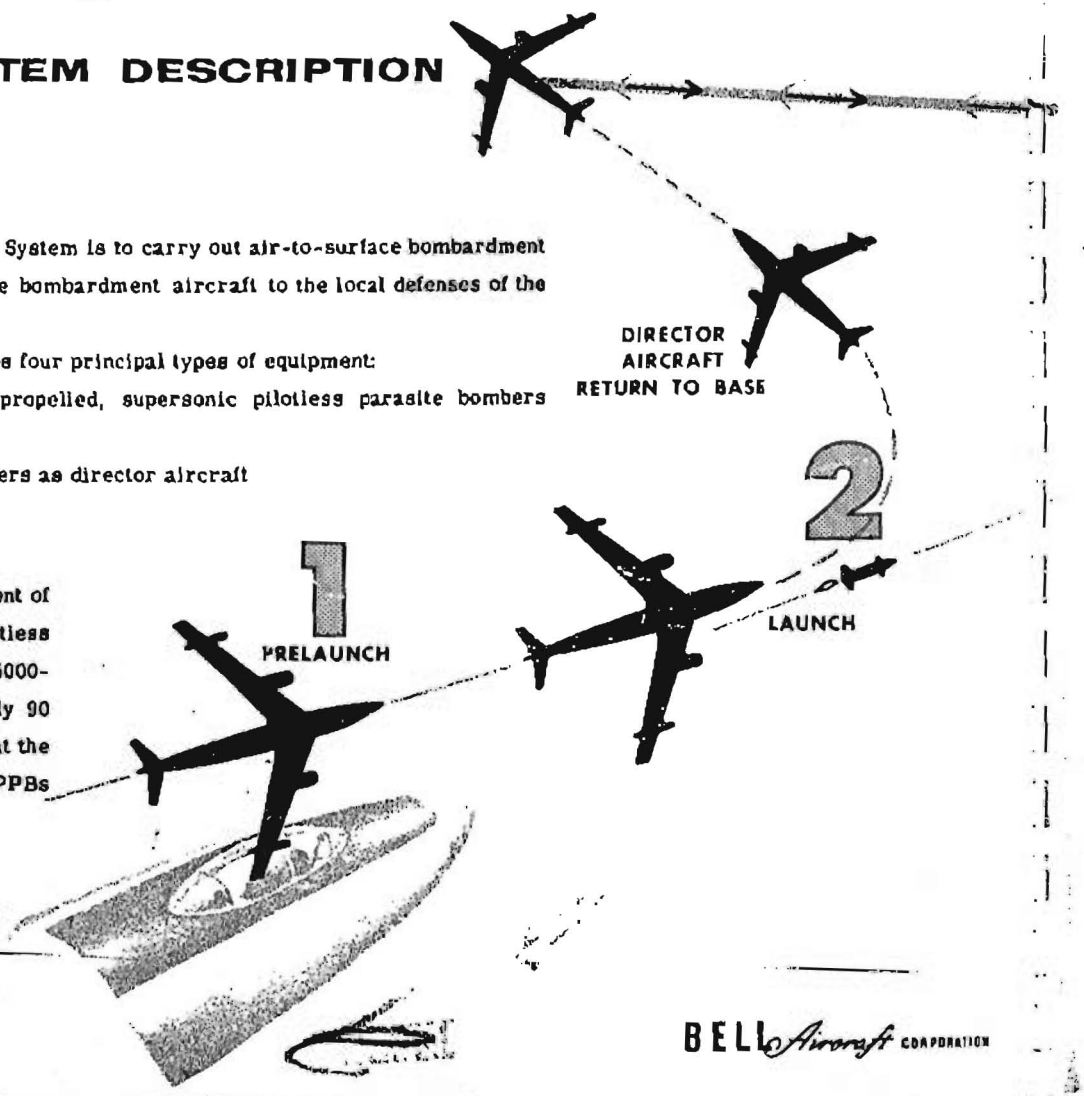
(1) Guided, air-to-surface, rocket-propelled, supersonic pilotless parasite bombers (PPBs)

(2) Medium or heavy strategic bombers as director aircraft

(3) Ground support items

(4) Training aids

Designed as an all-weather instrument of combat, the Rascal weapon can deliver pilotless parasite bombers with either a 3000- or a 5000-pound warhead to a target approximately 90 nautical miles from the director aircraft at the time of launching.[4] Fifty percent of the PPBs launched will have a CEP of 1500 feet.*



* CEP data for a PPB range of 75 nautical miles.

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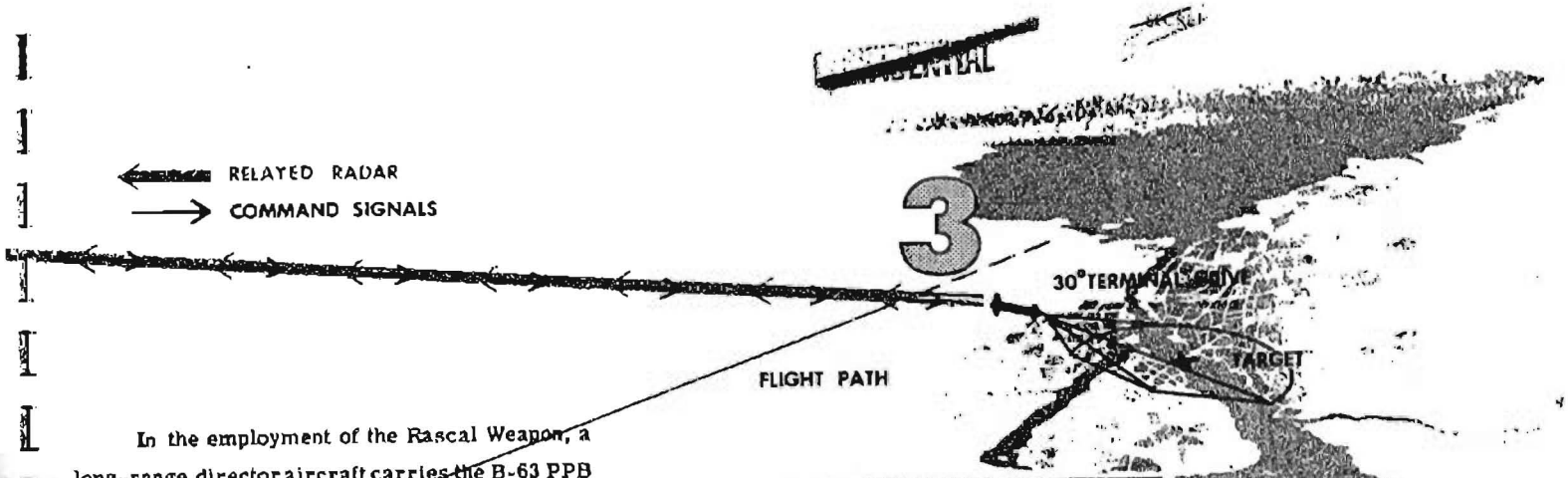
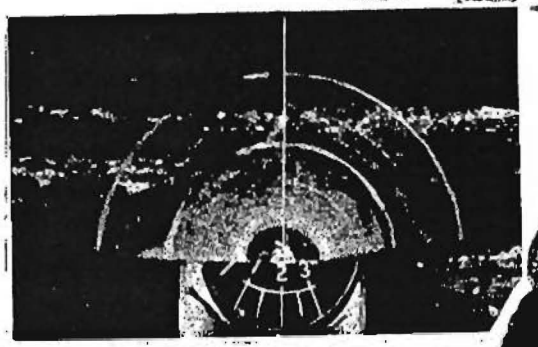
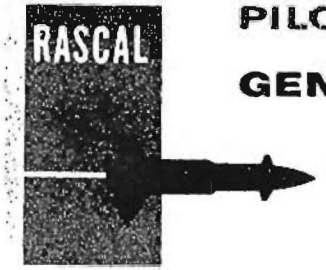


In the employment of the Rascal Weapon, a long-range director aircraft carries the B-63 PPB to a predetermined altitude and a geographical position (1). After initial speed and range-to-go have been fed into its guidance system, the PPB is automatically launched on its proper heading toward the target and the director aircraft begins its return to home base (2). The inertially guided PPB accelerates to supersonic speeds and follows a pre-established flight path until at a predetermined range from the target the unattended radar system in its nose automatically begins to scan the target area. As this radar system is turned on, the PPB assumes a 30° dive toward the target (3). The radar return of the target area is then relayed, via a radar relay system in the PPB, to the director aircraft and displayed there to enable the guidance operator to command the PPB during its dive to the target (4).



RADAR DISPLAY OF TARGET AREA

GUIDANCE OPERATOR IN DIRECTOR AIRCRAFT

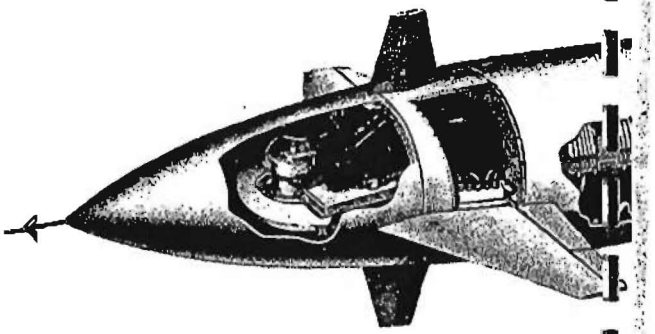


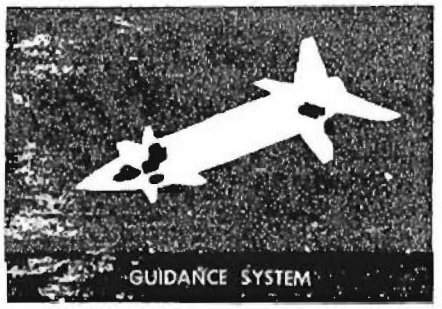
PILOTLESS PARASITE BOMBER
GENERAL ARRANGEMENT

The Rascal Weapon System is based on the ability of the B-63 pilotless parasite bomber to penetrate local defenses of strategic targets with little possibility of being detected or intercepted. Thus, strategic bombers as director aircraft equipped with B-63 PPBs need not approach the target closer than 90 nautical miles, the range of the B-63.

For its specific employment in the Weapon System, the B-63 pilotless parasite bomber comprises four closely integrated component system: (1) a guidance system to direct it to the target, (2) a servo system for flight stabilization and control, (3) a rocket propulsion system to accelerate it to supersonic speeds, and (4) armament for target destruction.

These systems are encompassed by the Rascal airframe which combines a cylindrical semi-monocoque fuselage with a canard cruciform wing configuration.





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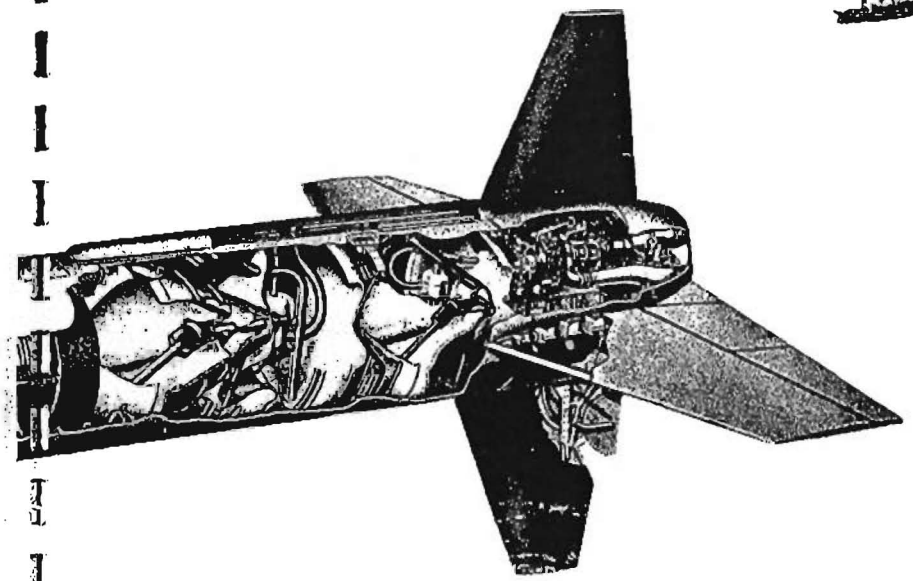
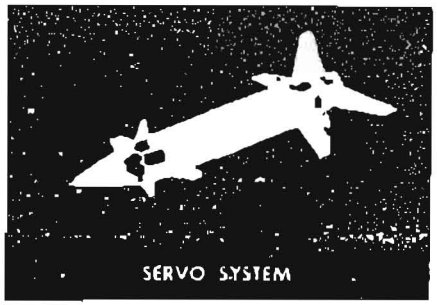
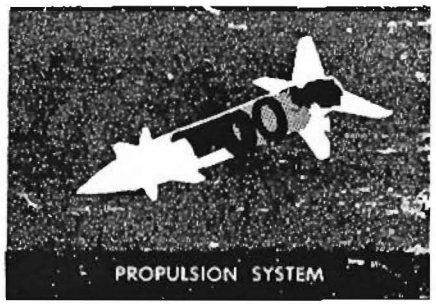
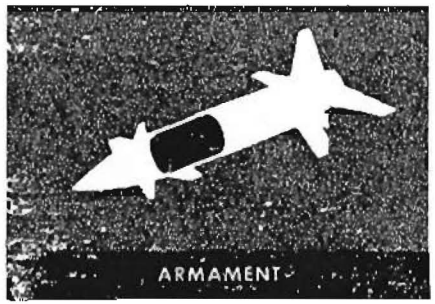



SERVO SYSTEM


PROPULSION SYSTEM


ARMAMENT

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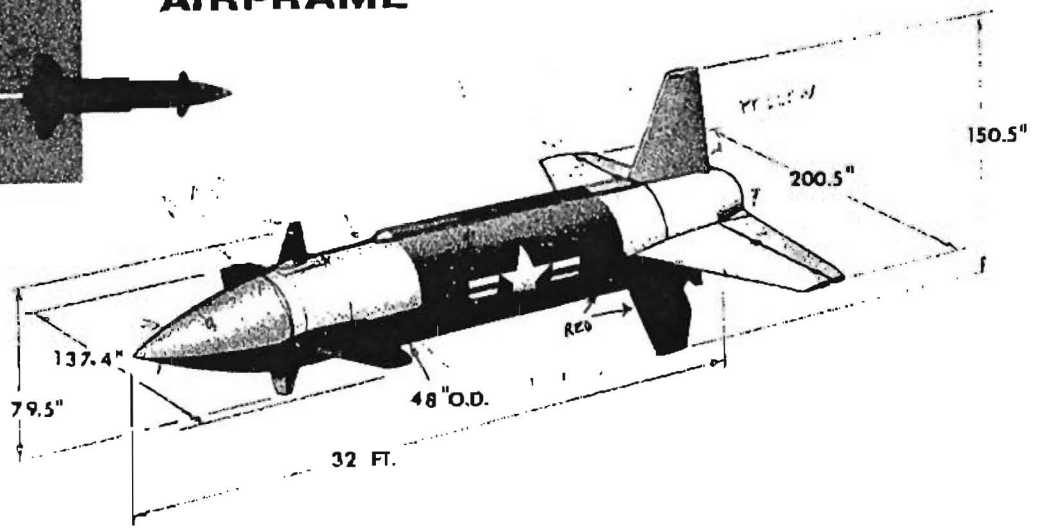
PILOTLESS PARASITE BOMBER AIRFRAME



The B-63 pilotless parasite bomber has an overall length of 32 feet, a body diameter of 4 feet, and a gross weight of approximately 18,500 pounds, half of which is fuel. Structurally, the B-63 consists of five major sections: radome, forward body, warhead compartment, center body, and aft body. These divisions are based on functional requirements as well as component accessibility and ease of shipment.

The radome, a solid laminate ogive, encompasses the unattended search radar, and is attached to the forward body by a splice ring.

Just aft of the radome, the forward body section includes rudders, forward lift surfaces, and elevators, and houses guidance and servo units. Two large doors provide entry to its upper compartment while its lower section is accessible through the warhead compartment.

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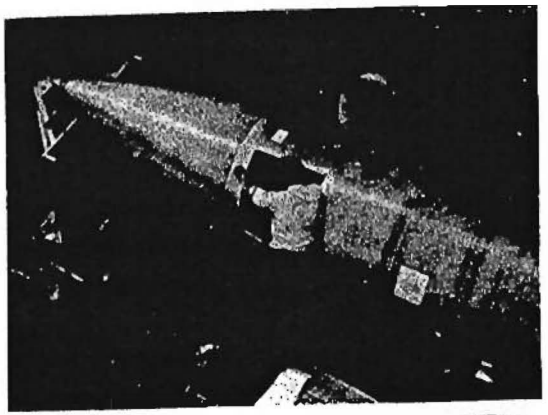
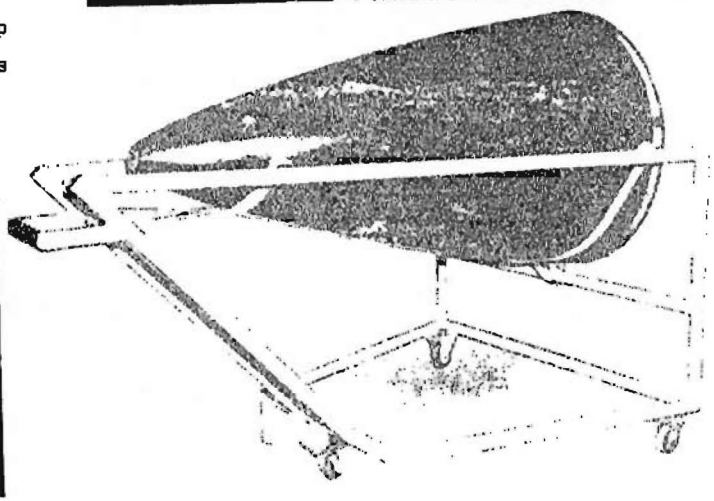
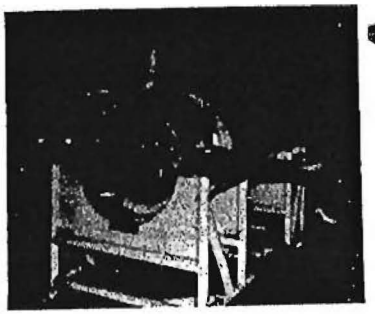
The rudders are solid forgings and the forward horizontal fixed surfaces are tapered skins on a multiweb, beam-type structure. The elevators, because of their thinness, are constructed of welded steel.

The warhead section consists of a fixed upper half and a lower half which serves as a removable structure to facilitate handling and installation of the warhead. A small dorsal door provides access for arming the warhead.

The center body section is a ring-stiffened, aluminum alloy, cylindrical shell with integral oxidizer and fuel tanks compartmented to maintain cg control. Nonstructural tunnels are provided on top and bottom of the body to enclose electrical cordages, as well as propellant, nitrogen, and hydraulic lines.



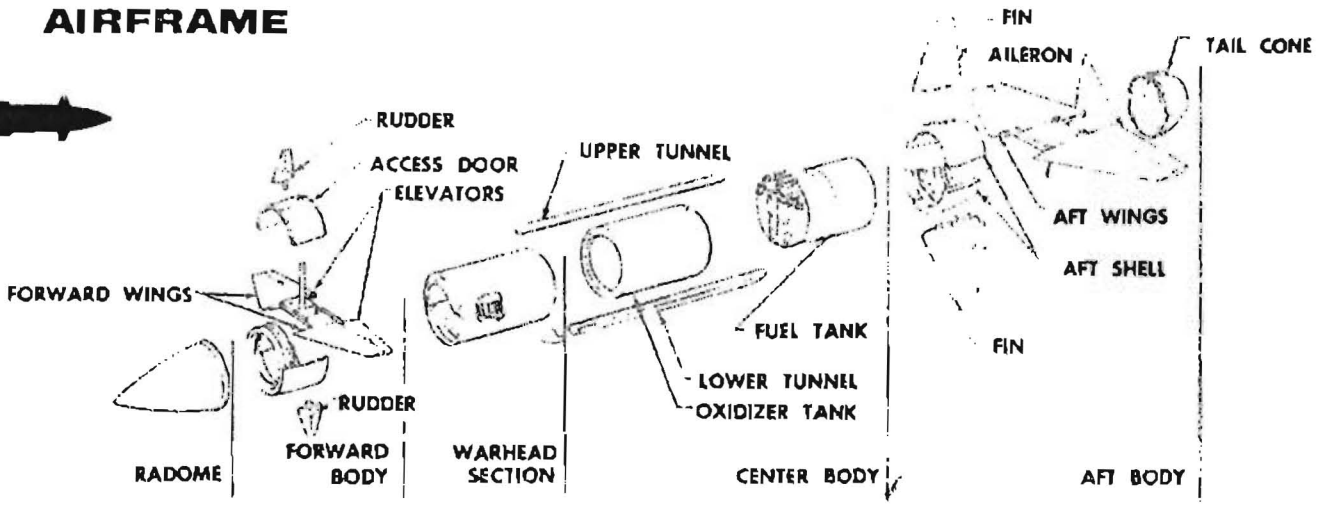




RASCAL

PILOTLESS PARASITE BOMBER

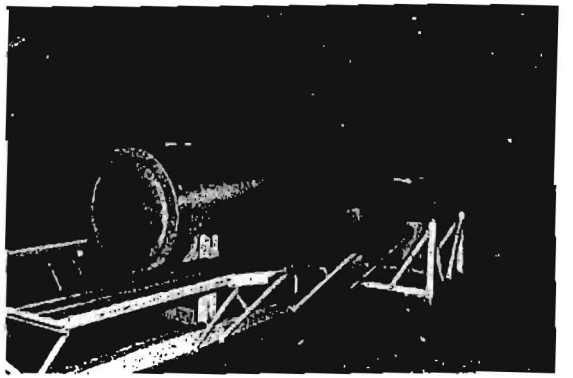
AIRFRAME



Components of the aft body section include the vertical and horizontal wing surfaces, equipment region, power plant, and tail cone. For ground clearance when the pilotless parasite bomber is loaded onto a director or carrier airplane, the lower fin can be folded by a hydraulically operated mechanism; the upper fin can be folded manually should the need arise. A three-chambered rocket engine is mounted on a tubular truss which is attached to, and supported by, the carry-through structure of the aft horizontal wing. The aft portion of the rocket engine is covered by a tail cone attached to the main body by tension bolts.

Launching provisions consist of two forged steel fittings which attach the B-63 to the director aircraft by means of shackle-type hooks. One fitting is located at the forward end of the warhead compartment, and the other is located in a reinforced bulkhead between the propellant tanks.

Structural design load factors are based on two weights, gross (full-launch) weight and weight with 20% propellants remaining at end of midcourse flight.[6,7] Since the prime requirement for maneuverability is during the terminal dive, the design is based on terminal dive weight with steady-state increment maneuvering load factors of ±6g vertical and ±3g lateral. An acceleration-limiting circuit is included in the autopilot to prevent control deflections which would result in excessively high aerodynamic loads.



WEIGHT SUMMARY, XB-63 IN TEST

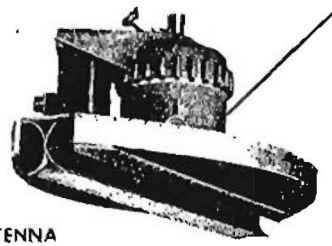
	WEIGHT IN POUNDS	
AFT SURFACES	1016.6	
FORWARD SURFACES	475.1	
BODY	2159.6	
POWER PLANT	864.1	
GUIDANCE SYSTEM	428.2	
SERVO SYSTEM	599.0	
ELECTRICAL	254.5	
INSTRUMENTATION	105.1	
TOTAL WEIGHT EMPTY		5902.9
PAYLOAD *	3000.0	
PROPELLANTS	9747.4	
NITROGEN GAS	91.5	
TOTAL USEFUL LOAD	12,898.9	
GROSS LAUNCH WEIGHT (FULL PROPELLANT LOAD)		18,741.8
WEIGHT (20% PROPELLANTS)		11,295.0

* Structural design also provides for a maximum payload of 5000 pounds

RASCAL

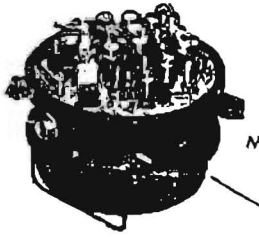
PILOTLESS PARASITE BOMBER

FORWARD GUIDANCE



UNATTENDED
SEARCH RADAR ANTENNA

RADAR SYNCHRONIZER



MODULATOR-POWER SUPPLY

RECEIVER-TRANSMITTER

Guidance of the Rascal weapon is accomplished by a modified K-4 or K-3 navigation system in the director aircraft, an inertial system in the B-63, and a track and command radar relay system, components of which are located in both the B-63 and the director aircraft.[8]

The director aircraft is navigated to the PPB launch point by means of a modified K-series radar system which continuously determines location with respect to known geographical points, computes heading to and distance from the target, provides accurate continuous ground speed, and prepares the foregoing information so that it can be supplied as initial condition data to the inertial system of the PPB when it is launched.

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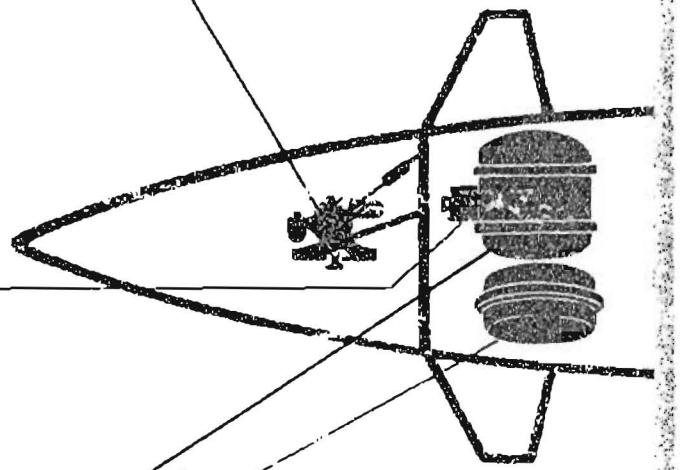
From launch point to the terminal dive point the PPB is guided by a nonemanating inertial system. Components include an autopilot which maintains stability and holds the pre-established course in azimuth, an altitude-sensing circuit to establish the climb to altitude, and a single-axis range computer which measures distance traveled and initiates terminal dive.

As the 30° terminal dive is initiated, the unattended search radar (USR) in the nose of the PPB is automatically activated and scans the area ahead of the PPB over a 150° sector.[9] Radar return from the target and surrounding area, complete with indication of PPB position and heading, is sent to the director aircraft via a microwave link.[10] In the director aircraft, the relayed radar information is displayed on a PPI scope from which suitable data are obtained for PPB flight path corrections.

(By means of a command link,[11] the guidance operator in the director aircraft may, at any time after launch, energize the unattended search radar in the PPB and utilize the relayed video information to check and correct the flight path of the PPB in relation to known check points. The terminal dive can also be initiated through the command link.)



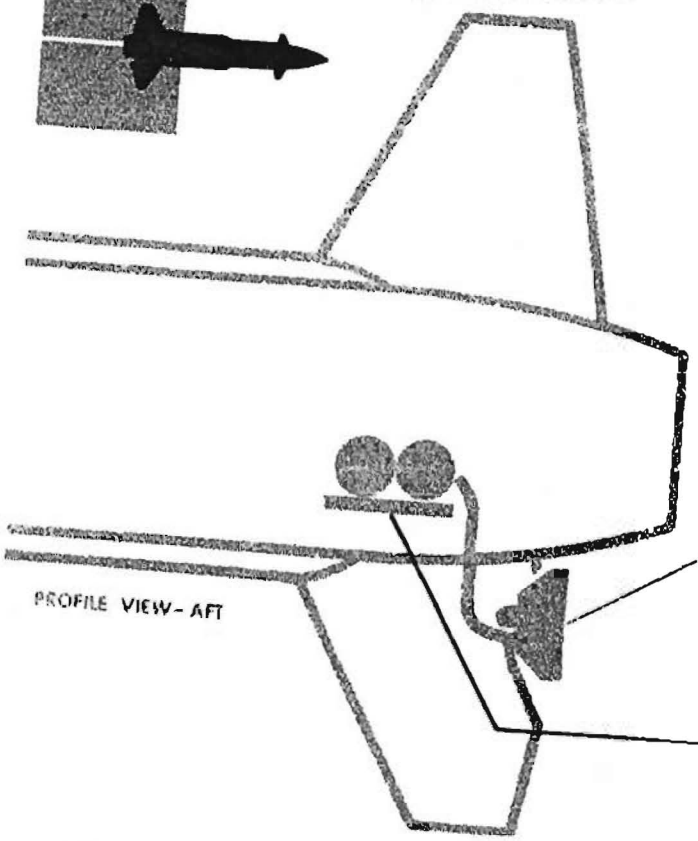
PROFILE VIEW FORWARD

RASCAL

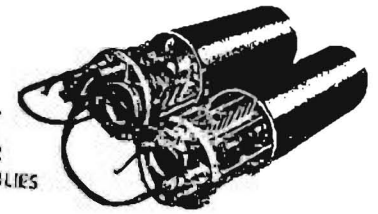
PILOTLESS PARASITE BOMBER

AFT GUIDANCE

After the position of the PPB relative to the target has been ascertained, the guidance operator determines what corrections, if any, must be made to the flight path.[12] Corrections in pitch and azimuth are calculated automatically by simple computers as the guidance operator lines up cursors on the radar display in coincidence with the target. Then, by means of the relay and command equipment in the director aircraft, these corrections are transmitted to the PPB where they override the controlling servo system thereby insuring high-precision target acquisition.

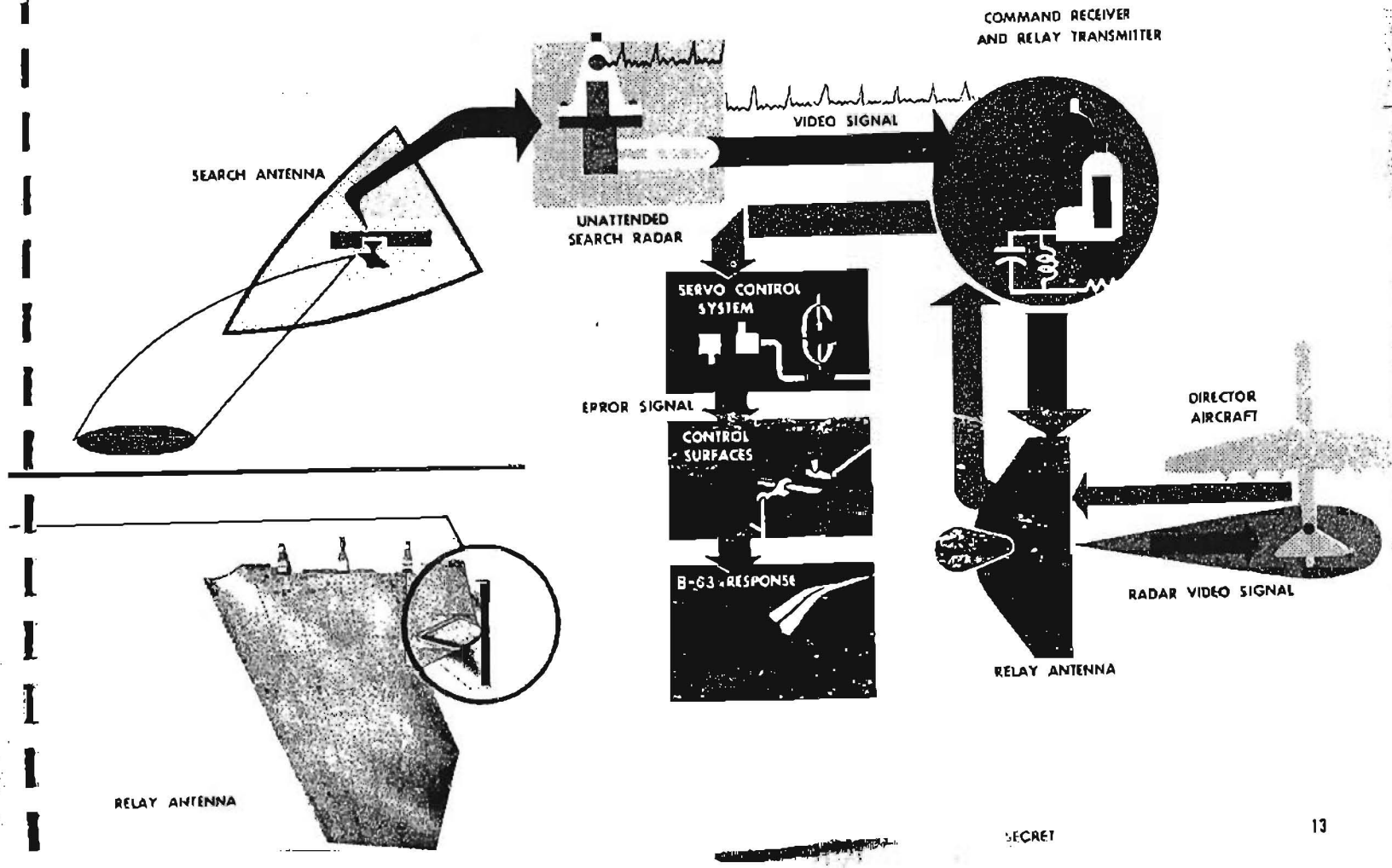


PROFILE VIEW - AFT



RELAY TRANSMITTER
AND COMMAND ASSEMBLIES

BELL Aircraft CORPORATION


COMMAND RECEIVER
AND RELAY TRANSMITTER
VIDEO SIGNAL
SEARCH ANTENNA
UNATTENDED
SEARCH RADAR
SERVO CONTROL
SYSTEM
ERROR SIGNAL
CONTROL
SURFACES
B-63 RESPONSE
DIRECTOR
AIRCRAFT
RADAR VIDEO SIGNAL
RELAY ANTENNA
RELAY ANTENNA

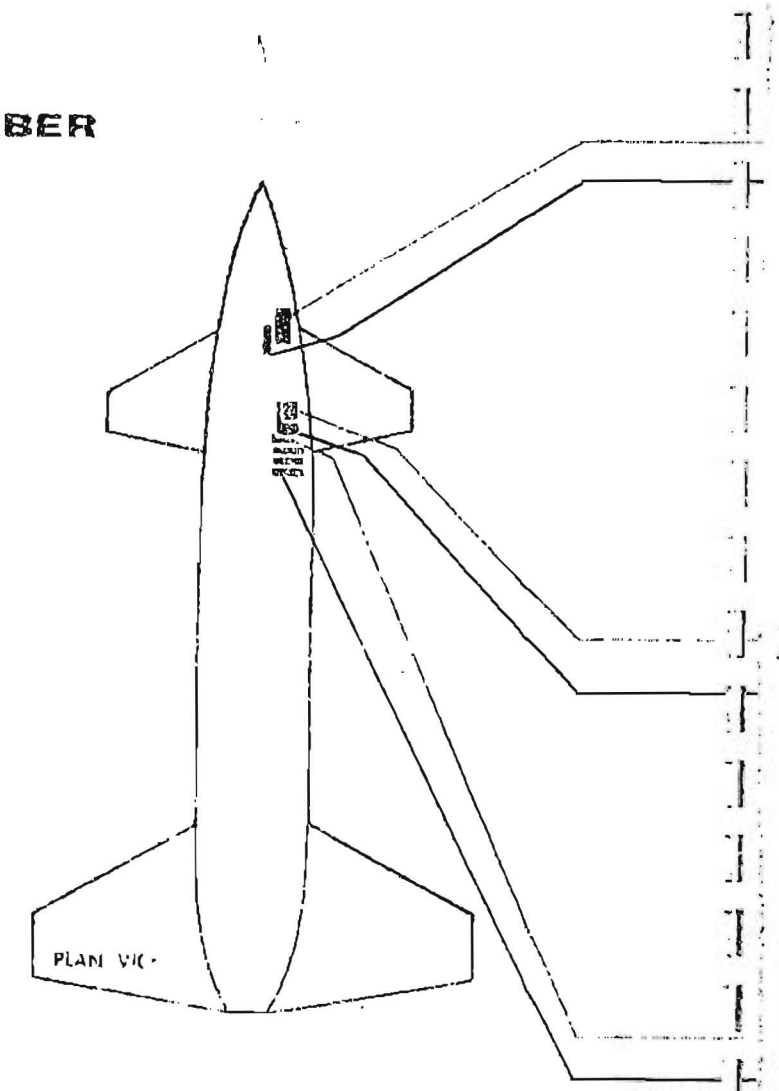
SECRET [redacted]

RASCAL

PILOTLESS PARASITE BOMBER SERVO SYSTEM

Rascal Servo Systems stabilize and maneuver the PPB about its three major axes.[13] In addition, servo-mechanisms are used to maintain the relay antenna of the PPB continuously focused on the director aircraft, to stabilize the unattended search radar antenna, and to provide a pitch-stabilized reference platform for the single-axis inertial system.

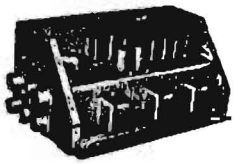
The pitch stable platform provides the vertical reference required for the autopilot and the antenna servos. Since the inertial guidance system utilizes the twice-integrated output of an accelerometer to measure ground distance traveled by the PPB, the attitude of the accelerometer is maintained by the pitch stable platform so that only accelerations along the projection of the flight path in a horizontal plane are measured. Should the normal to the stable platform not correspond to the vertical, an error signal causes the servo control motor to drive the platform to its proper horizontal position.



SECRET [redacted]

BELL Aircraft CORPORATION

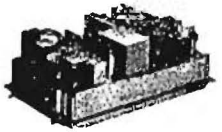
SEARCH ANTENNA
SPIN DRIVE AMPLIFIER



The autopilot uses information from the vertical gyro and the pitch stable platform to maintain pitch and roll stability. To satisfy relay antenna requirements, the PPB is held to minimum roll so that yaw maneuvering is accomplished by flat, skidding turns. In addition to stabilized flight, the autopilot controls the PPB flight path to a predetermined altitude, maintains constant altitude, and obeys the dive signal from the inertial system as well as command-override signals from the guidance operator.

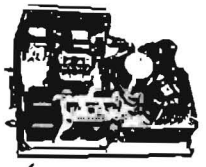
SEARCH ANTENNA PITCH
STABILIZATION AMPLIFIER

PITCH COMMAND MODULATOR

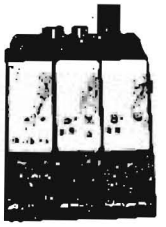


AZIMUTH COMPUTER

The antenna of the unattended search radar (USR) in the nose of the PPB is pitch-stabilized with respect to the stable platform so that uniform coverage of earth's surface ahead of the PPB is obtained. To eliminate the effects of yawing motions of the PPB and to satisfy navigational requirements, the USR antenna is rotated at a constant angular velocity about a vertical axis.



RELAY ANTENNA
PITCH CONTROLER



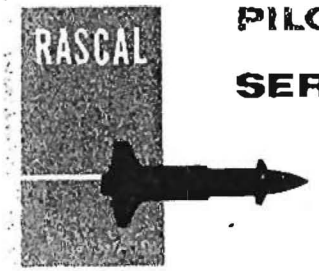
DIVE COMPUTER
AND INTEGRATORS

SECRET

~~CONFIDENTIAL~~

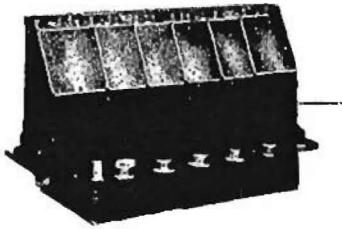
PILOTLESS PARASITE BOMBER

SERVO SYSTEM

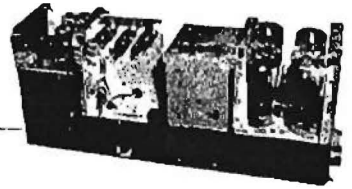


SERVO POWER SUPPLY

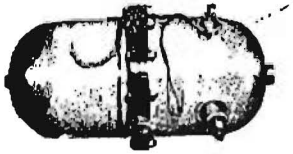
YAW GYRO



SERVO AMPLIFIER INSTALL.



INERTIAL GUIDANCE
POWER SUPPLY



RESERVOIR AND
HEATER ASSEMBLY

INERTIAL GUIDANCE
ACCELEROMETER

PITCH STABLE PLATFORM
AND VERTICAL GYRO

HYDRAULIC PUMP

SECRET

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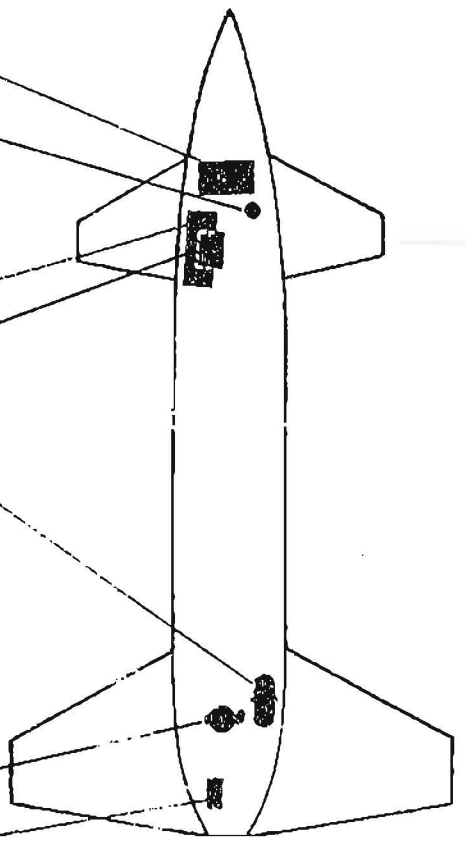
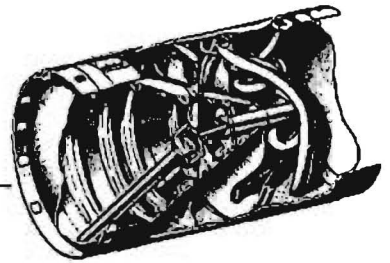
As the B-63 PPB follows the climb, cruise, and dive called for in its flight plan, a servo system stabilizes and orientates the relay antenna which transmits a directed beam of X-band signal to the director aircraft.

An additional function of the servo system is to limit maneuvering accelerations. The design of the pilotless parasite bomber has been based on the requirement that the airframe withstand maximum loads of ±6g in the vertical plane and ±3g in the horizontal plane. So that these values are not exceeded, g-limiting accelerometers are coupled into the servo system. Once the load limit has been reached, accelerometers prevent control surface movement in the direction producing additional load.

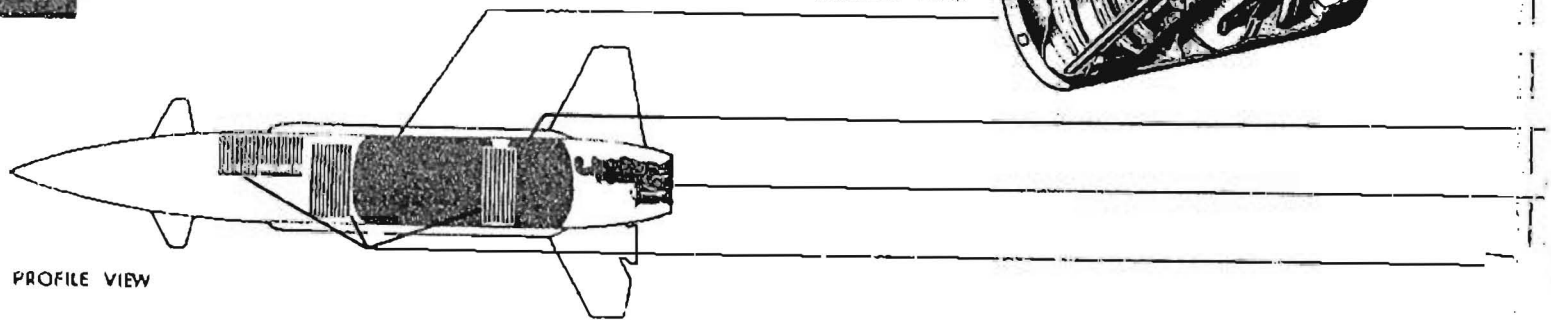


RASCAL

PILOTLESS PARASITE BOMBER PROPULSION SYSTEM

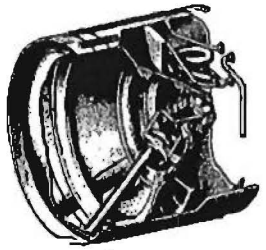


OXIDIZER TANK

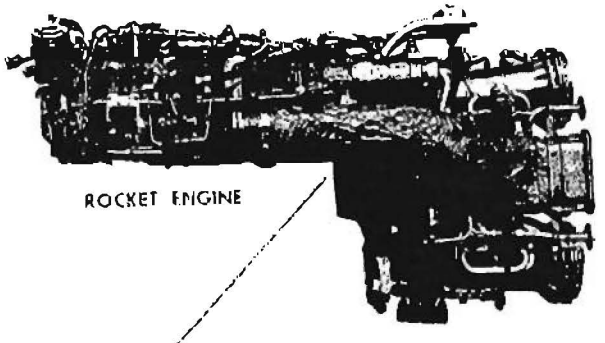


PROFILE VIEW

The B-63 pilotless parasite bomber is powered by a rocket power plant which uses a non-hypergolic (not self igniting) propellant combination, gasoline or JP-4 as fuel and white fuming nitric acid as oxidizer. For ignition, a hydrazine slug precedes the fuel into the combustion chamber to form with the oxidizer a self igniting mixture.



FUEL TANK

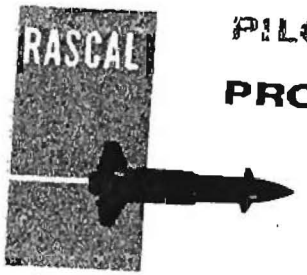


ROCKET ENGINE

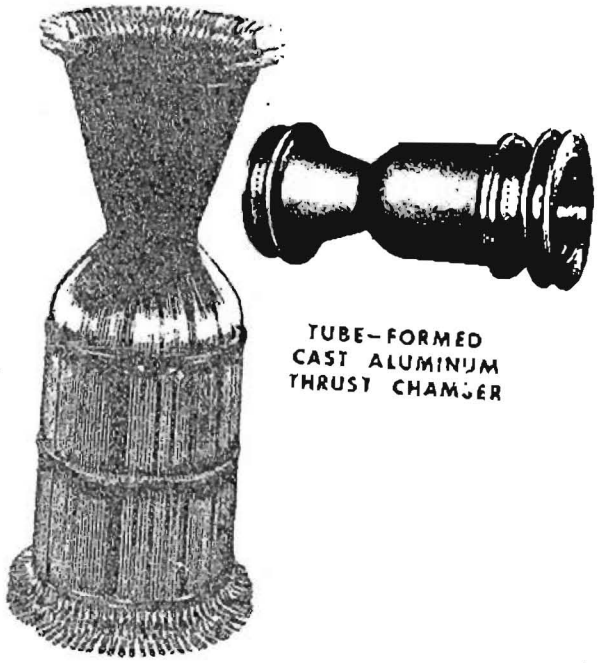
The rocket engine consists of three identical thrust chambers that are regeneratively cooled. Each chamber has a 4000-pound thrust rating at an altitude of 40,000 feet and 500 psi chamber pressure. Other power plant components are the fuel pressurizing system, the turbine pump, and the propellant valves and tanks.

NITROGEN TUBES

SECRET



PILOTLESS PARASITE BOMBER
PROPULSION SYSTEM



TUBE-FORMED
CAST ALUMINUM
THRUST CHAMBER

The propellants are supplied under pressure to the thrust chambers by a turbine pump driven by a gas generator. The gas generator, essentially a small thrust chamber, operates on propellants from the turbine pump discharge. The same propellant supply is used for both the gas generator and the thrust chambers. For starting, however, the propellants are fed to the gas generator from pressurized start-tanks and are electrically ignited. The oxidizer and fuel pumps are located on opposite sides of the turbine wheel and are driven at turbine speed. An alternator and a hydraulic pump are also driven by the turbine through a reduction gear box.

SECRET

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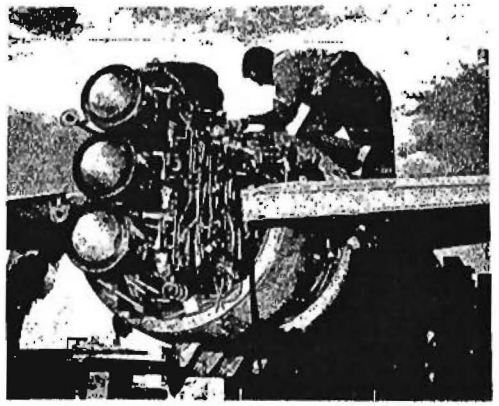
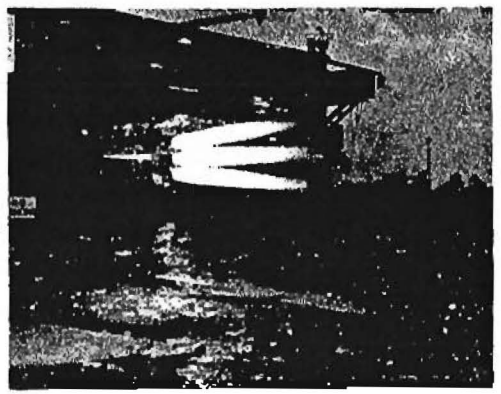
Tube bundles, which store nitrogen gas at 6000 psi, are located between the propellant tanks, in the warhead compartment, and behind the search radar antenna. After undergoing a two-stage reduction, this gas is used to pressurize the propellant tanks to 55 psi, thus supplying propellants under pressure to prevent fuel or oxidizer pump cavitation.

The propellant tanks are integral parts of the airframe and have capacities of 615 gallons of oxidizer and 295 gallons of fuel. Propellant loading is accomplished at high speeds without spillage by means of quick-disconnecting lines in separate, closed propellant systems.

In a typical flight plan, the PPB is launched from the director aircraft with all three thrust chambers operating to accelerate it to supersonic speed. During this boost period the PPB climbs from 40,000 feet and enters the cruise phase at an altitude of 60,000 feet and a Mach number of 2.0. After attaining cruise velocity, two thrust chambers shut down while the third remains in operation and increases PPB Mach number to 2.4 at end of cruise. As the PPB enters the terminal dive, this thrust chamber is shut down, but the turbine pump assembly continues to operate on remaining propellants to supply hydraulic and electrical power to impact.





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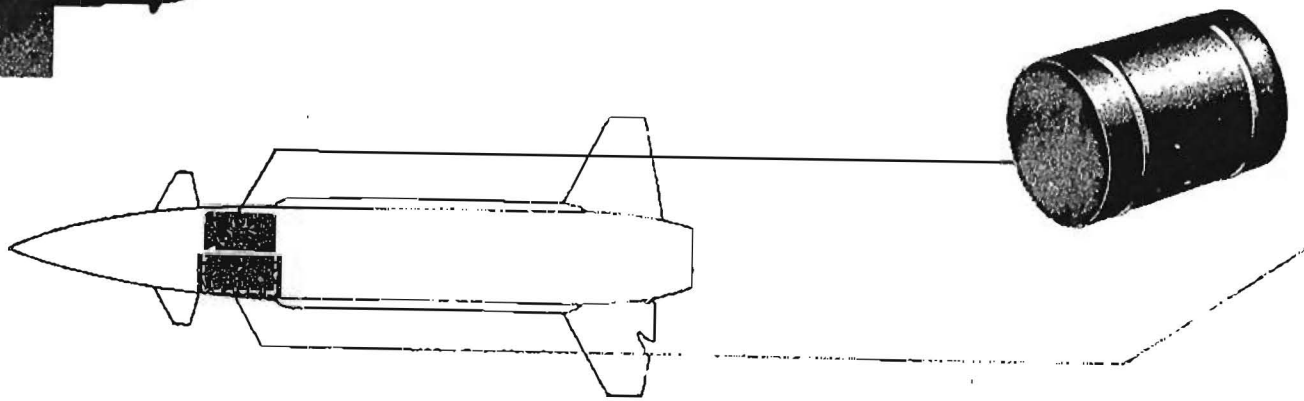
RASCAL

PILOTLESS PARASITE BOMBER

ARMAMENT



The Rascal weapon has been designed to accommodate warheads up to 3000 pounds.[15] Warheads weighing 5000 pounds may be carried as overload. Atomic warheads have the first priority followed by chemical and biological warheads.

The warhead is carried in a section of the B-63 aft of the forward wing and forward of the oxidizer tanks. The lower part of the airframe section serves as a structural door for warhead installation.

SECRET

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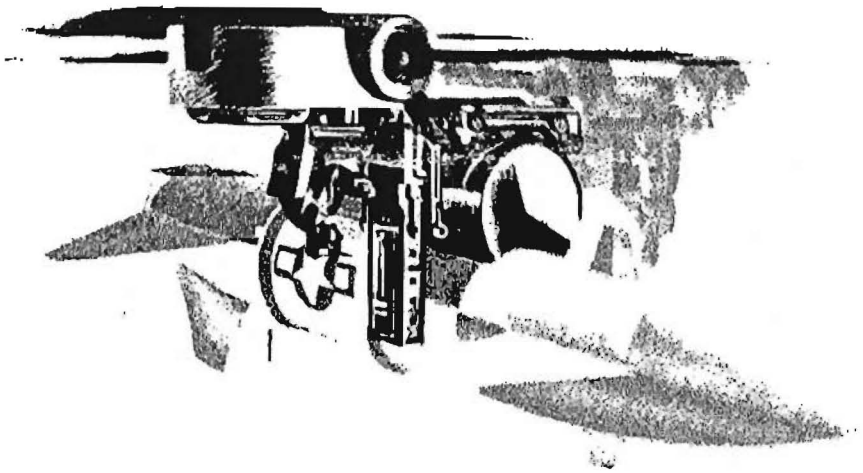
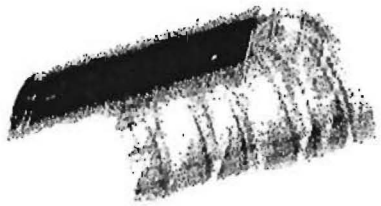
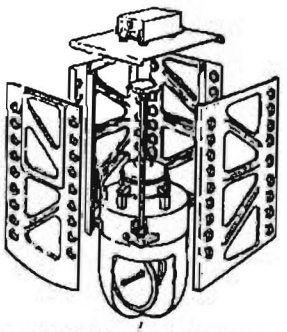


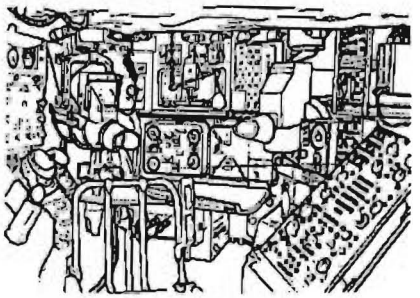


RASCAL

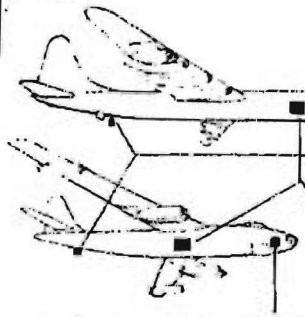
COMPONENT SYSTEMS
DIRECTOR AIRCRAFT

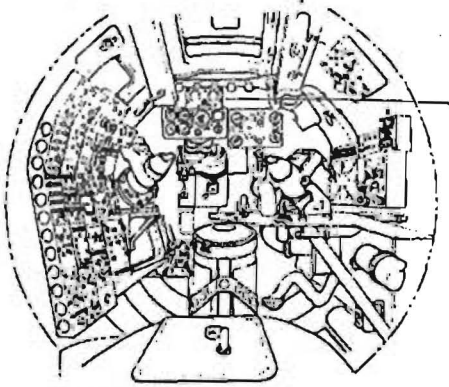


RELAY ANTENNA PACKAGE



OPERATOR'S STATION, DB-36





OPERATOR'S STATION, DB-47

Converted strategic bombers (B-36 and B-47) designated as director aircraft (DB-36 and DB-47) are used to launch and direct RASCAL pilotless parasite bombers.

The primary mission of the director aircraft is to carry the B-63 PPB the maximum possible distance commensurate with the performance characteristics of the director aircraft and PPB combination and to launch the PPB at a speed and altitude which will result in the PPB achieving maximum range.

The B-63 is carried partially within the bomb bay of the DB-36 and is mounted in an attitude so that the angle of yaw and roll is equal to zero, and the angle of attack is as small as possible.[17] When the DB-47 is used as the director aircraft, the B-63 is attached to a spar protruding from the fuselage and is mounted in an attitude so that the angle of yaw is equal to zero, the angle of attack is as small as possible, and the angle of roll does not exceed 13 degrees.[18]

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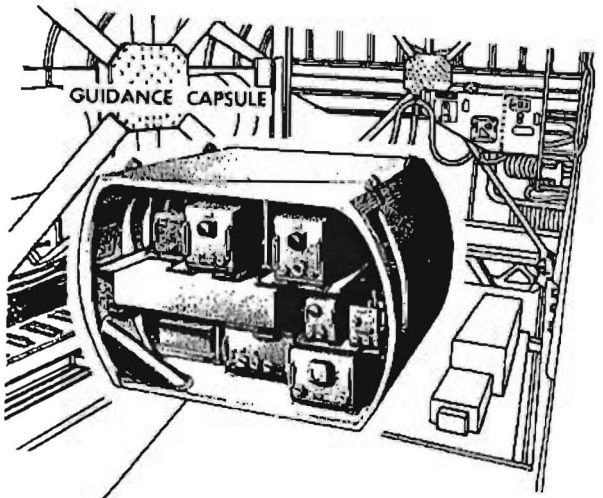


In addition to standard navigational equipment, director aircraft are equipped with: (1) a shock-mounted guidance capsule containing items such as range and elevation computer, automatic sequencer, synchronizer, and power converter; (2) a ventral radome of fiber glass which protrudes aft of the bomb bay and encompasses the command transmitter, relay receiver, and relay antenna: (3) an auto-check system to check quickly and completely the PPB prior to launch; and (4) a terminal guidance control station to correct the flight path of the PPB during its terminal dive to the target.

DB-36

[redacted]
LAUNCHING SPEED M=0.6

[redacted]
LAUNCHING ALTITUDE 42,500FT.

[redacted]
RANGE 2700 N. MILES *

DB-47

[redacted]
LAUNCHING SPEED M=0.8

[redacted]
LAUNCHING ALTITUDE 40,000 FT

[redacted]
RANGE 1750 N.MILES *

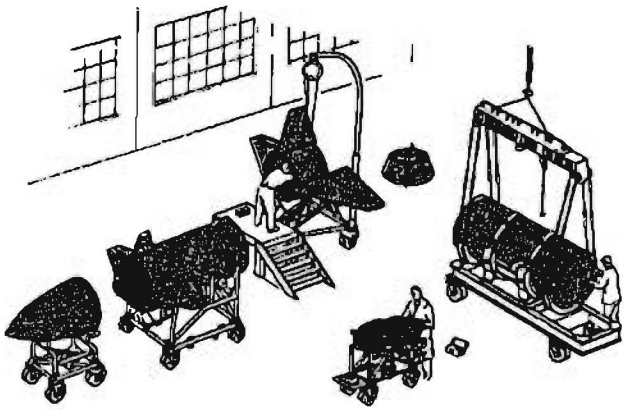
* MISSION RANGE – BASE TO TARGET

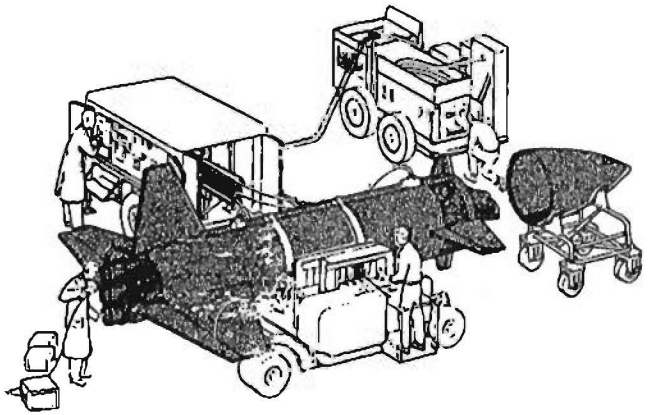
RASCAL

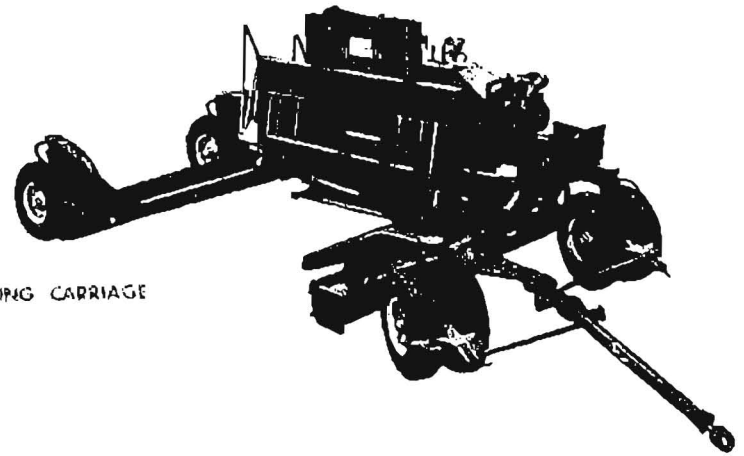
COMPONENT SYSTEMS
GROUND SUPPORT EQUIPMENT

Support equipment, although not an integral part of the PPB or the director aircraft, is the third major element of the Rascal Weapon System. Support units are required in the field to service, repair, and prepare the weapon for its mission as well as to protect personnel and equipment. Equipment is also needed for preflight checkout of various components and control systems of both the director aircraft and the PPB.

Ground support equipment can be segregated into two groups:[19] those items which are standard Air Force Equipment, and those developed especially for the Rascal Weapon. Only major items of the latter are discussed here.

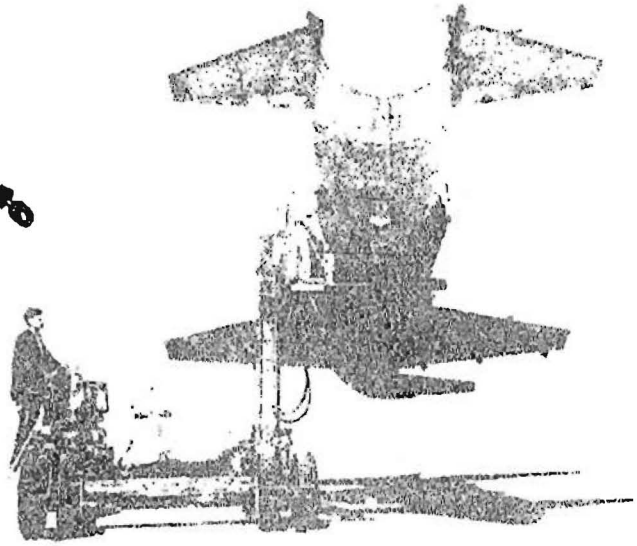






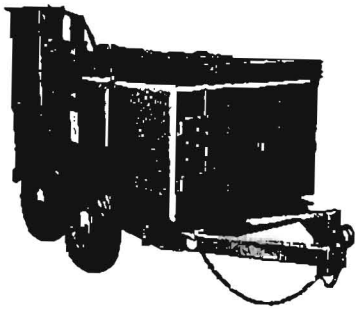
HANDLING CARRIAGE

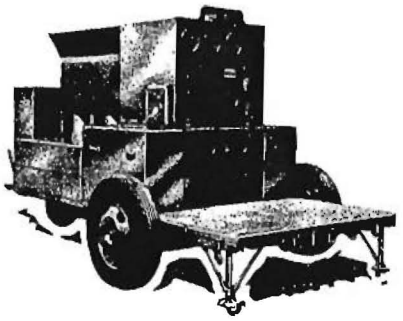
THE B-63 HANDLING CARRIAGE is a side-loading, fork-lift truck capable of picking up a fully loaded PPB and of moving it to any desired position within the limits of travel of its lifting mechanism. The degrees of motion of the B-63 on the carriage are vertical, longitudinal, and lateral translations; pitching and yawing; and rotation about the longitudinal axis.

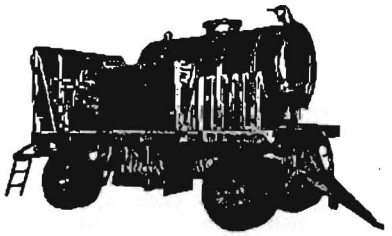


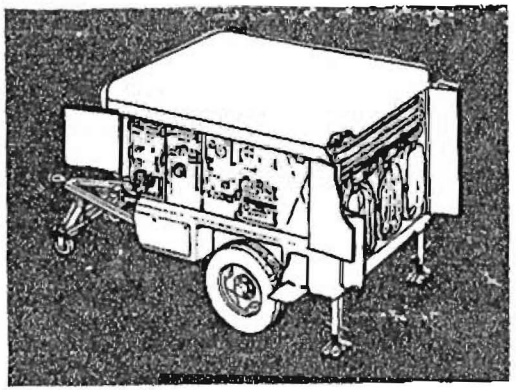
RASCAL

COMPONENT SYSTEMS
GROUND SUPPORT EQUIPMENT





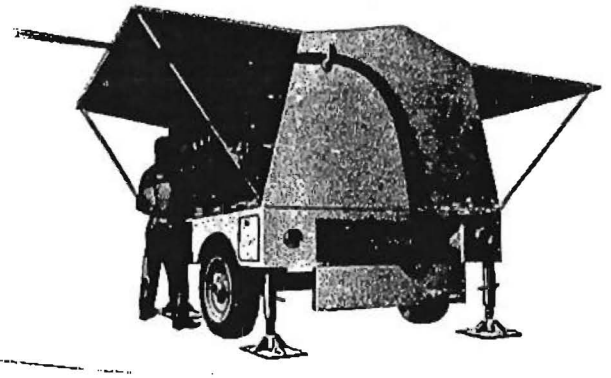


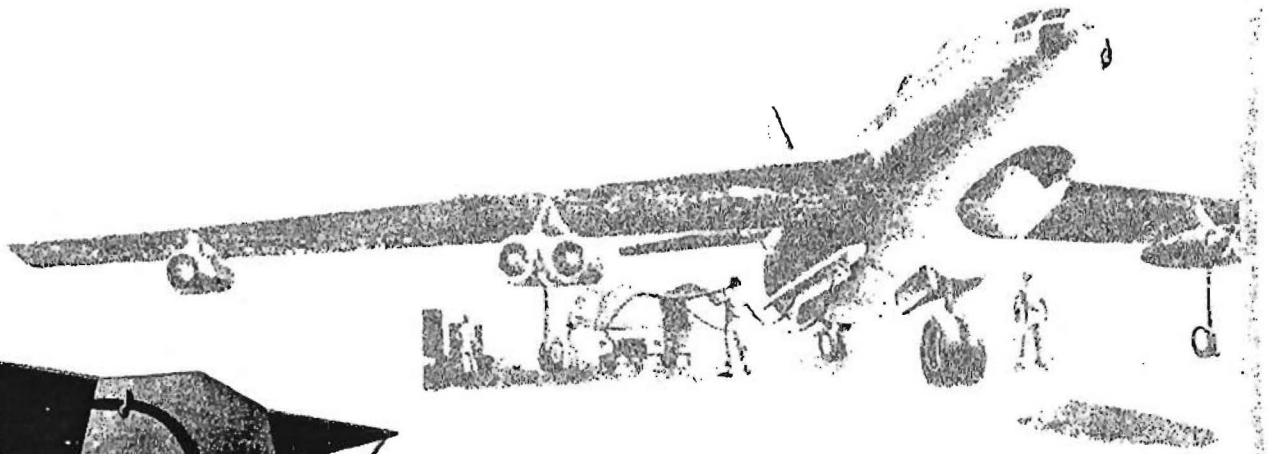


A B-63 CHECKOUT TRAILER is used for checking out pilotless parasite bombers by simulating flights with full guidance, video relay, command control, and rocket firing. This unit is also used during individual systems tests to ferret out minor disorders as well as major malfunctions. A generator unit provides power requirements for both the B-63 and the checkout unit during ground testing operations.

A HIGH-PRESSURE NITROGEN TRAILER is used to pressurize B-63 tube bundles to 6000 psi at the time of the propellant servicing operation. Other servicing units include fuel, acid, and water trailers.

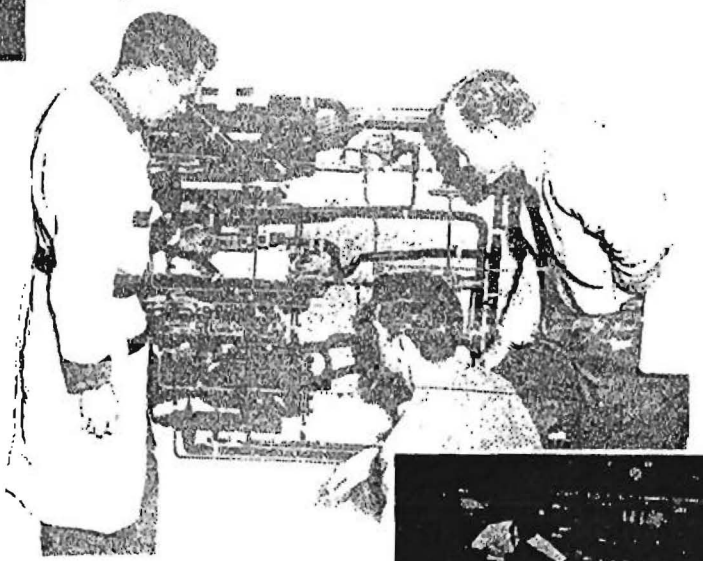
A DIRECTOR AIRCRAFT CHECKOUT TRAILER is used to ascertain proper operation of the Rascal guidance and control equipment on board the director aircraft. During checkout, electrical cordage from this small, two-wheeled trailer is connected to the umbilical cable of the director aircraft. (When the PPB is mated to the director aircraft, the umbilical cable plugs into the PPB to form the necessary electrical connections.) Additional test cordage connected to the guidance capsule enables a complete functional checkout to be made on the Rascal director aircraft equipment.





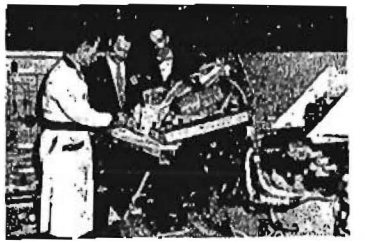
RASCAL

COMPONENT SYSTEMS TRAINING AIDS



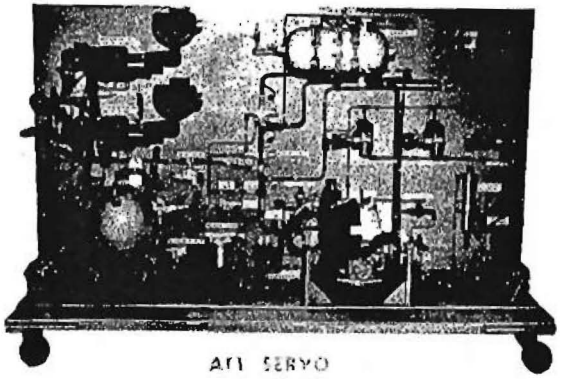
It is axiomatic that successful employment of complex aerial weapons is directly related to the proficiency levels of support and combat crew personnel. With this in view, the following four categories of specially designed training aids are included as part of the Rascal Weapon System.

CLASSROOM DEMONSTRATORS are used to teach personnel the operating theory and the maintenance techniques applicable to all systems of the B-63 and its director aircraft.[20] These are functional panel-presentations of component systems of the weapon.

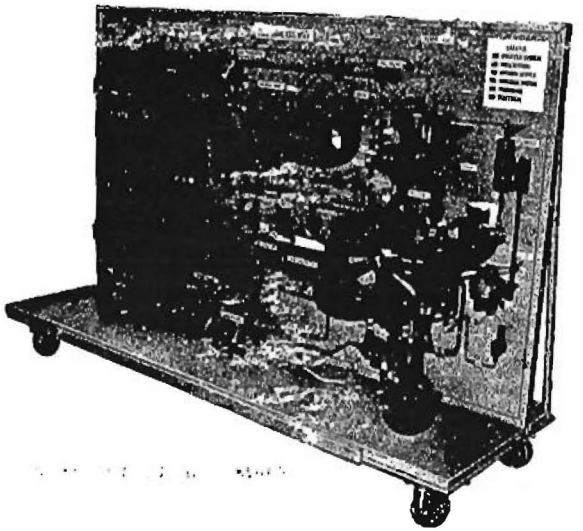


SYSTEMS DEMONSTRATORS

BELL Aircraft CORPORATION



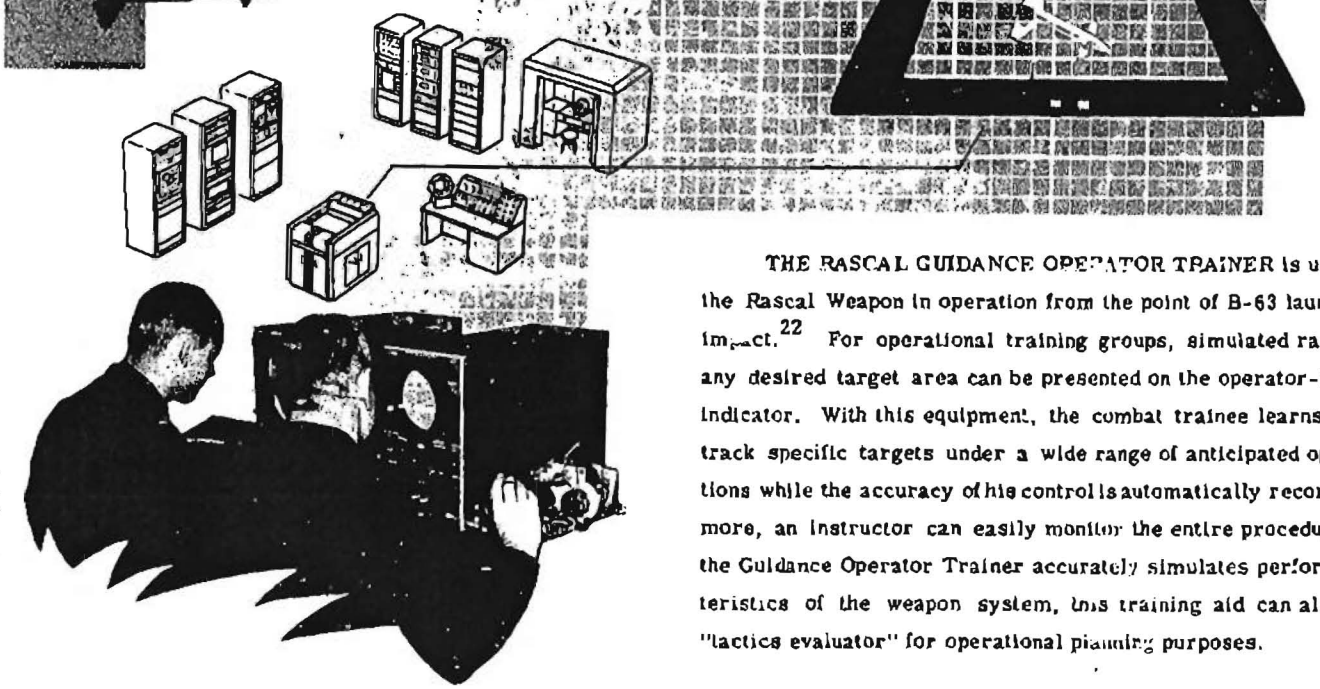
MOBILE TRAINING UNITS, similar in appearance to classroom demonstrators, are especially designed for use in the field.[21] These units are made up of actual B-63 and director aircraft components mounted on a series of vertical panels, each representing a component system. These panels interconnect to form the integrated systems of the B-63 and/or director aircraft. When used in conjunction with test equipment these trainers serve as instruction boards for teaching maintenance personnel the proper techniques of checking out, trouble-shooting, and routine testing.



RASCAL

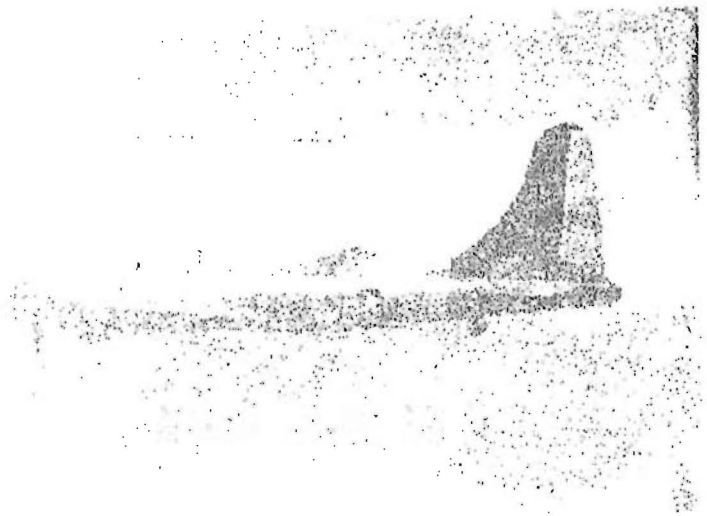
COMPONENT SYSTEMS

TRAINING AIDS



THE RASCAL GUIDANCE OPERATOR TRAINER is used to simulate the Rascal Weapon in operation from the point of B-63 launching to target impact.[22] For operational training groups, simulated radar echos from any desired target area can be presented on the operator-trainee's radar indicator. With this equipment, the combat trainee learns to identify and track specific targets under a wide range of anticipated operating conditions while the accuracy of his control is automatically recorded. Furthermore, an instructor can easily monitor the entire procedure used. Since the Guidance Operator Trainer accurately simulates performance characteristics of the weapon system, this training aid can also be used as a "tactics evaluator" for operational planning purposes.

BELL Aircraft CORPORATION



F-80 AND B-50 AIRCRAFT, modified to simulate a B-63 and a director aircraft, respectively, are used as a team for actual air-to-surface training. The guidance operator directs and controls the F-80 in the same manner he would control a B-63 in combat. The F-80/DB-50 flight team can also be used to train support personnel.

RASCAL

OPERATIONAL EMPLOYMENT

PREPARATION FOR TAKE-OFF

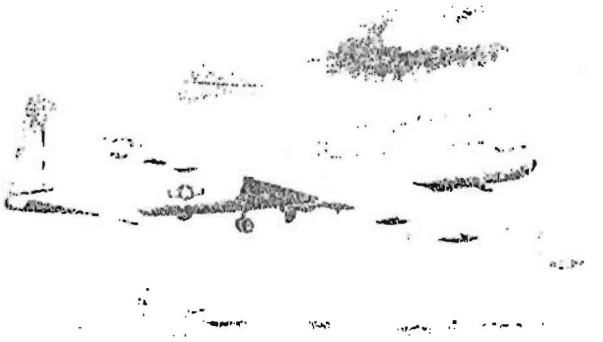
The B-63 pilotless parasite bomber is fabricated and assembled at the Bell Aircraft Corporation where all component systems and ground support equipment are checked. Following composite systems checks and final inspection, B-63s, director aircraft, support equipment, and qualified personnel are brought together at an advanced Air Force staging area where the various divisions of the Rascal weapon are integrated as an instrument of combat complete in every detail.

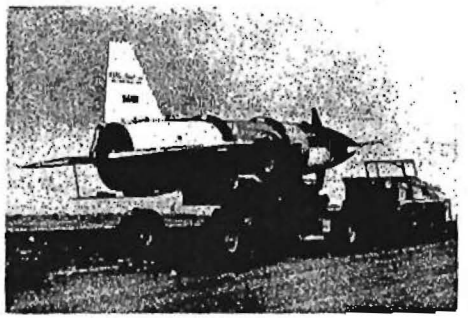
In preparing for a mission, PPBs are rolled out to the test area where trained maintenance crews check the servo, guidance, and propulsion systems, as well as the director aircraft and its B-63 guidance equipment.

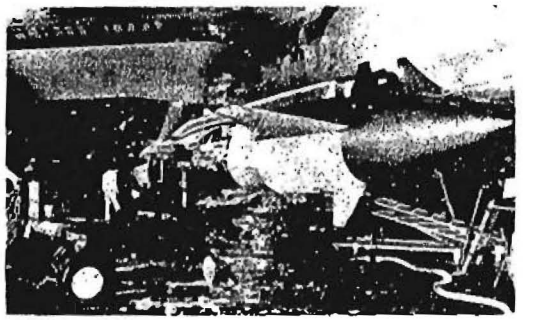
BELL Aircraft CORPORATION

Simultaneously, qualified air crews are given intelligence briefings on the mission. When servicing of director aircraft and PPB is complete, the warhead is installed and fuzed, and the PPB is attached to the director aircraft.

After all check-out procedures have been completed successfully, air crews climb aboard and within a few minutes the Rascal weapon is airborne.







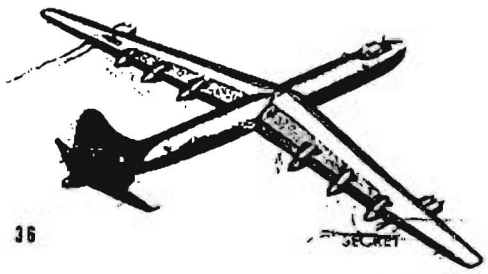
RASCAL

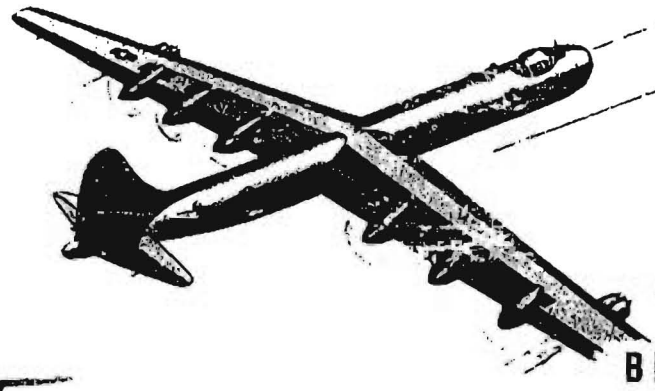
OPERATIONAL EMPLOYMENT

FLIGHT TO TARGET

The DB-36 is navigated to a predetermined launch area, approximately 90 nautical miles from the target, by means of a modified K-3 system which constantly computes distance and course to the target.[23] Simultaneously, initial condition data are fed into the B-63's inertial guidance system. At a pre-set distance from the target, the PPB is released automatically.

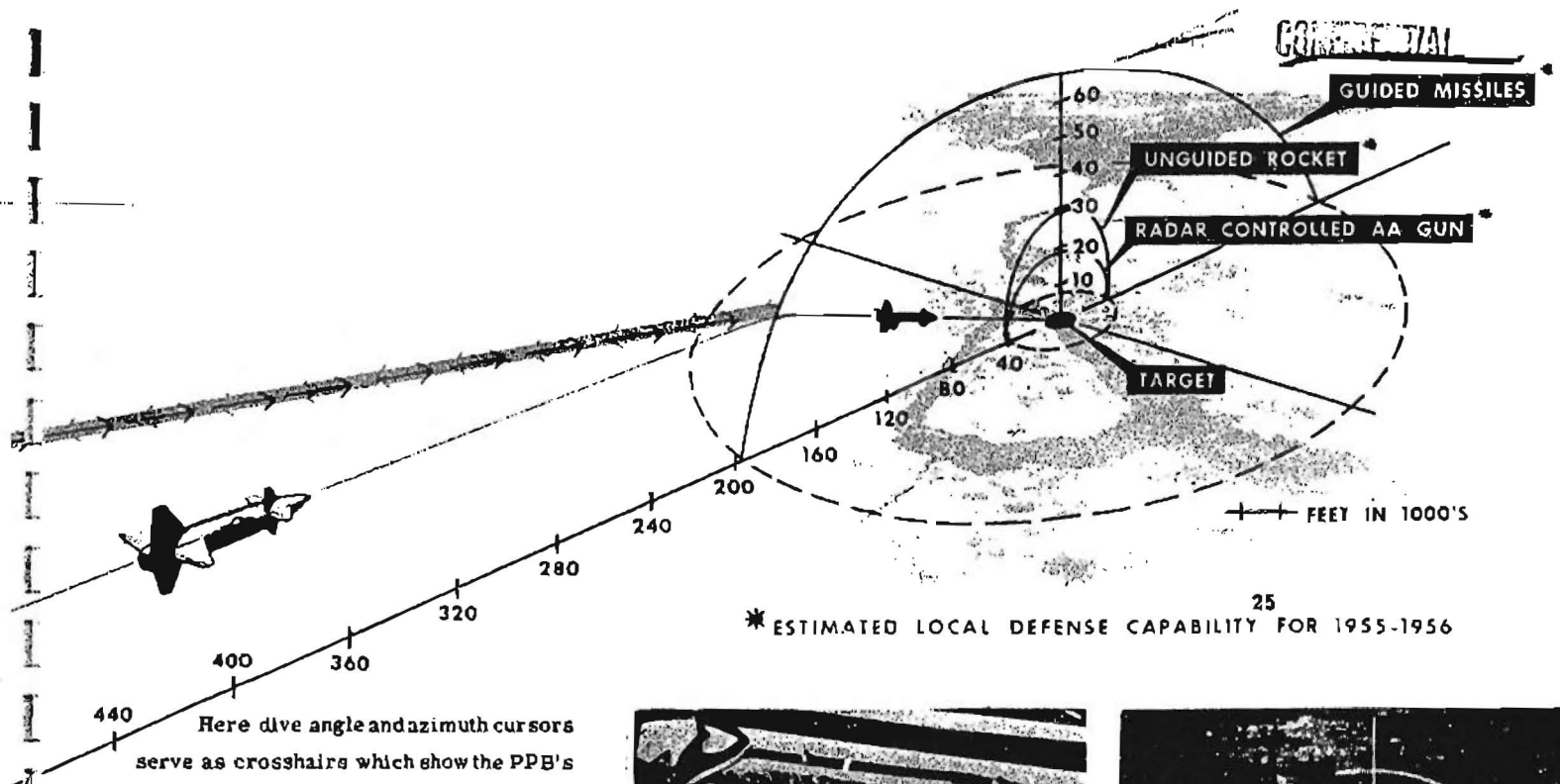
As the B-63 clears the director aircraft, the rocket engine is ignited and the PPB accelerates to supersonic speeds. A pressure sensing circuit programs it to a predetermined cruise altitude as the inertial guidance system computes the range-to-go. At a pre-set distance from the target, the B-63 automatically assumes a 30° terminal dive and the search radar in the nose of the B-63 is turned on. A radar image of the target area is sent from the PPB to the director aircraft where it is displayed to the operator at the terminal guidance station.





480
520
560
547 (90 N. MILES)

BELL Aircraft CORPORATION

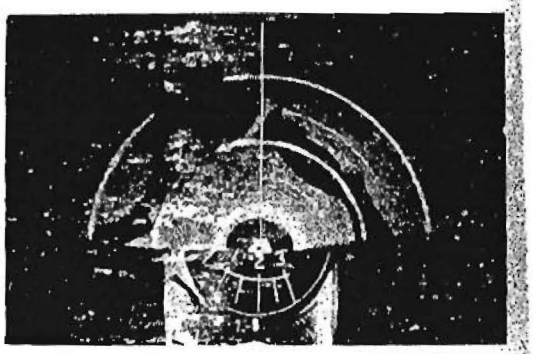


25

*ESTIMATED LOCAL DEFENSE CAPABILITY FOR 1955-1956

Here dive angle and azimuth cursors serve as crosshairs which show the PPB's distance from, and bearing to, the target. Alignment of these crosshairs on the target's radar image automatically sends correcting signals to the PPB's servo-pilot which brings about the necessary flight path corrections.

As the B-63 approaches the target, the radar image magnifies as though the guidance operator himself were in the nose of the B-63.



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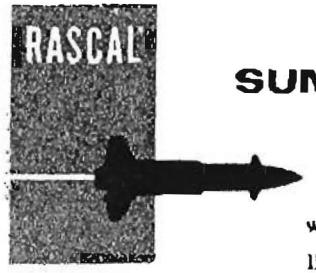

SUMMARY

With the advent of surface-to-air missiles and the improvement in radar-controlled antiaircraft weapons, the flying of conventional aircraft over strategic targets is rapidly becoming impractical. In the light of missile developments since World War II, it is reasonable to assume that the range of present surface-to-air missiles is 40 miles or even greater. These deterrents to strategic bombing point out the pressing need for a better means of target acquisition.

The Rascal Weapon System combines the performance of B-63 pilotless parasite bombers with that of strategic bombers. This combination improves hit probabilities and increases target-area performance of strategic bombers. Further, the survival probabilities of the strategic bomber are improved since it remains outside the local defense perimeter of the target. Thus the Rascal Weapon System adds considerably to the flexibility of strategic bombers. Also, Rascal director aircraft maintain their convertibility to bombardment aircraft without loss of any of their original bombing functions.

Early in 1952, the first Rascal XB-63 was launched from a DB-50 director aircraft to fly under its own power. By the end of 1953, major objectives of the Rascal Weapon had been tested successfully. Thus it is now possible to conclude that: (1) the thrust developed by the B-63 power plant is essentially as predicted and will be adequate for its intended use, (2) the servo-airframe combination has demonstrated its ability to maintain three-axis stabilized flight and to perform the maneuvers which have been required thus far in the evaluation program.

Assured by these initial successes, the United States Air Force and the Bell Aircraft Corporation are undertaking a comprehensive testing program which has operational application of the Rascal system as its ultimate objective.

SECRET

BELL Aircraft CORPORATION

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3. Project MX-776 Program Planning Report, Bell Aircraft Report No. 56-989-003, Revision 9, 31 December 1953.
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11. Relay and Command System, Bell Aircraft Report No. 56-947-178.
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13. Rascal Servo System, Bell Aircraft Report No. 56-947-316.
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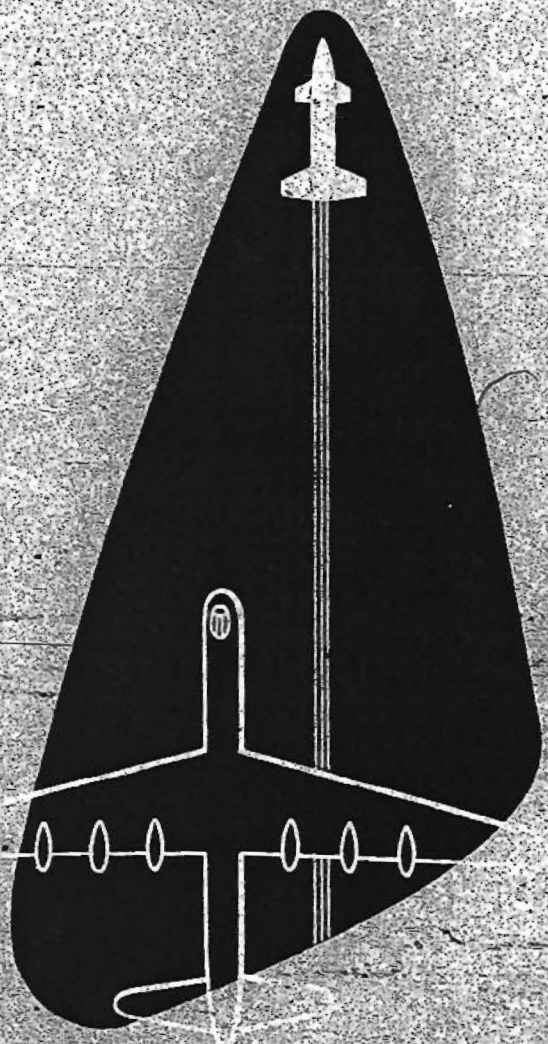
15. Armament System, Bell Aircraft Report No. 56-947-377.
16. Rascal Fuzing System, Bell Aircraft Report No. 56-947-320.
17. Installation Requirements, DB-36 Director Aircraft, Bell Aircraft Report No. 110-947-034.
18. Installation Requirements, DB-47 Director Aircraft, Bell Aircraft Report No. 110-947-005.
19. Ground Support Equipment, Bell Aircraft Reports Nos. 56-947-086 and 62-989-004.
20. AF Exhibit MCREXE95-339 (Demonstrators), [illegible] March 1953.
21. AF Exhibit WCE-280 (Mobile Training Units), 2 January 1952.
22. AF Exhibit MCREXE95-340 (Guidance Operator Trainer), 10 September 1953.
23. Model 110 Guidance System (Director Aircraft), Bell Aircraft Report No. 100-947-007.
24. Project MX-776 Quarterly Progress Report, Bell Aircraft Reports, BMPRs 1 through 35.
25. Project NIKE, Douglas Aircraft Report [illegible], 15 September 1951; Ballistics Research Laboratory, Report MR 656, March 1953.

RASCAL (B-63) WEAPON SYSTEM



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DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

SECRET

CONFIDENTIAL

Semi-Annual Progress Report on F-80/B-50 Program
for Period Ending 31 December 1954 RCS: HADC-RL

HDTM HDTMB(F-80/B-50) 5 Jan 55

1. Accomplishments and Deficiencies:

a. The F-80/B-50 program, an integral part of Project MX-776, has conducted a total of twenty-one (21) test missions during the period covered by this report. The purpose of these tests was to determine the accuracy of the B-63 terminal guidance equipment as adapted to the F-80/B-50 combination against a point target. Five (5) of the twenty-one (21) missions flown were successful. Attached as Incl #1 is a brief which describes malfunctions experienced on each of the unsuccessful missions flown during this period.

b. Fifteen (15) airmen have been 50% trained in the maintenance of B-63 guidance equipment as adapted to the F-80/B-50 combination.

c. Because of many and varied deficiencies in the F-80/B-50 program, a letter has been forwarded to WADC recommending program cancellation. The main deficiencies are as follows:

(1) F-80/B-50 guidance equipment is obsolete.

(2) Because of the experimental nature of the equipment, the reliability factor is extremely low. Assignment of two Bell Aircraft technical representatives has not materially improved overall reliability.

(3) Seventeen (17) of nineteen (19) airmen who attended a factory training course on maintenance of F-80/B-50 guidance equipment have been discharged from the Air Force. Replacement personnel do not have the basic qualifications to meet the requirements for maintaining F-80/B-50 guidance equipment.

(4) Modernization of existing equipment is considered uneconomical.

2. Resolved and Unresolved Problem Areas:

a. There are no resolved problem areas.

b. The main unresolved problem area is whether or not HQ, WADC, and HQ, ARDC will approve F-80/B-50 program cancellation. Until definite word is received no F-80/B-50 test missions utilizing range facilities will be scheduled. Off range missions are being scheduled and flown to maintain proficiency.

3. Funding, personnel, and facilities:

a. The remaining funds of a $50,000 spare parts contract negotiated with Bell Aircraft Corporation in July 1953 were expended during this period. A contract was negotiated with Bell Aircraft Corporation in August 1954 to provide the services of two technical representatives to the F-80/B-50 program for a period of one year.

CONFIDENTIAL

Semi-Annual Progress Report on F-80/B-50 Program

b. As stated previously under Program Deficiencies, the program has lost the majority of experienced and trained maintenance personnel through discharge from the Air Force during the past six months. Sufficient numbers of personnel are assigned to the program, however, their basic qualifications do not meet the requirements for maintaining F-80/B-50 guidance equipment.

c. Adequate facilities have been available for the accomplishment of F-80/B-50 equipment check-out and tests. Approximately 2,000 square feet of shop, lab and supply space is used by the program. The two B-50 and three F-80 aircraft are parked on the West Area ramp.

d. Because the program has experienced a shortage of trained and qualified maintenance personnel during the past six months, efforts have been directed toward assigning personnel to maintain equipment on more than one aircraft. For example, three F-80 aircraft modified to simulate the XB-63 missile are assigned to the program and to insure proper check-out of the equipment one well qualified NCO was given the responsibility of inspecting the final check-out of any one of these three aircraft. Through use of this procedure, two NCO crew chiefs were released for other equally important duties.

4. Future Plans and Programs

Providing the program is not cancelled, Phase II consisting of fifteen (15) successful F-80/B-50 missions against a point target will be accomplished. Upon completion of this phase, twenty successful missions will be flown in Phase III. Phase III missions will be flown against complex target areas to evaluate the guidance operator target identification problem during the terminal dive. The program, if continued, will not proceed on schedule because of the lack of fully qualified and trained personnel.

1 Incl
Brief on F-80/B-50 Missions

JAMES L. SHERRARD, Capt, USAF
Chief, F-80/B-50 Test Unit

SECRET

BRIEF OF TEST MISSIONS FLOWN DURING THE
SIX-MONTH PERIOD ENDING 31 DECEMBER 1954

Mission No.	Date of Test	Results
1G	1 July 1954	Unsuccessful; 28 volt DC fuse blew.
1H	8 July 1954	Unsuccessful; Demodulator in square wave command tuned to critically and dive signal was not received.
1I	16 July 1954	Successful
2A	22 July 1954	Unsuccessful; Detuned power amplifier in square wave command system.
2B	30 July 1954	Unsuccessful; Transmitter magnatron in video relay link failed, slipping clutch on F-80 autopilot caused dive to shallow out.
2C	5 August 1954	Unsuccessful; Pre-amplifier stage in unattended search radar receiver out of tune.
2D	12 August 1954	Successful.
3A	12 August 1954	Unsuccessful; Dive angle computer in terminal guidance system out of calibration.
3B	19 August 1954	Unsuccessful; First video return on monitor scope of terminal guidance system too weak, stuck dive motor in square wave command.
3C	24 August 1954	Unsuccessful; No video signal received on monitor scope of terminal guidance system.
3D	10 September 1954	Successful.
4A	14 September 1954	Unsuccessful; 115 volt AC too high causing an unstable condition in the F-5C terminal guidance equipment
4B	21 September 1954	Unsuccessful; several weak tubes in unattended search radar synchronizer causing video to be very critical.
4C	23 September 1954	Unsuccessful; 300 volt rectifier autopilot power supply failed.
4D	28 September 1954	Successful.

SECRET

SECRET

Mission No.	Date of Test	Results
5A	28 September 1954	Successful.
6A	5 October 1954	Unsuccessful; Unstable range trigger in synchronizer of terminal guidance system prevented lock in.
6B	14 October 1954	Unsuccessful; Broken lead in the F-80 video relay antenna.
6C	21 October 1954	Unsuccessful; EW valve in F-80 relay antenna stuck.
6D	26 October 1954	Unsuccessful; short in wire from unattended search radar to high-low switch on pilot's panel for controlling PRF.
6E	16 November 1954	Unsuccessful; Video relay power supply failed.

SECRET

~~CONFIDENTIAL~~ ~~SECRET~~

HADC Semi-Annual Progress Report

HDTM HDTMB (B-63) 4 JAN 55
Capt Richards/dgf/6041

1. Submitted herewith is the XB-63 Project information requested for the HADC Semi-Annual Progress Report:

a. Accomplishments and Deficiencies:

(1) The last six months of 1954 marked the most intensive flight testing of the XB-63 to date. Twelve XB-63 launchings were accomplished with ten of them occurring in the last three months. For the first time it was demonstrated that the HADC facilities and the Bell Test Crew are adequate to maintain an XB-63 launching schedule of one per week. In fact, it is considered that the XB-63 testing facilities at HADC are practically complete. (CONFIDENTIAL)

(2) A building was completed to house Sandia Corporation in support of their tests in conjunction with the XB-63. Tests of the first Sandia Corporation instrumentation were successfully carried out on three of the XB-63 launchings. (CONFIDENTIAL)

(3) The first DB-36 and DB-47 arrived at HADC for incorporation into the program. Facilities were established for maintaining these aircraft plus one additional DB-36 and DB-47 to arrive during the first six months of 1955. Initial checkout of the DB-36 and DB-47 has been successfully accomplished and captive flights are being conducted utilizing missile number 48F. (CONFIDENTIAL)

(4) With the increased testing many technical accomplishments were realized. For the first time it was demonstrated that the missile Unattended Search Radar would successfully operate at 60,000 feet. A series of modifications to the servo system resulted in improved performance. The missile propulsion system safety circuitry caused two test failures. This circuitry was removed and a lanyard launching procedure adopted to provide crew safety. This transition was accomplished without incident, and propulsion system reliability appears to have been greatly improved. For the first time an XB-63 was guided all the way from launch to impact, thus demonstrating that the missile is at least capable of performing its mission. Missile 26B was guided to impact within 300 feet of the target (well within the design CEP of 1500 feet). (SECRET)

(5) The greatest deficiency, in the opinion of this writer, is missile reliability. The XB-63 is an extremely complex system, and it

~~SECRET~~

~~CONFIDENTIAL~~ SECRET

SUBJECT: HADC Semi-Annual Progress Report (Cont'd)

TO: HDTM FROM: HDTMB(B-63) CONCEPT #1 (Contd

is yet to be demonstrated that the system is reliable enough to be operationally practical. Past and continuing improvements in reliability are encourging, and the next year of testing should solve the reliability question one way or the other. (CONFIDENTIAL)

b. Resolved and Unresolved Problem Areas: The only known significant problem area is one of inadequate firing range at HADC for the longer range missiles to be launched from the DB-36 and DB-47 aircraft. It is desirable, if not practically mandatory, to fly over the Fort Bliss Anti-Aircraft firing ranges with these missiles. This problem has been presented in the form of a request to WSPO to arrange for use of the Fort Bliss ranges for XB-63 firings. At the present time no committment, satisfactory to the requirements of this project, has been obtained from Fort Bliss. (UNCLASSIFIED)

c. Funding, personnel, and Facilities:

(1) For the first time in the history of this project at HADC, USAF officer personnel have been assigned for the specific purpose of evaluating XB-63 test results. Three officers are presently assigned. One monitors the guidance and servo systems; one monitors the warhead; and one monitors the propulsion system and all ground handling equipment. These officers are becoming familiar with the project; and for the first time it is believed that adequate reporting of test results and project progress can presently be accomplished. (UNCLASSIFIED)

(2) As previously stated facilities at HADC for testing the XB-63 are practically complete, and the maximum planned firing schedule of one missile launching per week can be supported with presently assigned facilities and personnel. (CONFIDENTIAL)

d. Future Plans and Programs: Present plans call for the launching of 39 XB-63's during calendar 1955. This will complete the R&D program for Objectives I and II, which are the DB-47/B-63 and DB-36/B-63 weapons systems respectively. No further firings of XB-63's at HADC are definitely established except for the Operational Suitability Test Firings. 32 OST missiles are to be launched during calendar 1956, and OST is to be completed by 1 January 1957. (CONFIDENTIAL)

2. The reason for the overall classification of SECRET for this report is the XB-63 guidance and control details are SECRET.

JOHN E. RICHARDS, Captain, USAF
Chief, B-63 Project Office

~~CONFIDENTIAL~~

SECRET

HADC 55-

317/69

DISPOSITION FORM

SECURITY CLASSIFICATION (If any)

CONFIDENTIAL

FILE NO.

SUBJECT: Minutes of Conference

TO: MTPT | FROM: MTHTD-2 | DATE: 1 Oct 1952 | COMMENT NO. 1

1. On 29 September 1952 a meeting was held to discuss office and laboratory facility requirements of the Sandia Corporation in connection with Project MX-776. The following personnel were in attendance:

Col. J. F. Harris, AFSWC
Lt. Col. J. P. Faris, MTHTN
Maj. K. N. Beckman, MTHTD-2
2nd Lt. H. F. Yamane, MTHTP
Mr. J. T. Foley, MTHF
Mr. K. Levin, Bell Aircraft Corp.
Mr. G. Froelick, Sandia Corp.
Mr. E. P. Stobie, Sandia Corp.
Mr. V. A. Harris, Sandia Corp.

2. Mr. Stobie stated that the Sandia space requirement consisted of approximately 1300 - 1500 square feet of laboratory and office space. This space should be relatively near to the Bell operation. For this reason the possibility of using the second missile checkout building at the new loading pits was investigated.

3. It appears that Sandia Corporation is extremely interested in the use of this facility. It should be possible for them to occupy this building until approximately 1 January 1954 at which time Bell Aircraft may have a technical requirement for it as a second missile checkout building. However, the Sandia representatives are of the opinion that, at that time, future requirements of Sandia Corporation at HAFB should be better known, and a permanent building would be better considered at that time.

4. The Sandia program to be conducted in conjunction with MX-776 will last for a minimum of eighteen months. The following additions will have to be provided at the Bell checkout building for this period:

a. Installation of travelling chain hoist, 2-ton capacity.

b. Installation of fence and guard shelter around building, to conform with AEC security agreement with ARDC - HAFB.

c. Provision of water facilities sufficient for the operation of a small photographic laboratory.

d. Installation of TWX and telephone equipment.

e. Installation of cooling and heating system, if not presently provided.

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HQ HDTA 55-17

DD FORM 1 FEB 50 96 REPLACES NAVEXOS 96, 1 OCT 48, WHICH MAY BE USED.

MTHTD 52-142 copy

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SUBJECT: Minutes of Conference

TO: MTET FROM: MTRTD-2 DATE: 1 Oct 1952 COMMENT NO. 1

5. Plans of the present building were given to Mr. Froelich by Mr. Foley. These plans will be studied by Sandia Corp. personnel, desired modifications indicated thereon, and returned to HAFB on 3 October 1952. Further coordination will be effected at that time.

Kenneth N. Beckman
KENNETH N. BECKMAN
Major, USAF
Chief, Missile Unit

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 19 December 1954. Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 20B: Pit checks were accomplished on this missile without incident prior to scheduled launch on 15 December. The relay magnetron was replaced because the magnetron in the missile failed to operate properly during pre-launch checks on 15 December. The launching on 16 December was cancelled because of a short circuit in the turbine fire ready light. (Confidential)

b. XB-63 No. 31D: The Unattended Search Radar (USR) magnetron was replaced because the magnetron that came with the missile was low in power output. Wiring in the USR modulator was re-routed to eliminate arcing. An engineering order has been initiated to make this re-routing standard on all future units. The autopilot check was completed on this missile without further discrepancies. (Secret)

c. XB-63 No. 32D: This missile arrived at HADC on 16 December. Receiving inspections have been initiated. (Unclassified)

d. XB-63 No. 48F: Pre-flight checks were accomplished on this missile without any discrepancies prior to captive flights with B-47 #51-5220. (Unclassified)

e. F-80 No. 45-8484: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

f. B-50 No. 48-075: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

g. B-50 No. 48-111: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

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h. B-47 No. 51-5220: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

i. B-36 No. 51-5710: This aircraft was flown to Convair - Ft. Worth to receive a major inspection on 17 December. (Unclassified)

2. Test Operations:

a. B-47 Engineering Check Flights: (Unclassified)

(1) Dates of Tests: 15 and 16 December 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: B-47 #51-5220 and XB-63 #48F. (Unclassified)

(4) Purpose of Tests: These flights were accomplished with the missile attached to the B-47 in normal launching position. The purpose of the flights was to familiarize the pilots with the aerodynamic characteristics of the B-47 and the off-center loading of the missile. (Confidential)

(5) Results of Tests: Both flights were very successful. It was found that 4° of trim are necessary at take-off but as speed is increased all trim can be eliminated. (Confidential)

b. XB-63 Test Flight: (Confidential)

(1) Date of Test: Captive Flight, 14 December 1954.

(2) Date of Next Test: Unknown.

(3) Aircraft Involved: B-36 #51-5710 and XB-63 #48F.

(4) Purpose of Test:

(a) Primary purpose: To perform an airborne operational check of all electrical and electronic systems of XB-63 #48F and director B-36 #51-5710 during a simulated launch.

(b) Secondary purpose: To increase the proficiency of flight and ground personnel in preparation for the launching of inertial guidance missiles.

(5) Description of Test: The B-36 was to climb to 20,000 feet and make several runs on the target NIP.

(6) Results of Test: The test was very successful and all checks were accomplished with but few discrepancies.

c. XB-63 Test Flight: (Secret)

(1) Date of Test: 17 December 1954.

(2) Date of Next Test: 6 January 1955.

(3) Aircraft involved: XB-63 No. 20B and DB-50 No. 48-111.

(4) Purpose of Test:

(a) Primary purpose: To test the operation of the "dual operator" relay-command system. The PPB was to be guidance controlled during both the mid-course and terminal phases of flight. In addition, the USR system was to be turned on at launch and the video presentation on the TG indicators monitored during the mid-course phase of flight. The pressure sensing system and barometric switches of the warhead fuzing system were to be tested.

(b) Secondary purpose: To obtain airframe/servo pilot response to commands introduced through the relay link and to obtain vibration data in flight.

(5) Description of Test as Scheduled:

(a) Take-off time: 1415 hours.

(b) True Air Speed at Launch: 243 knots.

(c) Launch Time: 1623 hours.

(d) Range: 45.0 nautical miles.

(e) Mach No.: 1.50 maximum.

(f) Duration of Flight: 270 seconds.

(6) Description of Flight: This PPB was to be guidance controlled from launch until impact. The flight was to consist of a free drop launch at 30,000 feet altitude, a climb to approximately 60,000 feet, and a 30 degree dive on NIP.

(7) Results of Test: Normal launch and climb were effected. At approximately X +40 seconds a slight deflection in the altitude track was noted, indicating a slightly decreased angle of climb. At X +120 seconds destruction occurred at an altitude of 42,500 feet, while still climbing. Telemetry indicates that the L-Band contacts closed but no further information is available. The tanks and aft fuselage in general remained together and did not burn, so some information may be gained by an examination of the wreckage. The nose section drifted approximately thirty miles and has not been found yet. In view of the premature destruction of the missile only partial accomplishment of the purposes of the test was effected.

3. General: (Unclassified)

a. Aircraft used and hours flown:

B-50	#48-111	7 hours, 20 minutes
F-80	#45-8484	2 hours
B-36	#51-5710	6 hours, 20 minutes
B-47	#51-5220	1 hour, 50 minutes

b. Contractor Personnel assigned: 165 permanent, 30 temporary.

c. Project Office Personnel: 5 Officers, 1 Airman.

d. Number of Visitors (Not assigned to HADC): 4.

e. Other: The Cardox technical representative visited the project office and arrangements have been made to start using the Cardox nitrogen equipment. (Unclassified)

The next report written covering activities on this project will cover the interval between 19 December 1954 and 9 January 1955.

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Weekly Test Status Report, B-63, 19 December 1954.

4. Conclusions and Recommendations: None.

PREPARED BY THE 6580TH TEST GROUP

John E. Richards
JOHN E. RICHARDS
Captain, USAF
Chief, B-63 Project

John G. Hemans
JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is the XB-63 guidance and control details are Secret.

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63 Project Priority 1-A, Precedence Rating III-23, For Week Ending 12 December 1954, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 20B: An autopilot check was accomplished on this missile with no discrepancies. The duplexer unit in the missile was found to be extremely sensitive to mechanical vibrations; the unit was replaced with a more stable duplexer. At the start of the weapon system check on 10 December the hydraulic reservoir burst and hydraulic oil was sprayed over the missile. Weapon system checks were accomplished without any further major discrepancies. (Secret)

b. XB-63 No. 27B: Pit checks were accomplished on this missile without incident prior to scheduled launch on 8 December. Power plant number 26, installed on this missile, was a spare power pack. This pack had been cannibalized of the gas generator propellent valve, boost number 1 propellant valve, fuel pump drain line, and propellant tank pressure jettison valves. This pack was rebuilt on 28 November and installed on the missile the following day. Power plant checks indicated the following discrepancies which were satisfactorily corrected: leaking high pressure tee, leaking boost pilot control valve, and replacement of the diaphram and bleed line of the oxidizer pressure transmitter. The power plant was satisfactorily checked out. It is to be noted that the gas generator and thrust chamber propellant valves are calibrated valves and that the package had never been fired with the replacement valves. Preflight and pit checks of Sandia telemetering equipment were successfully accomplished, 7 December 1954. (Confidential)

c. XB-63 No. 31D: A yaw accelerometer was found to be malfunctioning during the autopilot checks. Arcing occurred in the modulator unit of the USR (Unattended Search Radar) when it was first turned on. A spare modulator unit was substituted but the power output of the USR was then found to be below specification (48.3 KW). Consequently all checks on this missile are awaiting the troubleshooting and repair of the USR system. The Sandia telemetry package to be associated with this missile arrived on 10 December. Preliminary ground checks of this package have been successfully performed. (Secret)

d. XB-63 No. 48F: Preflight checks were accomplished without discrepancy prior to a captive flight with director Aircraft B-36 number 51-5710 on 9 December 1954. (Unclassified)

e. F-80 No. 45-8484: The command receiver in this aircraft was thoroughly checked after it was reported that no commands were being received during an F-80 guidance to laboratory mission. No malfunction of the receiver could be detected on the ground. It is believed that the lack of command reception was due to the failure of the F-80 pilot to open the crystal shutter in the receiver during the simulated run on the target. (Confidential)

f. B-50 No. 48-075: Normal maintenance and servicing were accomplished on this aircraft.

g. B-50 No. 48-111: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

h. B-36 No. 51-5710: Normal maintenance and servicing were accomplished on this aircraft. Aircraft participated in checks with PPB number 48F prior to captive flight on 9 December 1954. (Unclassified)

i. B-47 No. 51-5220: This aircraft is still AOCP for a nose wheel "O" ring. It is anticipated that the aircraft will become in commission in time for a scheduled captive flight on 17 December 1954. (Unclassified)

2. Test Operations:

a. F-80 Simulated Missile Test:

(1) Date of Test: F-80-to-Laboratory check flight on 8 December 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: F-80 #45-8484. (Unclassified)

(4) Purpose of Test: To familiarize operators with a new terminal guidance operation. (Unclassified)

(5) Description of Test: Several simulated runs were to be made on NIP and Holloman. (Unclassified)

(6) Results of Test: During the first run on NIP, the F-80 did not respond to commands sent from the lab. At the time it was decided that the command receiver was malfunctioning and no further attempt was made to establish the command link. However, video reception was satisfactory and several dives were made on NIP with the Unattended Search Radar turned on in order for the guidance operator to become familiar with target acquisition. (Secret)

Weekly Test Status Report, B-63, 12 December 1954.

b. XB-63 Flight Test:

(1) Date of Test: Captive Flight, 9 December 1954. (Unclassified)

(2) Date of Next Test: 14 December 1954. (Unclassified)

(3) Aircraft Involved: B-36 #51-5710 and XB-63 #48F. (Unclassified)

(4) Purpose of Test:

(a) Primary Purpose: To perform an airborne operational check of all electrical and electronic systems of XB-63 #48F and director B-36 #51-5710 during a simulated launch. (Confidential)

(b) Secondary Purpose: To increase the proficiency of flight and ground personnel in preparation for the launching of inertial guidance missiles. (Confidential)

(5) Description of Test: The B-36 was to climb to 20,000 feet and several runs were to be made on NIP and on HADC. (Unclassified)

(6) Results of Test: During the pre-launch (simulated) checks the high voltage was lost to the USR system. Consequently, no video reception was possible. However, the runs were made on the target in order to check out the mid-course inertial guidance system. This system checked out completely satisfactory. (Secret)

c. XB-63 Test Flight: (Secret)

(1) Date of Test: 8 December 1954.

(2) Date of Next Test: 6 January 1954.

(3) Aircraft Involved: XB-63 #27B and DB-50 #48-111.

(4) Purpose of Test:

(a) Primary Purpose: To test the operation of the "dual operator" relay-command guidance system. The PPB was to be guidance controlled during both the mid-course and terminal phases of flight. In addition, the USR

system was to be turned on at launch and the video presentation on the TG indicators monitored during the mid-course phase of flight. The pressure sensing system and barometric switches of the warhead fuzing system were to be tested.

(b) Secondary Purpose: To obtain airframe/servo pilot response to commands introduced through the relay link and to obtain environmental data in the warhead compartment using Sandia instrumentation.

(5) Description of Test as Scheduled:

(a) Take-off time: 0715 hours

(b) True air speed at launch: 247 ± 5 knots

(c) Launch Time: 0942 hours

(d) Range: 41.9 nautical miles

(e) Mach No.: 2.0 maximum

(f) Duration of Flight: 200 seconds

(6) Description of Flight: This PPB was to be guidance controlled from launch until impact. The flight was to consist of a launch at 30,000 feet altitude, a climb to approximately 48,000 feet, a period of level flight at that altitude, and a 30 degree dive on NIP.

(7) Results of Test: Pre-launch checks were accomplished with minor discrepancies. Launch was normal, and power plant operation was normal up to X ± 37 seconds, at which time the boost motors were shut down. At approximately X ± 45 seconds the cruise motors were shut down also (based upon the actuating pressures of the propellant pilot control valves). The turbine continued to run until destruct at approximately 120 seconds. After engine shutdown, severe oscillations in both roll and pitch were reported by the pilots of the chase planes but telemetry data do not indicate that they affected the success of the mission. The telemetered rocket motor chamber pressures were inconclusive after about 30 seconds. Some doubt exists as to the validity of the remainder of the channels after this time. (Secret)

Weekly Test Status Report, B-63, 12 December 1954.

3. General: (Unclassified)

a. Aircraft used and hours flown:

DB-36	#51-5710	3 hours, 45 minutes
DB-47	#51-5220	1 hour, 45 minutes
DB-50	#48-111	3 hours, 50 minutes
EF-80	#45-8484	1 hour, 5 minutes

b. Contractor Personnel Assigned: 165 permanent, 38 temporary.

c. Project Office Personnel: 5 Officers, 1 Airman.

d. Number of Visitors (Not assigned to HADC): 5

4. Conclusions and Recommendations: Past performance indicates that the rocket motor chamber pressure transducers presently installed for telemetering purposes (manufactured by Giannini) are approximately 50 per cent reliable. They are located in a region where they are subject to vibration. It is recommended that WADC conduct an impartial study as to both the accuracy and the reliability of this instrument. It is also recommended that studies be conducted on relocation or shock mounting the panel on which these instruments are mounted. It is to be noted that these instruments have been repeatedly reported as unsatisfactory through Bell Aircraft channels and these UR's have been rejected on the basis of expending stock on hand. (Confidential)

PREPARED BY THE 6580TH TEST GROUP

John E. Richards — for —

JOHN E. RICHARDS
Captain, USAF
Chief, B-63 Project

JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is that XB-63 guidance and control details are Secret.

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63 Project Priority 1-A, Precedence Rating III-23, For Week Ending 5 December 1954, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 23B; Preflight and pit checks were accomplished on this missile without incident prior to a scheduled launch on 2 December 1954. A command system malfunction and erratic stable platform movements experienced during the pre-launch checks on 2 December caused cancellation of the mission. The launching was rescheduled for 3 December 1954. Troubleshooting revealed an open filament in the delay line driver tube in the command package. Also, a bad pulse transformer was found in the command transmitter. These two components were replaced and a command system check was accomplished without further discrepancies. A thorough examination of the stable platform and its associated circuitry revealed no disorder; consequently, it was decided to proceed. The erratic motions experienced in the air could not be duplicated on the ground. (Secret)

b. XB-63 No. 25B: This missile was in standby status between pit checks accomplished on 26 November and launching on 29 November. (Unclassified)

c. XB-63 No. 27B: Command calibrations were accomplished on this missile with no discrepancies. During the weapon system check of this missile, the relay magnetron appeared unstable. Troubleshooting revealed that the relay antenna was presenting an unmatched load to the magnetron thus causing the instability. Consequently, the relay antenna was removed and replaced with a spare. The weapon system check was completed without further incident. Power plant SN 26 has been installed and checked. Installation and check-out of Sandia telemetering equipment was successfully accomplished on 30 November. (Secret)

d. XB-63 No. 31D: Normal maintenance and servicing were accomplished on this missile which is in standby status awaiting the firing of the rest of the "B" category missiles. (Confidential)

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Weekly Test Status Report, B-63, 5 December 1954.

e. XB-63 No. 48F: Normal maintenance and servicing were accomplished on this missile following a captive flight on 24 November. Command calibrations are being accomplished prior to a tentative captive flight during the week of 5 December. (Confidential)

f. F-80 No. 45-8484: Normal maintenance and servicing were accomplished on this aircraft prior to an engineering flight on 2 December. (Unclassified)

g. B-50 No. 48-075: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

h. B-50 No. 48-111: Normal maintenance and servicing were accomplished on this aircraft prior to an engineering flight on 1 December. (Unclassified)

i. B-36 No. 51-5710: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

j. B-47 No. 51-5220: This aircraft went AOCP for a nose wheel tire following an engineering flight. Indications are that the wrong part has been received and that reorder of the part may be necessary. (Unclassified)

2. Test Operations:

a. XB-63 Test Flight: (Secret)

(1) Date of Test: 29 November 1954

(2) Date of Next Test: 3 December 1954

(3) Aircraft Involved: XB-63 #25 and B-50 #48-075

(4) Purpose of Test:

(a) Primary Purpose: To obtain structural flight load data. Special instrumentation, consisting of strain gages and direct recording oscillographs was installed for the measurement and recording of in-flight airload distribution. The pressure sensing system for the warhead fuzing system will be tested.

(b) Secondary purpose: The terminal guidance system will be tested as an open loop system, i.e., the servo pilot will not respond to guidance commands. The GSR system will be monitored on the TG indicators from launch till

the end of flight. A check will be made on the mid-course guidance system consisting of beacon tracking for positioning of the director relay antenna. The free drop launch procedure will be tested. Servo-pilot/airframe response to programmed pitch and yaw movements will be monitored.

(5) Description of Test as Scheduled:

(a) Take-off time: 0630 hours

(b) True air speed at launch: 247 ±5 knots

(c) Launch Time: 0952 hours

(d) Range: 41.8 nautical miles

(e) Mach No.: 1.90 maximum

(f) Duration of Flight: 197 seconds

(6) Description of Flight Plan: This flight was to consist of a free drop launch at 30,000 feet altitude and a climb to approximately 40,000 feet under boost thrust. After thrust chamber cut-off, programmed pitch and yaw maneuvers were to be introduced for the purpose of obtaining servo-pilot response and structural load data. The MRB was to be roll stabilized for the entire flight and mid-course and terminal guidance indicators were to be monitored throughout the flight. The recovery sequence was to be initiated at 18,000 feet MSL so that the structural records could be recovered.

(7) Results of Test: Pre-launch checks were accomplished without incident, prior to launch, 29 November. The launch was normal and the missile dropped approximately 6000 feet. Power plant operation was normal and the missile started to climb. At +30 seconds the missile commenced an aerodynamic oscillation in pitch with the servo pilot damping the oscillation. The mean pitch angle continued to decrease until about launch +40 seconds, at which time the missile stabilized in about a 2 degree dive. It is to be noted that this corresponds to the pitch gyro electrical shim. The aneroid destruct system operated at approximately 21,000 feet altitude, but recovery was unsuccessful. The flight programmer recovered from the wreckage indicated that it was stopped in stage seven. This (at approximately seven seconds per stage) corresponds neither

to the time the dive was initiated nor to the times of destruction or impact. Although no definite conclusions as to the cause of the malfunction can be drawn from data available to the Holloman project office, there seems to be every indication of a failure of the flight programmer. A portion of the primary purpose of the test was achieved since a part of the oscillographs was salvaged and sent back to Bell Aircraft for reduction. Beacon tracking was successfully accomplished until destruction. The free drop launch was accomplished without incident and although destruct occurred before the programmed maneuvers were introduced the missile did indicate that it would stabilize from unprogrammed oscillations.

b. X6-6) Test Flight: (Secret)

(1) Date of Test: 3 December 1954

(2) Date of Next Test: 8 December 1954.

(3) Aircraft Involved: X6-6) No. 23 and DB-50 No. 48-075

(4) Purpose of Test:

(a) Primary Purpose: To test the operation of the "dual operator" relay command guidance systems. The MTB is to be guidance controlled during both the mid-course and terminal phases of flight. In addition, the USQ system will be turned on at launch and the video presentation on the TG indicators will be monitored during the mid-course phase of flight. The pressure sensing device for the warhead fuzing system will be evaluated.

(b) Secondary Purpose: To obtain a airframe/servo pilot response to commands introduced through the relay link and to obtain in flight temperature data inside the guidance equipment.

(5) Description of Test as Scheduled:

(a) Take-off time: 0630 hours

(b) True Air speed at launch: 247 ± 5 knots

(c) Launch Time: 0837 hours

(d) Range: 61.1 nautical miles

(e) Mach No.: 1.67 maximum

(f) Duration of Flight: 270 seconds

(6) Description of Flight Plan: This PPB was to be guidance controlled from launch until impact. The flight was to consist of a launch at 30,000 feet altitude, a climb to approximately 60,000 feet, a period of level flight at approximately 50,000 feet and a 30 degree dive on MTP.

(7) Results of Test: The scheduled launch for 2 December was cancelled due to discrepancies encountered during pre-launch checks. Launch was scheduled for 3 December. During pre-launch checks prior to the rescheduled launch, the hydraulic pump in the B-50 director aircraft failed. This eliminated the possibility of accomplishing any command response checks of the missile surfaces. It was decided to proceed with the pre-launch checks and accomplish only an electrical command system check, i.e., check the command package outputs for the various commands sent and assume that the servo system would function properly. These checks were accomplished without discrepancy. A normal launch was experienced and the missile responded to the programmed commands. It climbed to a maximum altitude of approximately 61,000 feet during which the mid-course guidance operator had the missile on track. The terminal dive was initiated by the TG (Terminal Guidance) operator, who had the target on his indicator. During the dive, the TG operator experienced a loss of automatic altitude track. He consequently switched to manual altitude track and manually tracked for a short interval. He then released the manual switch and indications were that automatic altitude tracking was back in operation. He then proceeded to command the missile toward the target. The missile impacted approximately 5 miles short of the target and very close to the correct azimuth heading.

Telemetry shows that when the TG operator released the switch to go back to automatic tracking, the switch relay malfunctioned and consequently the system stayed in the manual mode of altitude track. Thus the terminal guidance computer operated as if the missile were flying at a constant altitude, and consequently called for the erroneous pitch corrections that resulted in the missile impacting short of the target. With the exception of the above malfunction the test could be considered successful in every respect. (Secret)

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Weekly Test Status Report, B 63, 5 December 1954.

3. General: (Unclassified)

a. Aircraft used and hours flown:

B-50 No. 46-015 6 hours, 45 minutes

B-50 No. 46-111 1 hour, 45 minutes

B-47 No. 51-5220 3 hours, 15 minutes

F-80 No. 45-8484 55 minutes

b. Contractor Personnel Assigned: 167 permanent, 34 temporary

c. Project Office Personnel: 4 Officers, 1 Airman

d. Number of Visitors (Not assigned to HADC): 12

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

for Shelton G. Spear Capt USAF

JOHN E. RICHARDS
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Chief, B-63 Project

JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is the XB-63 guidance and control details are Secret.

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63 Project Priority 1-A, Precedence Rating III-23, For Week Ending 28 November 1954. MX No. 776B, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 Number 23B: The malfunction in the vertical gyro erection system, which caused the cancellation of launch on 20 November, was traced to a defective lead on the vertical gyro. The lead was replaced and the erection of the gyro is normal. A weak multivibrator tube in the pitch channel of the command package was replaced; this tube caused the malfunction experienced in the dive relay circuit during the pre-launch checks on 19 November. Other discrepancies which were encountered during the pre-launch checks on 19 November have been corrected. A second weapon system check in conjunction with B-50 #48-075 was started on 26 November, and was completed without further discrepancies. Power plant check-out is under way after reinstallation, (removal was required for access to the servo system). (Secret)

b. XB-63 Number 25B: Exceptional servo noise was encountered during command calibrations. A microphonic tube was replaced in the servo power supply; this cleared the noise up at this time. False commands from the command package were also experienced during the command calibrations. These were eliminated by replacing a broken beacon-blanking lead and by reducing the sensitivity of the command package slightly. Weapon system check in conjunction with B-50 #48-075 was started on 24 November. Extreme servo noise was again experienced. Replacing of a weak regulator tube in the servo power supply corrected this noise problem. A failure of the relay magnetron and noise in the yaw servo system required a postponement of the weapon system check until these problems were cleared up. A weapon system check was conducted 26 November without discrepancies. Pit checks were conducted on 28 November without incident. A faulty main oxidizer supply line was replaced by one from PPB Number 31, because the replacement shipped from the factory was unusable. The bomber has been fueled and pressurized for launch on 29 November. (Secret)

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Weekly Test Status Report, XB-63, 28 November 1954.

c. XB-63 Number 27B: This PPB arrived at HADC on 27 November 1954. Spare power pack Number 26 is now ready for installation on the bomber. (Confidential)

d. XB-63 Number 31D: This PPB arrived at HADC on 23 November 1954. Receiving inspections were accomplished. (Confidential)

e. XB-63 Number 48F: Preflight checks were accomplished in conjunction with B-36 #51-5710 prior to captive flight scheduled on 23 November 1954. The flight was cancelled on 23 November due to the Unattended Search Radar Antenna not synchronizing properly. The flight was rescheduled for 24 November. The USR antenna malfunction was traced to a defective spin drive amplifier which was replaced. All other systems checked out prior to actual captive flight on 24 November, except the pitch command system. Commands sent in pitch would not command the servo system. It was decided to fly with this discrepancy rather than have another postponement. (Secret)

f. F-80 Number 45-8404: This aircraft is in standby status awaiting T. O. compliance. AOCP status was removed as of 26 November and the aircraft is expected to be in commission as of 1 December 1954. (Unclassified)

g. B-50 Number 48-075: Normal maintenance and servicing was accomplished on this aircraft. (Unclassified)

h. B-50 Number 48-111: This aircraft was out for major inspection during this period. Major inspection was completed on 24 November. (Unclassified)

i. B-47 Number 51-5220: Normal maintenance and servicing was accomplished on this aircraft. (Unclassified)

j. B-36 Number 51-5710: Normal maintenance and servicing was accomplished on this aircraft. The aircraft participated in checks with number 48F prior to captive flight on 24 November. (Unclassified)

2. Test Operations:

a. Date of Test: Captive Flight, 24 November 1954. (Unclassified)

b. Date of Next Test: Unknown. (Unclassified)

c. Aircraft Involved: B-36 #51-5710 and XB-63 #48F. (Unclassified)

Weekly Test Status Report, XB-63, 28 November 1954.

d. Purpose of Test: (Confidential)

(1) Primary Purpose: To perform an airborne operational check of all electrical and electronic systems of XB-63 #48P and director B-36 #51-5710 during a simulated launch.

(2) Secondary Purpose: To increase the proficiency of flight and ground personnel in preparation for the launching of inertial guidance missiles.

e. Description of Test: The B-36 was to climb to 20,000 feet and several runs were to be made on NIP and on HADC. (Unclassified)

f. Results of Test: All checks were accomplished successfully with a few minor discrepancies: The video could not be decoded at high PRF and the pitch command system malfunctioned. These malfunctions are in the process of being repaired. (Secret)

3. General: (Unclassified)

a. Aircraft used and hours flown:

DB-36 #51-5710 3 hours

b. Contractor Personnel Assigned: 166 Permanent, 41 Temporary.

c. Project Office Personnel: 5 Officers, 1 Airman.

d. Number of Visitors (not assigned to HADC): 9

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

JOHN E. RICHARDS
Captain, USAF
776 Project Officer

for JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is the XB-63 guidance and control details are Secret.

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63 Project, System No. 112A, Priority 1-A, Precedence Rating III-23 For Week Ending 21 November 1954. MX No. 776B, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 23B: Several malfunctions occurred during the weapon system check-out of this missile. The relay magnetron was found to drift excessively and was replaced with a spare. The yaw gyro proved to have excessive play in its bearings, resulting in a noisy servo loop. This gyro was replaced with the unit recovered from missile #14B. The emergency dive circuit appeared to malfunction during the weapon system check. Approximately 100 man-hours were spent in trying to obtain a fix on this discrepancy. As a result of a telephone call to Bell Aircraft Corporation at Buffalo, it was found that the proportional flight programmer had been wired with reverse polarity and corrected by reversing the polarity of the busses at the plant. However, the correction at HADC reversed the polarity of the emergency dive circuit which discrepancy was not corrected. It was decided to proceed with the scheduled launching, relying upon the destructor systems to destroy the missile if necessary prior to initiation of the "emergency dive". Oxidizer loading proceeded routinely and was accomplished in 26 minutes. What appeared to be a leaking turbine pump seal was found to be a leakage of the main gas generator valve. After conference with the Bell plant, it was decided that the characteristics of the valve on spare power-plant No. 26 were similar enough to the faulty valve to permit interchange. It is to be noted that one of the main propellent valves was exchanged last week. The launching scheduled in conjunction with LB-50 No. 46-075, on 18 November, was cancelled during pre-launch checks because of a failure in the servo B+ circuit. Ground checks revealed that an excessive load on the B+ power supply, due to partial breakdown of insulation of wiring leading from the fore to the aft section of the bomber, caused the B+ power supply relay contact to arc and burn out. Launching was rescheduled for 19 November 1954. During pre-launch checks various discrepancies occurred. The more important ones were as follows: (Secret)

(1) Vertical gyro did not erect properly.

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(2) Dive relay would fall out at 20° dive. (It should hold in until approximately 10° dive.)

(3) Hydraulic pump in B-50 malfunctioned.

(4) The PRF of the Unattended Search Radar could not be switched from low to high.

(5) A frequency divider in command transmitter synchronizer failed to count correctly.

(6) The J-2 compass in B-50 operated intermittently.

Consequently, the flight was cancelled and tentatively rescheduled for 20 November. However, troubleshooting of the missile revealed that the vertical gyro was malfunctioning and would have to be replaced. This cannot be accomplished without first removing the power plant. Therefore, the 20 November flight was cancelled and the missile de-fueled. Extensive repair is now being accomplished, and the missile is tentatively scheduled to be ready for firing by 2 December. Corrective action will be taken on the defective emergency dive circuit. (Confidential)

b. XB-63 No. 25B: This missile arrived at HADC on 16 November 1954. Receiving inspections were accomplished without incident. Autopilot servo check-out was accomplished with no discrepancies. Command calibrations were started on 19 November. Power plant pressure checks were in progress, 21 November. (Confidential)

c. XB-63 No. 48F: Miscellaneous maintenance was accomplished on this missile in preparation for a captive flight with B-36 #51-5710 on 24 November 1954. (Unclassified)

d. F-80 No. 45-8484: This aircraft is in standby status and is AOCP for fuel unloader valve.

e. B-50 No. 48-075: This aircraft participated in weapon systems check with PPB #23B. No discrepancies occurred. (Unclassified)

f. B-50 No. 48-111: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

g. B-47 No. 51-5220: Normal maintenance and servicing were accomplished on this aircraft. (Unclassified)

h. B-36 No. 51-5710: Normal maintenance and servicing were accomplished on this aircraft. Aircraft participated in checks with PPB #48F prior to a scheduled captive flight on 24 November. (Unclassified)

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Weekly Test Status Report, XB-63, 21 November 1954.

2 Test Operations: None. (Unclassified)

3 General: (Unclassified)

a Aircraft used and hours flown:

B-50 #46-075 4 hours, 30 minutes

b. Contractor personnel assigned: 163 permanent, 26 temporary

c. Project Office Personnel: 5 Officers, 1 Airman

d Number of Visitors (not assigned to HADC): 16

4. Conclusions and Recommendations: None (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

JOHN B. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is the XB-63 guidance and control details are Secret.

HADC 54 5047

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 14 November 1954, MI No. 7768, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 23B: Autopilot check-out was accomplished on 8 November 1954. One discrepancy occurred during this check-out - the G-limiting electrical limits were out of specifications. A faulty diode was found in the servo pitch amplifier. During the command calibration it was found that the proper frequency deviations could not be achieved with the relay magnetron. This trouble was alleviated by replacing two resistors in the relay modulator. The original resistors were slightly off value. Also during the command calibration, a bracket broke on the Unattended Search Radar platform. This item has been ordered from Bell Aircraft Corporation and should arrive in time for the launch on 18 November 1954. The remainder of the command calibration was accomplished on 10 November 1954, without incident. Power plant check-out has been accomplished. A replacement propellant valve was removed from a spare power package because the records on the one maintained in stock were not available. (Secret)

b. XB-63 No. 27B: This bomber has not arrived at HADC. The Sandia telemetry package to be associated with this missile arrived 8 November. Preliminary ground checks of this package have been successfully performed. (Confidential)

c. XB-63 No. 28B: During the electrical preflight checks prior to launch on 10 November 1954, a malfunction occurred in the antenna channel of the command link. The command transmitter and receiver were retuned and checked successfully. Preflight checks were accomplished without further electrical or servo discrepancies. Loading and fueling the bomber for launch on 12 November proceeded without incident. Acid loading time was 27 minutes. (Confidential)

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d. XB-63 No. 48F: Preflight checks were accomplished in conjunction with director aircraft B-36 #51-5710 without discrepancy prior to a captive flight on 11 November 1954. (Unclassified)

e. F-80 #45-8484: This aircraft is in standby status. (Unclassified)

f. B-50 #48-075: Normal servicing and maintenance were accomplished on this aircraft. (Unclassified)

g. B-50 #48-111: Participated in preflight and pit checks with PPB #28B. The launch mechanism is being checked after the hesitant release experienced on the launch of 28B. (Confidential)

h. B-36 #51-5710: Aircraft participated in preflight checks with PPB #48F prior to captive flight on 11 November 1954. (Unclassified)

i. B-47 #51-5220: Normal maintenance and preflight checks accomplished on this aircraft prior to two engineering flights made on 9 and 12 November 1954. (Unclassified)

2. Test Operations:

a. B-47 Engineering and Transition check Flights. (Unclassified)

(1) Dates of Tests: 9 and 12 November 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: B-47 No. 51-5220. (Unclassified)

(4) Results of Tests: Both flights were accomplished without incident. (Unclassified)

b. XB-63 Test Flight: (Secret)

(1) Date of Test: 10 November 1954.

(2) Date of Next Test: 18 November 1954.

(3) Aircraft Involved: XB-63 #28B and DB-50 #48-111.

(4) Purpose of Test:

(a) Primary Purpose: To test the operation of the "dual-operator" relay-command guidance system. The PPB was to be guidance controlled during both the midcourse

and terminal phases of flight. In addition the USR system was to be turned on at launch and the video presentation on the TG indicators monitored during the mid-course phase of flight. The pressure sensing system and barometric switches for the warhead fuzing system were to be tested.

(b) Secondary Purpose: To obtain airframe/servo-pilot response to commands introduced through the relay link and to obtain environmental data in the warhead compartment using Sandia Instrumentation.

(5) Description of Test as Scheduled:

(a) Take-off time: 0900 hours

(b) True Air Speed at Launch: 243 knots

(c) Launch Time: 1059 hours

(d) Range: 37.5 nautical miles

(e) Mach Number: 1.85 maximum

(f) Duration of Flight: 190 seconds

(g) Description of Flight: This MPB was to be guidance controlled from launch until impact. This flight consisted of a launch at 30,000 feet altitude, a climb to approximately 46,000 feet, a period of level flight at approximately 48,000 feet and a 30 degree dive on MIP.

(6) Results of Test: Multiple cursors were observed on the Terminal Guidance Indicators when the system was operating on high PRF during the pre-launch checks. This discrepancy was intermittent and not bothersome enough to warrant delay of launch. Servo-command checks were exceptionally good. The mid-course guidance operator picked up the missile beacon immediately after launch. Tracking of the missile was satisfactory. The MCG operator gave several commands during mid-course. The missile flew exceptionally straight on correct azimuth, according to radar plots, during the mid-course and initial part of dive. The Terminal Guidance operator commanded dive at X + 129 seconds and no further dive corrections were made. Prior to impact the missile

veered sharply to the right and impacted approximately 2 miles from the target. Telemetry results show that the missile rudder was suddenly displaced to its extreme right position at approximately 5 seconds before impact. Telemetry also shows that no false commands were received at this time and that no guidance malfunctions occurred in the missile. However, false commands were received during the flight in all three channels and the surfaces responded correctly. Consequently, it is believed that a malfunction occurred in the yaw servo system itself. Positive identification of the cause of the malfunction is unlikely. Power plant operation remained normal until impact. Sandia telemetry operated satisfactorily. The pressure sensing switches for the warhead were satisfactory in all details. In general it may be said that the primary and secondary purposes of the test were successfully accomplished with the exception of a servo-system malfunction occurring in the last five seconds of flight. (Secret)

c. XB-63 Flight Test:

(1) Date of Test: Captive Flight, 11 November 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: B-36 #51-5710 and XB-63 No. 48F (Unclassified)

(4) Purpose of Test: (Confidential)

(a) Primary Purpose: To perform an airborne operational check of all electrical and electronic systems of XB-63 #48 F and director B-36 #51-5710 during a simulated launch.

(b) Secondary Purpose: To increase the proficiency of flight and ground personnel in preparation for the launchings of inertial guidance missiles.

(5) Description of Test: The B-36 was to climb to 20,000 feet and several runs were to be made on NIP and on HADC. (Unclassified)

(6) Results of Test: All checks were accomplished successfully with a few minor discrepancies: The Unattended Search Radar Antenna went out of synchronization several times; a hydraulic leak occurred on landing. These malfunctions are in the process of being repaired. (Secret)

3. General: (Unclassified)

a. Aircraft used and hours flown:

B-50	#48-111	2 hours, 45 minutes
B-47	#51-5220	4 hours, 40 minutes
B-36	#51-5710	3 hours, 50 minutes

b. Contractor personnel assigned: 164 permanent, 42 temporary

c. Project Office Personnel: 5 Officers, 1 Airman

d. Number of Visitors (Not assigned to HADC): 1

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

JOHN E. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

JOHN O. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall Secret classification of this report is the AB-63 guidance and control details are Secret. (Unclassified)

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 7 November 1954, MX No. 7768, Program Stage No. 4, Program Objective: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the warhead fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 23B: This missile arrived at HADC on 5 November 1954. Receiving inspections have been accomplished. (Unclassified)

b. XB-63 No. 26B: A preflight check of the Unattended Search Radar revealed a poor azimuth cursor on the Terminal Guidance Indicator. The trouble was traced to a defective selsyn-pickoff on the USR antenna. Further preflight and pit checks were accomplished without discrepancies. Two thousand and fifty-five pounds of JP-4 fuel was loaded prior to launch. The power plant sequence box was modified to program the engine into cruise from boost at plus 120 seconds instead of plus 132 seconds. (Secret)

c. XB-63 No. 28B: During the command calibration, a malfunction appeared in the relay and command system. The trouble was traced to an open delay-decoder line in the command package. During the start of the weapon system check, the relay and command magnetron showed evidences of drifting. The magnetron was replaced. Beacon blanking in the relay transmitter was found to be inoperative during the weapon system check. The trouble was traced to a weak beacon blanking tube, which was replaced. A high standing-wave-ratio was observed in the waveguide leading to the relay antenna. It was decided that the relay antenna was presenting a reflective load upon the system. The antenna was replaced and the standing-wave-ratio was found to be within specifications. The weapon systems check was finished on 6 November without further discrepancies. A replacement oxidizer line was received from Bell Aircraft Company in poor condition. This line has been installed after rework of the flange. The sequence box of the power plant has been reworked to duplicate the flight program of PPB No. 26B. In addition, all safety circuits are locked out upon Rocket Fire. (Secret)

d. XB-63 No. 48F: A faulty connector in the gyro caging circuit was found to be the cause of the intermittent malfunction which caused the captive flight postponement last week. Further preflight checks were accomplished prior to the rescheduled captive flight on 2 November 1954. (Confidential)

e. F-80 #45-8484: Pre-flight checks were accomplished on this aircraft prior to an engineering flight that was scheduled for the latter part of the week. This flight was cancelled due to a fuel system malfunction. (Unclassified)

f. B-50 #48-075: A modification kit was installed which enables the Terminal Guidance Camera to be remotely controlled from the scanners panel. This aircraft participated in pit checks with PPB #26B prior to a hot launch on 4 November 1954. (Confidential)

g. B-50 #48-111: A modification kit was installed which enables the Terminal Guidance Camera to be remotely controlled from the scanners panel. This aircraft participated in a weapon system check with PPB #28B on 4 and 5 November 1954. (Confidential)

h. B-36 #51-5710: This aircraft participated in preflight checks with PPB #48F prior to a captive flight on 2 November 1954. (Confidential)

i. B-47 #51-5220: Normal maintenance and installation of instrumentation was accomplished on this aircraft. (Unclassified)

2. Test Operations:

a. XB-63 Flight Test: (Unclassified)

(1) Date of Test: Captive Flight; 2 Nov 54. (Unclassified)

(2) Date of Next Test: Captive flight; unknown. (Unclassified)

(3) Aircraft Involved: B-36 #51-5710 and XB-63 #48F. (Unclassified)

(4) Purpose of Test: (Confidential)

(a) Primary: To perform an airborne operational check of all electrical and electronic systems of XB-63 #48F and director B-36 #51-5710 during a simulated launch.

(b) Secondary: To increase the proficiency of flight and ground personnel in preparation for the launchings of inertial guidance missiles.

(5) Description of Test: The B-36 was to climb to 20,000 feet and several runs were to be made on NIP and on HADC. (Confidential)

(6) Results of Test: All checks were accomplished successfully with one exception. The relay signal from the missile could not be decoded at the director receiver when the Unattended Search Radar in the missile was operating at low PRF. This malfunction is still being repaired. (Secret)

b. XB-63 Test Flight: (Unclassified)

(1) Date of Test: XB-63 Launching, 4 November 1954. (Unclassified)

(2) Date of Next Test: 10 November 1954. (Unclassified)

(3) Aircraft Involved: DB-50 #48-075 and XB-63 #26B. (Unclassified)

(4) Purpose of Test: (Secret)

(a) Primary Purpose: To test the operation of the "dual-operator" relay-command guidance system. The PPB was to be guidance controlled during both the midcourse and terminal phases of flight. In addition, the USR System was to be turned on at launch and the video presentation on the TG indicators monitored during the mid-course phase of flight. The pressure sensing system and barometric switches for the warhead fuzing system were to be tested.

(b) Secondary Purpose: To obtain airframe/servo-pilot response to commands introduced through the relay link; to obtain environmental data in the warhead compartment using Sandia Instrumentation, and to obtain in-flight temperature data inside the guidance and servo equipment compartment.

(5) Description of Test as Scheduled: (for results see (6) below) (Confidential)

(a) Take-off time: 0700 hours

(b) True Air-speed at launch: 247 knots

(c) Launch Time: 0845 hours

(d) Range: 37.5 nautical miles

(e) Mach Number: 1.85 maximum

(f) Duration of Flight: 180 seconds

(g) Description of Test: This PPB was to be guidance controlled from launch until impact. The flight consisted of a launch at 30,000 feet altitude, climb to approximately 48,000 feet, a period of level flight, and a 30 degree dive on NIP.

(6) Results of Test: Take-off and launching were delayed by two hours because of pre-take-off missile malfunctions which were corrected. Launch was normal. Rocket fire occurred at X+ 2.56 seconds. Beacon return was good immediately after launch. The mid-course guidance operator gave two commands in azimuth prior to dive which were received. Immediately preceeding dive, the relay signal was lost for approximately four seconds. Transition from boost to cruise occurred at X+ 122 seconds. Dive was initiated at X+ 135 seconds. During dive, one command in azimuth and one change of K-factor were successfully sent. Dive to impact at X+ 186.5 seconds was stable. The bomber impacted on the correct azimuth and over by less than 100 yards in range. All tests objectives were successfully accomplished. Telemetry operated satisfactorily including all of the Sandia functions. Good photographic coverage, including that from Askania, was obtained. It should be noted that this is the first XB-63 to have been fired with no captive flights conducted with it prior to the launching flight. (Secret)

3. General: (Unclassified)

a. Aircraft used and hours flown:

B-50	#48-075	2 hours, 55 minutes
B-50	#48-111	40 minutes
B-36	#51-5710	3 hours, 30 minutes

b. Contractor Personnel assigned: 163 permanent, 34 temporary

Weekly Test Status Report, XB-63, 7 November 1954. [redacted]

c. Project Office Personnel: 5 Officers, 1 Airman

d. Number of Visitors (Not assigned to HADC): None

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

JOHN E. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

JOHN G. HEMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall SECRET classification of this report is the XB-63 guidance and control details are SECRET. (Unclassified)

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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 10 October 1954, MX No. 776B, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system and the Model III X-Band guidance system; and to test the components of the war-head fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 19B: Command calibrations were accomplished successfully. An E&Z valve was replaced in the relay antenna servo system because of a sluggish response of the antenna encountered during the command calibration. A weapon system check-out was accomplished with director aircraft #48-111. Spikes on the Terminal Guidance video signal were noted. The trouble was traced to an overcompensated modulator in the missile relay transmitter; the modulator was replaced. Severe servo noise was encountered. After extensive troubleshooting this discrepancy was traced to a bad wave form output from the missile alternator which was replaced. Power plant checks have been completed, the destructor system installed, and the missile is ready for propellant servicing. Firing remains scheduled for 12 October 1954. (Secret)

b. XB-63 No. 21B: A weapon system check-out was accomplished with no major discrepancies. Check-out was made in conjunction with DB-50 No. 48-[illegible]. Power plant installation of engine S/N 19 was accomplished, replacing engine S/N 30. All special instrumentation was reinstalled on the new power pack. (Confidential)

c. XB-63 No. 22B: Guidance and servo control systems remained in standby status. Receiving inspection was accomplished on engine S/N 18 which will probably be used for this missile. (Confidential)

d. XB-63 No. 24B: Guidance and servo control systems remained in standby status. Power plant functional checks and high pressure checks were accomplished. Another high pressure jettison valve packing O ring was found to be leaking. This missile is to be scheduled for firing about 20 Oct 54. (Confidential)

e. XB-63 No. 48F: Full systems checks are still in progress on this missile. (Confidential)

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Weekly Test Status Report, MX-7768, 10 October 1954.

f. F-80 No. 45-8484: Routine maintenance inspections were performed. (Unclassified)

g. DB-50 No. 48-075: A weapon system check-out was accomplished in conjunction with PPB No. 21B. (Confidential)

h. DB-50 No. 48-111: A weapon system check-out was accomplished in conjunction with PPB No. 19B. (Confidential)

i. DB-36 No. 51-5710: A routine training mission was flown during this period. (Unclassified)

j. DB-47 No. 51-5220: Routine maintenance and installation of instrumentation was accomplished during this period.

2. Test Operations: XB-63 Flight Test:

a. Date of Test: XB-63 Launching, 8 October 1954. (Unclassified)

b. Date of Next Test: XB-63 Launching, 12 October 1954. (Unclassified)

c. Aircraft Involved: DB-50 No. 48-075 and XB-63 No. 1221B. (Unclassified)

d. Purpose of Test:

(1) Primary Purpose: To test operation of the turbine pump propulsion system as modified for lanyard launching procedure, and its affect on other PPB Systems. (Confidential)

(2) Secondary Purpose: To test servo pilot and open loop guidance systems operation; to obtain structural flight load data; and to evaluate the pressure sensing warhead fuzing system. (Confidential)

e. Description of Test as Scheduled; for actual results see Par f. (Confidential)

(1) Launch Aircraft DB-50 No. 48-075.

(2) Take-off Time: 0630 hrs.

(3) Altitude: 30,000 feet MSL.

(4) True Air Speed at Launch: 247 knots (285 mph).

(5) Launch Time: 0815 hours.

(6) Range: 41.6 nautical miles.

(7) Missile Flight Altitude: 40,000 feet maximum.

(8) Launch Point: 41.6 nautical miles from NIP on a heading of 343° T.

(9) Mach No.: 2.2 maximum.

(10) Duration of flight: 235 seconds.

(11) Description of Flight: The missile is free drop launched at 30,000 feet, followed by a climb to 40,000 feet under boost thrust. After thrust chamber cutoff, programmer pitch and yaw maneuvers are introduced. The PPB is roll stabilized for the entire flight and the mid-course and terminal guidance indicators are to be monitored throughout the flight. The recovery sequence is initiated at 18,000 feet MSL in order to recover the recorders.

f. Results of Test: The purposes of test as stated above were not accomplished. Take-off was delayed from 0630 hours until 1130 hours because of an inoperative fin folding mechanism. Upon removal and replacement of the fin folding selecton valve and the solenoid operated hydraulic shutoff valve, located directly under the power plant, it was determined that the latter was corroded because of direct acid spillage. During pre-launch countdown the S-band destruct signal was inoperative. It was noted that the bias voltage on the monitoring destructor unit did not go to a minimum during the PRF (Pulse Rate Frequency) change, indicating that the destruct PRF was not transmitted at the correct frequency. Calibration of the ground radar destruct system is under way. The X-band beacon was out of tune, hence there was no return on the mid-course guidance indicator prior to launch. However, the missile was launched since the primary purpose of the mission was a power plant check. Turbine pump operation was smooth and drop away was clean. Immediately after launch the PPB commenced to oscillate in roll inverting after approximately 2.5 seconds. Preliminary monitoring of telemetry data indicates complete servo failure for the first 1.2 seconds of operation and weak response subsequently. Rocket fire, initiated 2.55 seconds after launch, had a smooth transition from turbine bypass to boost phase. Normal engine operating continued until break-up at 26.2 seconds (approximately 22,000 feet MSL). No L-band beacon destruct signal was recorded. It will be determined on 12 October if the missile broke up because of the destructor system. The recovery system failed to operate and the century (continuous) recorder was badly damaged. Portions of the recording reindicate that the launch through rocket fire, power plant sequence was completely normal.

The telemetry information is, at present, being analyzed at the Bell Aircraft Plant. (Secret)

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Weekly Test Status Report, MX-776B, 10 October 1954.

3. General:

a. Aircraft used and hours flown: (Unclassified)

DB-50	#48-075	2 hours, 30 minutes
DB-50	#48-111	20 minutes
DB-36	#51-5710	2 hours, 30 minutes

b. Contractor Personnel Assigned: 183 permanent, 44 temporary. (Unclassified)

c. Project Office Personnel: 6 Officers and 1 Airman. (Unclassified)

d. Number of Visitors: 15. (Unclassified)

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6560TH TEST GROUP

JOHN E. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

for JOHN G. REMANS
Lt. Col., USAF
Commander

NOTE: The reason for the overall SECRET classification of this report is the XB-63 guidance and control details are SECRET. (Unclassified)

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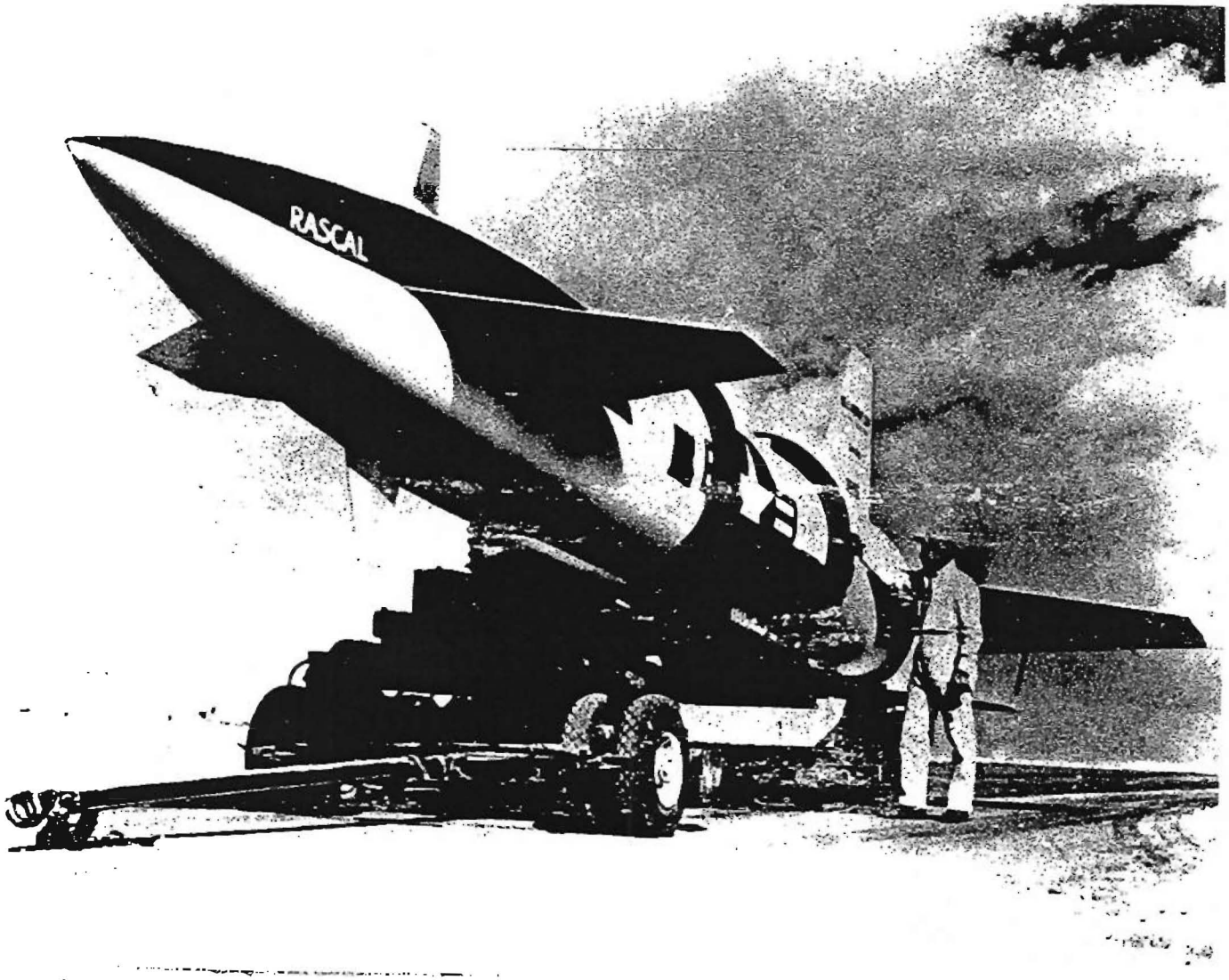
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HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 3 October 1954, HX No. 776B, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system; the servo system and the Model III X-Band guidance system; and to test the components of the war-head fuzing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 19B: This missile was undergoing routine trouble-shooting of discrepancies noted during the captive last week. The turbine pump pressure regulator and a high pressure jettison valve leak were repaired. The servo system is being checked for servo noise difficulties. No further captive flights are planned for this missile. If 21B is launched successfully on 8 October, this missile will be scheduled for a firing on 12 October. (Confidential)

b. XB-63 No. 21B: Routine checks were conducted with this missile to prepare it for a captive flight on 28 September. Trouble shooting of the difficulties encountered on the captive was then accomplished. The telemetry failure was caused by the high voltage dynamotor having burned out. The cause of the burnout is unknown. The servo noise was traced to the exciter in the director aircraft. This exciter was replaced and the servo noise was apparently eliminated.

Following these repairs the missile entered check-out for a firing scheduled on 5 October. Minor repairs and checks of the power plant were being accomplished when a low pressure check revealed a crack in one turbine pump nozzle. The cause of this crack is not known, but it is known that CO_2 was used to extinguish a fire around this engine during a test stand firing at the Bell Test Center prior to the power plant being sent to HADC. It is suspected that the rapid cooling by the CO_2 may have caused this crack. Records now at HADC do not indicate what tests, if any, were conducted at Bell Test Center to detect such a crack prior to the shipping of the power plant.

Following the finding of this crack, the October 5 firing was cancelled. A spare power plant is now being put on the missile. Checks will be resumed for a firing of this missile on 8 October. (Confidential)

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c. XB-63 No. 22B: Only minor checks were accomplished on this missile. (Confidential)

d. XB-63 No. 24B: The power plant for this missile went through receiving inspection and is ready for installation. Only minor checks and maintenance were accomplished on this missile. (Confidential)

e. XB-63 No. 48F: Sub-systems checks of this missile were completed, and full systems checks are now in progress. (Confidential)

f. DB-36 No. 51-5710: This aircraft was out of commission for parts throughout the week. (Unclassified)

g. DB-47 No. 51-5220: This aircraft is undergoing checks of director guidance equipment. The crew to fly this aircraft is not at HADC as yet. (Confidential)

h. DB-50 No. 46-075: This aircraft was used for the captive flight with missile 21B. All director systems operated satisfactorily, and it is planned to use this aircraft to launch 21B. (Confidential)

i. DB-50 No. 48-111: This aircraft was satisfactorily checked out during an F-80/B-50 flight on 27 September and will be used to launch missile 19B. (Confidential)

j. F-80 Simulated Missile No. 45-8484: A ground check of the guidance and servo systems was satisfactorily conducted with director aircraft No. 46-111 prior to an air-to-air guidance check flight. (Confidential)

2. Test Operations:

a. F-80/B-50 Guidance Check flight: (Unclassified)

(1) Date of Test: 27 September 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: F-80 No. 45-8484 and B-50 No. 48-111 (Unclassified)

(4) Purpose of Test: To check the guidance gear in B-50 No. 48-111 with the F-80 as a simulated Pilotless Parasite Bomber (PPB) so that it may be used for missile launchings. (Confidential)

(5) Description of Test: An F-80 simulated missile dive was to be made on the North Impact Point (NIP) and on the main Bell Buildings at Holloman. The B-50 and F-80 were to rendezvous at 20,000 feet. The F-80 was to assume a position off the left wing tip of the B-50 and be guided to a launch point. At the launch signal, the F-80 was to descend 1,000 feet and accelerate to a maximum safe speed. It would then perform a simulated cruise and dive on NIP. The B-50 and F-80 were then to rendezvous over NIP and repeat the flight with the Bell building as the target. (Confidential)

(6) Results of Test: The first dive was completely successful with all systems operating exceedingly well. The second dive was unsuccessful because the mid-course guidance (MCG) operator set the wrong initial conditions into the MCG computer prior to launch. This caused the MCG antenna to position itself 180° from the F-80 and consequently no MCG video presentation was achieved. (Secret)

b. XB-63 Flight Test: (Unclassified)

(1) Date of Test: Captive Flight, 28 September 1954. (Unclassified)

(2) Date of Next Test: Launching of XB-63 No. 21B on 8 Oct 54. (Unclassified)

(3) Aircraft Involved: DB-50 No. 48-075 and XB-63 No. 21B. (Unclassified)

(4) Purpose of Test: To perform an airborne operational check of all electrical and electronic systems of XB-63 number 21B and director B-50 number 48-075 during a simulated launch. The secondary purpose was to increase proficiency of flight and ground personnel in preparation for the launching of XB-63 number 21B. (Confidential)

(5) Description of Test: The B-50 was to take off and climb to 30,000 feet MSL. During the climb, preliminary checks were to be made. Upon reaching 30,000 feet, the B-50 was to be vectored into a right-hand, short-range, rectangular pattern terminating in a flight down the launch line on a bearing of 343° True. A dry run and simulated launch were then to be made. (Confidential)

(6) Results of Test: This flight was essentially unsuccessful. Primarily, the telemetering equipment was inoperative thus no instrumentation results were obtained. Also, excessive servo noise was present on all the control surfaces. Consequently, a command check could not be accomplished. Power plant operation appeared normal. (Confidential)

3. General:

a. Aircraft used and hours flown: (Unclassified)

B-50	#48-075	2 hours, 45 minutes
B-50	#48-111	3 hours, 25 minutes
F-80	#45-8484	1 hour, 5 minutes

b. Contractor Personnel assigned: 160 permanent, 33 temporary. (Unclassified)

c. Project Office Personnel: 6 Officers and 1 Airman. (Unclassified)

d. Number of visitors: 1. (Unclassified)

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

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NOTE: The reason for the overall SECRET classification of this report is the XB-63 guidance and control details are SECRET. (Unclassified)

SECRET [redacted]

HOLLOMAN AIR DEVELOPMENT CENTER
Holloman Air Force Base
New Mexico

WEEKLY TEST STATUS REPORT

Report on XB-63, Project Priority 1-A, Precedence Rating III-23, For Week Ending 26 September 1954, MX No. 776B, Program Stage No. 4, Program Objectives: To obtain aerodynamic data; to test the propulsion system, the servo system, and the Model III X-Band guidance system; and to test the components of the war-head fusing system. Preliminary Reports issued during period: None. Agency conducting tests: Bell Aircraft Corporation. (Confidential)

1. Assembly and Check-out Operations:

a. XB-63 No. 19B: A systems check-out was accomplished with this missile and director aircraft B-50 #48-111 on Monday, 20 September, prior to a Captive Flight on 22 September. All systems checked out satisfactorily except that the high pressure jettison valve was leaking and had to be repaired. Considerable noise was observed in the servo system during the captive flight. Trouble-shooting was accomplished on the servo system and the major portion of the noise was eliminated with the replacement of a poor regulator tube in the servo power supply. (Confidential)

b. XB-63 No. 21B: This missile arrived at HADC, complete with a new modified power plant on 22 September. A systems check-out was accomplished with this missile and director aircraft B-50 #48-075 on Wednesday, 22 September, prior to a scheduled captive flight on 24 September. Servo noise was encountered during the systems check. Trouble-shooting found that the cause was poor regulation in the servo power supply. Replacement of a regulator tube cleared the noise. There was a high pressure jettison valve seal leak which was repaired. The check-out revealed that the launching lanyard micro-switch had a broken spring; this was replaced. This was the first missile to contain this particular switch and Bell is taking steps to insure thorough inspection of this switch on future missiles. (Confidential)

c. XB-63 No. 22B: No work was accomplished on this missile. It is still awaiting the arrival of a power plant. (Confidential)

d. XB-63 No. 24B: The power plant for this missile arrived on 24 September. No other work was accomplished on this missile during the week. (Confidential)

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e. XB-63 No. 48F: This missile is still undergoing complete subsystem checks prior to intensive systems checks. After the systems checks, this missile will be used for mating checks and the first captive flights involving the recently arrived DB-47 and DB-36. (Confidential)

f. Director DB-36 No. 51-5710: This aircraft was still out of commission for parts throughout the week. (Unclassified)

g. Director DB-47 No. 51-5220: The major inspection of this aircraft is complete, and the aircraft is ready for an engineering flight except for two batteries. The crew to fly this plane has not arrived at HADC as yet. (Unclassified)

h. Director B-50 No. 48-111: Following a captive flight on 22 September this aircraft was grounded by maintenance inspectors for a rudder change. This rudder change will be completed by next week. It had been planned to use this director for the captive and hot flights with missile 21B; however, plans have now been changed to use director DB-50 No. 48-075. (Confidential)

i. Director DB-50 No. 48-075: No flights were conducted with this aircraft. It has been checked out and is ready for a captive flight with missile No. 21B, scheduled for 28 September. (Confidential).

j. F-80 Simulated Missile No. 45-8484: Fabrication of an altimeter controlled pitch controller was accomplished during this period. This pitch controller is similar to the one that will eventually be used in the missiles. (Secret)

2. Test Operations:

a. XB-63 Flight Test:

(1) Date of Test: Captive Flight, 22 September 1954. (Unclassified)

(2) Date of Next Test: Captive Flight, 28 September 1954. (Unclassified)

(3) Aircraft Involved: B-50 No. 48-111 and XB-63 No. 19B. (Unclassified)

(4) Purpose of Test: To perform an airborne operational check of all electrical and electronic systems of XB-63 number 19B and director B-50 number 48-075 during a simulated launch. The

secondary purpose was to increase proficiency of flight and ground personnel in preparation for the launching of XB-63 number 19B. (Confidential)

(5) Description of Test: The B-50 was to take off and climb to 30,000 feet MSL. During the climb, preliminary checks were to be made. Upon reaching 30,000 feet, the B-50 was to be vectored into a right-hand, long range, rectangular pattern terminating in a flight down the launch line on a bearing of 343° True. A dry run and simulated launch were then to be made. (Confidential)

(6) Results of Test: Guidance and servo operations were essentially successful with few minor discrepancies. Roll servo noise was present throughout the flight. Power plant operation was satisfactory. Both beacons operated satisfactorily, and the telemetry system operation was excellent. If servo noise troubles can be found in ground tests, this missile should not require another captive prior to a launching. (Confidential)

b. F-80 Air-to-Lab Guidance Check Flights.

(1) Date of Test: 22 September 1954. (Unclassified)

(2) Date of Next Test: Unknown. (Unclassified)

(3) Aircraft Involved: F-80 No. 45-8484. (Unclassified)

(4) Results of Test: This flight was primarily run to check out the autopilot system of the F-80. A successful dive on NIP (North Impact Point) was accomplished with all systems operating satisfactorily. (Confidential)

3. General:

a. Aircraft used and hours flown: (Unclassified)

B-50	#48-111	3 hours
F-80	#45-8484	55 minutes

b. Contractor personnel assigned: 159 permanent, 33 temporary. (Unclassified)

c. Project Office personnel: 6 Officers, 1 Airman. (Unclassified)

d. Number of visitors: None. (Unclassified)

Weekly Test Status Report, MX-776B, 26 September 1954.

4. Conclusions and Recommendations: None. (Unclassified)

PREPARED BY THE 6580TH TEST GROUP

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NOTE: The reason for the overall SECRET classification of this report is the XB-63 guidance and control details are SECRET.

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I. Introduction

A. [redacted]
B. [redacted]
C. [redacted]
D. [redacted]

II. [redacted]

A. [redacted]
B. [redacted]

III. [redacted]

A. [redacted]
B. [redacted]
C. [redacted]

IV. [redacted]

A. [redacted]
B. [redacted]
C. [redacted]

V. [redacted]

VI. [redacted]

VII. [redacted]

Bibliography:

Bell Report No. [redacted], [redacted]

Bell Report No. [redacted], [redacted]

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Slide 1 -- Exterior View of Shrike Missile

Slide 2 -- Exterior View of Hasal Missile

Slide 3 -- Diagramatical View of Hasal

Slide 4 -- View of Hasal Mounted on B-36

Slide 5 -- View of Hasal Mounted on B-47

Slide 6 -- Diagram of Slide #5 of Hasal

Slide 7 -- X-Ray View of Hasal Showing Locations of Guidance Equipment

Slide 8 -- View of ATJ Reconnaissance Aircraft

Slide 9 -- X-Ray View of Hasal Showing Locations of Guidance Equipment

Slide 10 -- View of Hasal Test by Firing

Slide 11 -- View of Tail of Hasal Showing Army Unit Mounted

Slide 12 -- X-Ray View of Hasal Showing Location of Control Equipment

Slide 13 -- X-Ray View of Hasal Showing Location of Guidance Equipment

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[redacted]-776 BRIEFING

(Delivery time approximately 5 minutes)

Project [redacted]-776 was initiated in [redacted] as a study program leading to the development of a supersonic air-to-surface pilotless aircraft. The requirements were primarily directed to make the pilotless bomber, commonly known as Hound Dog, a supersonic missile.

SLIDES #2 & #3

The Hound Dog has an overall length of 42 feet, a body diameter of 4 feet and a gross weight of approximately 10,000 pounds.

SLIDES #4, #5 & #6

Operationally, the B-52 will be launched from B-36 and B-52 aircraft. It will be launched at altitudes in the vicinity of 40,000 feet, climb to 60,000 feet for cruise, and then enter a 30 degree to the horizontal dive to the target. Range is interchangeable to 90 nautical miles, cruising speed from Mach 2 to Mach 2.5 and dash velocities about Mach 1.5. Total time of flight will be on the order of 1.5 hours. The desired accuracy is for 50% of the missiles to fall within 1500 feet of vertical through the target and within ± 500 feet of a predetermined azimuth.

Guidance of the Hound Dog is accomplished by a modified K-4 navigation system in the Director aircraft, an inertial system in the B-52 and a track and command data system components of which are located in both the B-52 and the Director aircraft.

The Director is navigated to the predetermined launch point by the K-4 radar system. Prior to launch, the K-4 system provides initial condition data that is fed to the inertial system in the missile. After launch the guidance of the Hound Dog is accomplished by the inertial system until the terminal dive is initiated at which time the search radar in the missile is turned on. This scans the terrain immediately below and in front of the missile

SECRET

SLIDE #8

and sends this picture via the microwave relay link to the director where it is viewed by the terminal guidance operator on a PPI scope. Determining the position of the missile from the radar presentation, the operator sends appropriate commands to guide it in to the proper target area. These commands are sent via the same relay link.

The Bascal employs an electro hydraulic servo system to stabilize and maneuver the "F" about its three major axes. In addition, the servo system maintains the radar antenna of the PPI continuously focused on the director aircraft, stabilizes the search radar antenna and provides a pitch-stabilized reference platform for the single-axis inertial system.

SLIDES #10+11

The rocket propulsion system consists of three identical thrust chambers that are rated at 4000 pounds thrust at an altitude of 40,000 feet.

The Bascal weapon has been designed to accommodate warheads up to 3000 pounds. Atomic warheads have the first priority followed by chemical and biological warheads.

To date approximately 10 missiles have been launched at [illegible]. These launchings have borne out the following conclusions:

(1) The thrust developed by the Bascal power plant under actual conditions is essentially as predicted and will be adequate for its intended use.

(2) The servo-airframe combination has demonstrated its ability to maintain three-axis stabilized flight and to perform the [illegible] which have been required thus far in the evaluation program.

Guidance equipment check-out and development is in progress with the launchings currently scheduled at [illegible].

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MX-776 BUMPER

(Delivery Time Approximately 15 Minutes)

Project MX-776 was initiated in 1946 as a study program leading to the development of a subsonic air-to-surface pilotless aircraft. The requirements were subsequently changed to make the pilotless bomber, commonly known as the Rascal, a supersonic missile. The project was assigned a 1-A priority and in August 1950 it was substantially accelerated. In December 1951, the Air Force announced that the production pilotless parasite bomber would be designated the B-63.

SLIDES #4, #5 + #6

Operationally, the B-63 will be launched from B-36 and B-47 aircraft. It will be launched at altitudes in the vicinity of 40,000 feet, climb to 60,000 feet for cruise, and then enter a 30 degree to the horizontal dive to the target. Range is intended to be 90 nautical miles, cruising speed from Mach 2 to Mach 2.5 and impact velocity about Mach 1.5. Total time of flight will be on the order of 4.5 minutes. The desired accuracy is for 50% of the missiles fired to fall within 1500 feet of vertical line through the target and within ± 500 feet of a predetermined altitude.

GUIDANCE SYSTEM

The director aircraft is navigated to the IFP launch point by means of a modified E-series radar system which continuously determines location with respect to known geographical points, computes heading to and distance from the target, provides accurate continuous ground speed, and prepares the foregoing information so that it can be supplied as initial condition data to the inertial system of the Rascal when it is launched.

From launch point to the terminal dive point the IFP is guided by a homemanating inertial system. Components include an autopilot which maintains stability and holds the pre-established course [redacted] altitude-sensing

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circuit to establish the climb to altitude, and a single-axis range computer which measures distance traveled and initiates terminal dive.

As the 30 degree terminal dive is initiated, the unattended search radar (USR) in the nose of the PPB is automatically activated and scans the area ahead of the PPB over a 150 degree sector. Radar return from the target and surrounding area, complete with indication of PPB position and heading, is sent to the director aircraft via a microwave link. In the director aircraft, the relayed radar information is displayed on a PPI scope from which suitable data are obtained for PPB flight path corrections.

SLIDE # 8

After the position of the PPB relative to the target has been ascertained, the guidance operator determines what corrections, if any, must be made to the flight path. Corrections in pitch and azimuth are calculated automatically by simple computers as the guidance operator lines up cursors on the radar display in coincidence with the target. Then, by means of the relay and command equipment in the director aircraft, these corrections are transmitted to the PPB where they override the controlling servo system thereby insuring high-precision target acquisition.

SERVO SYSTEM

Rascal Servo Systems stabilize and maneuver the PPB about its three major axes. In addition, servo-mechanisms are used to maintain the relay antenna of the PPB continuously focused on the director aircraft, to stabilize the unattended search radar antenna, and to provide a pitch-stabilized reference platform for the simple-axis inertial system.

An additional function of the servo system is to limit maneuvering accelerations. The design of the pilotless parasite bomber has been based on the

requirement that the airframe withstand maximum loads of ± 6g in the vertical plane and ± 3g in the horizontal plane. So that these values are not exceeded, g-limiting accelerometers are coupled into the servo system. Once the load limit has been reached, accelerometers prevent control surface movement in the direction producing additional load.

PROPULSION SYSTEM

SLIDES #10 + 11

The rocket engine consists of three identical thrust chambers that are regeneratively cooled. Each chamber has a [illegible] thrust rating at an altitude of 40,000 feet and 500 psi chamber pressure. Other power plant components are the fuel pressurizing system, the turbine pump, and the propellant valves and lines.

The propellants are supplied under pressure to the thrust chambers by a turbine pump driven by a gas generator. The gas generator, essentially a small thrust chamber, operates on propellants from the turbine pump discharge. The same propellant supply is used for both the gas generator and the thrust chambers. For starting, however, the propellants are fed to the gas generator from pressurized start-tanks and are electrically ignited. The oxidizer and fuel pumps are located on opposite sides of the turbine wheel and are driven at turbine speed. An alternator and a hydraulic pump are also driven by the turbine through a reduction gear box.

In a typical flight plan, the PFB is launched from the director aircraft with all three thrust chambers operating to accelerate to a supersonic speed. During this boost period the PFB climbs from 40,000 feet and enters the cruise phase at an altitude of 60,000 feet and a Mach number of 2.2. After attaining cruise velocity, two thrust chambers shut down while the third remains in operation and increases PFB Mach number to 2.4 at end of cruise. As the PFB

enters the terminal dive, this thrust chamber is shut down, but the turbine pump assembly continues to operate on remaining propellants to supply hydraulic and electrical power to impact.

[illegible]

The Pascal weapon has been designed to accommodate up to 3 [illegible] pounds. Warheads weighing 5000 pounds may be carried as overloads. Atomic warheads have the first priority followed by chemical and biological warheads.

The warhead is carried in a section of the B-63 aft of the forward wing and forward of the oxidizer tanks. The lower part of the airframe section serves as a structural door for warhead installation.

PROGRESS AND FUTURE PLANNING

To date, approximately 10 missiles have been launched at [illegible]. These launchings have borne out the following conclusions:

(1) The thrust developed by the Pascal power plant under actual conditions is essentially as predicted and will be adequate for its intended use.

(2) The servo-airframe combination has demonstrated its ability to maintain three-axis stabilized flight, and to perform the maneuvers which have been required thus far in the evaluation program.

Guidance equipment checkout and development is in progress with the launchings currently scheduled at [illegible].

The unofficial schedule calls for the following:

(1) Completion of R & D on the [illegible]-36/B-63 weapon (with nonemanating midcourse and an emanating X-band terminal guidance) by 1 November 1955 and an [illegible] starting date of 1 January 1956; and (2) completion of R & D on the [illegible]-47/B-63 weapon by 1 February 1956 and [illegible] 1 April, 1956.

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MX-776 PASCAL

(Delivery time approximately 30 minutes)

Project MX-776 was initiated in 1946 as a study program leading to the development of a subsonic air-to-surface pilotless aircraft. The requirements were subsequently changed to make the pilotless bomber, commonly known as Pascal, a supersonic missile. A development program was immediately begun.

SLIDE #1

The great cost of a Pascal missile dictated an initial development program incorporating a scaled down research test vehicle. The missile, known as the Shrike, was used to solve many problems in stability and control, propulsion, handling, test and checkout of pilotless aircraft, launch procedures, etc. Development of Shrike was begun early in 1947 and the Pascal development program was changed to development of Pascal guidance only.

In December of 1948, the full Pascal development program was again initiated. Shortly thereafter, the project was assigned a 1-A priority and in August 1950 it was substantially accelerated. In December 1951, the Air Force announced that the production pilotless parasite bomber would be designated the B-63.

In February of 1952 the program was reoriented to attain a B-63 for operational use by the military in 1955. The program reached a major milestone in September of 1952 when the first Pascal was released from a B-50 director aircraft to fly under its own power. In January 1953, the Shrike flight program, which included 28 missiles, was successfully completed. The experience gained from this program is now being applied to the Pascal development.

SECRET

SLIDES #2+3

The B-63 pilotless parasite bomber has an overall length of 32 feet, a body diameter of 4 feet, and a gross weight of a proximately 10,500 pounds, half of which is fuel. Structurally, the B-63 consists of five major sections: radome, forward body, warhead compartment, center body and aft body. These divisions are based on functional requirements as well as component accessibility and ease of shipment.

For its specific employment in the Weapon System, the B-63 pilotless parasite bomber comprises four closely integrated component systems: (1) a guidance system to direct it to the target,(2) a servo system for flight stabilization and control, (3) a rocket propulsion system to accelerate it to supersonic speeds and (4) armament for target destruction.

These systems are encompassed by the Rascal airframe which combines a cylindrical semi-monocoque fuselage with a canard cruciform wing configuration.

SLIDES #4, 5, +6

Operationally, the B-63 will be launched from B-36 and B-47 aircraft. It will be launched at altitudes in the vicinity of 40,000 ft., climb to 60,000 ft. for cruise, and then enter a 30 degree to the horizontal dive to the target. Range is intended to be 50 nautical miles, cruising speed from Mach 2 to Mach 2.5 and impact velocity about Mach 1.5. Total time of flight will be on the order of 4.5 minutes. The desired accuracy is for 50% of the missiles fired to fall within 1500 feet of vertical line through the target and within ± 500 feet of a predetermined altitude.

The B-63 will be capable of carrying a 3000 pound warhead, either atomic, chemical, or biological. In the research and development missiles, the space allocated for the warhead is used to house telemetry equipment.

GUIDANCE SYSTEM:

Guidance of the Rascal Weapon is accomplished by a modified N-4 navigation

SLIDE #7

system in the director aircraft, an inertial system in the B-63, and a track and command radar system, components of which are located in both the B-63 and the director aircraft.

The director aircraft is navigated to the PFP launch point by means of a modified K-series radar system which continuously determines location with respect to known geographical points, computes heading to and distance from the target, provides accurate continuous ground speed, and prepares the foregoing information so that it can be supplied as initial condition data to the inertial system of the Pascal when it is launched.

From launch point to the terminal dive point the PFP is guided by a nonemanating inertial system. Components include an autopilot which maintains stability and holds the pre-established course in azimuth, altitude-sensing circuit to establish the climb to altitude, and a single-axis range computer which measures distance traveled and initiates terminal dive.

As the 30 degree terminal dive is initiated, the unattended search radar (USR) in the nose of the PFP is automatically activated and scans the area

SLIDE #8

ahead of the PFP over a 150 degree sector. Radar return from the target and surrounding area, complete with indication of USR position and heading, is sent to the director aircraft via a microwave link. In the director aircraft, the relayed radar information is displayed on a PPI scope from which suitable data are obtained for PFP flight path corrections.

After the position of the PFP relative to the target has been ascertained, the guidance operator determines what corrections, if any, must be made to the flight path. Corrections in pitch and azimuth are calculated automatically by simple computers as the guidance operator lines up cursors on the radar display in coincidence with the target. Then, by means of the relay and

command equipment in the director aircraft, these corrections are transmitted to the PIP where they override the controlling servo system thereby insuring high-precision target acquisition.

SERVO SYSTEM

SLIDE #9

Pascal Servo Systems stabilize and maneuver the PIP about its three major axes. In addition, servo-mechanisms are used to maintain the relay antenna of the PIP continuously focused on the director aircraft, to stabilize the unattended search radar antenna, and to provide a pitch-stabilized reference platform for the air-data inertial system.

The pitch stable platform provides the vertical reference required for the autopilot and the antenna servos. Since the inertial guidance system utilizes the twice-integrated output of an accelerometer to measure ground distance traveled by the PIP, the attitude of the accelerometer is maintained by the pitch stable platform so that only accelerations along the projection of the flight path in a horizontal plane are measured. Should the normal to the stable platform not correspond to the vertical, an error signal causes the servo control motor to drive the platform to its proper horizontal position.

The autopilot uses information from the vertical gyro and the pitch stable platform to maintain pitch and roll stability. To satisfy relay antenna requirements, the PIP is held to minimum roll so that yaw maneuvering is accomplished by flat, skidding turns. In addition to stabilized flight, the autopilot controls the PIP flight path to a predetermined altitude, maintains constant altitude, and obeys the drive signal from the guidance operator.

The antenna of the unattended search radar (USR) in the nose of the PIP is pitch stabilized with respect to the stable platform so that uniform coverage of the earth's surface ahead of the PIP is obtained. To eliminate

the effects of yawing motions of the PPB and to satisfy navigational requirements, the USB antenna is rotated at a constant angular velocity about a vertical axis.

As the B-63 PPB follows the climb, cruise, and dive called for in its flight plan, a servo system stabilizes and orientates the relay antenna which transmits a directed beam of X-beam signal to the director aircraft.

An additional function of the servo system is to limit maneuvering accelerations. The design of the pilotless parasite bomber had been based on the requirement that the airframe withstand maximum loads of ± 6g in the vertical plane and ± 3g in the horizontal plane. So that these values are not exceeded, g-limiting accelerometers are coupled into the servo system. Once the load limit has been reached, accelerometers prevent control surface movement in the direction producing additional load.

PROPULSION SYSTEM

SLIDES #10, #11

The Rascal is powered by a rocket power plant which uses a non-hypergolic (not self igniting) propellant combination, gasoline or JP-4 as fuel and white fuming nitric acid as oxidizer. For ignition, a hydrazine slug precedes the fuel into the combustion chamber to form with the oxidizer a self igniting mixture.

The rocket engine consists of three identical thrust chambers that are regeneratively cooled. Each chamber has a 4,000 pound thrust rating at an altitude of 40,000 feet and 500 psi chamber pressure. Other power plant components are the fuel pressurizing system, the turbine pump, and the propellant valves and tanks.

The propellants are supplied under pressure to the thrust chambers by a turbine pump driven by a gas generator. The gas generator, essentially

a small thrust chamber, operating on propellants from the turbine pump discharge. The same propellant supply is used for both the gas generator and the thrust chambers. For starting, however, the propellants are fed to the gas generator from pressurized start-tanks and are electrically ignited. The oxidizer and fuel pumps are located on opposite sides of the turbine wheel and are driven at turbine speed. An alternator and a hydraulic pump are also driven by the turbine through a reduction gear box.

The two gas, which stays at 4000 psi, are located between the propellant tanks, in the equipment compartment, and feed the search radar antenna. After undergoing a two-stage reduction, this gas is used to pressurize the propellant tank to 55 psi, thus supplying propellants under pressure to prevent fuel or oxidizer pump cavitation.

SLIDE #12

The propellant tanks are internal parts of the airframe and have capacities of 415 gallons of oxidizer and 215 gallons of fuel. The propellant loading is accomplished at high speeds without spillage by means of quick-disconnecting lines in separate, closed propellant systems.

In a typical flight plan, the RPV is launched from the booster aircraft with all three thrust chambers operating to accelerate it to supersonic speed. During this boost period the RPV climbs from 40,000 feet and enters the cruise phase at an altitude of 60,000 feet and a Mach number of 2.0. After attaining cruise velocity, two thrust chambers shut down while the third remains in operation and increases RPV Mach number to 2.4 at end of cruise. As the RPV enters the terminal dive, this thrust chamber is shut down, but the turbine pump assembly continues to operate on remaining propellants to supply hydraulic and electrical power to impact.

WARHEAD

The Rascal weapon has been designed to accommodate warheads up to 3000 pounds. Warheads weighing 5000 pounds may be carried as overload. Atomic warheads have the first priority followed by chemical and biological warheads.

SLIDE #13

The warhead is carried in a section of the B-3 aft of the forward wing and forward of the oxidizer tanks. The lower part of the airframe section serves as a structural door for warhead installation.

Through a sequence of safety features, a proximity system arms and detonates the warhead. Detonation is determined by a barometric switch which can be set to close at a particular pressure altitude to meet air burst-detonation requirements of various warheads and targets.

TRAINING

SLIDE #14

B-60 and B-52 aircraft, modified to simulate a B-63 and director aircraft, respectively, are used as a team for actual air-to-surface training. The guidance operator directs and controls the B-60 in the same manner he would control a B-63 in combat. The B-60/B-52 flight team can also be used to train support personnel.

FIRINGS AND FUTURE PLANNING

To date, approximately 10 missiles have been launched at Hill AFB. These launchings have borne out the following conclusions:

(1) The thrust developed by the Rascal power plant under actual conditions is essentially as predicted and will be adequate for its intended use.

(2) The servo-airframe combination has demonstrated its ability to maintain three-axis stabilized flight, and to perform the maneuvers which have been required thus far in the evaluation program.

Guidance equipment check-out and development is in progress with the launchings currently scheduled at [illegible].

The unofficial schedule calls for the following:

(1) Completion of R & D on the [illegible]-36/B-63 weapon (with nonemanating midcourse and an emanating X-band terminal guidance) by 1 November 1955 and an ARDC starting date of 1 January 1956; and (2) completion of R & D on the [illegible]-47/B-63 weapon by 1 February 1956 and ARDC on 1 April, 1956.

[redacted] CONFIDENTIAL

MONTHLY HISTORICAL REPORT
AUGUST 1954
MX-776 PROJECT

One XB-63 launching was accomplished during the month of August, using missile number 1117B. This missile was launched on 9 August for the primary purpose of testing the propulsion system and the servo-pilot system. The test was unsuccessful because the missile power plant shut down completely immediately after launching. The cause of the shut down has not been determined, but it appears to have been an identical shut down as experienced with missile 1016B last month. Both of these malfunctions apparently originated in the power plant safety circuits which shut down the missile if certain power plant operations are out of specifications. All firings have been cancelled until these malfunctions are investigated and corrected.

Missiles 21B and 22B arrived at HADC during this month. Captive flights were conducted on missiles 19B, 21B, and 22B for the purpose of checking out all missile and director aircraft systems with the exception of the missile propulsion system.

The first director B-47 aircraft #51-5220 arrived on 26 August 1954.

for Thomas E Sledge Maj USAF
JOHN E. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

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HDT 54-242

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MONTHLY HISTORICAL REPORT
SEPTEMBER 1954
MX-776 Project

No XB-63 launchings were conducted during this month because of the missile power plant failures during July and August. After an investigation of these failures it was decided to remove power plant safety circuits which were believed to be the cause of the failures. This necessitated using a new launching technique in which the missile is dropped before the rocket motors are fired. Modifications to missiles 19B, 21B, and 24B were accomplished to provide for this new drop launching, and launchings are to be resumed in October.

Captive flights were conducted on missiles 19B, 21B, and 24B for the purpose of checking various missile systems.

Missiles 24B and 48F arrived at HADC during the month. Missile 48F is to be used for mating checks and the first captive flights involving the recently arrived DB-36 and DB-47 aircraft.

Thomas E. Aliceja, Maj USAF
for JOHN E. RICHARDS
Captain, USAF
Chief, MX-776 Test Unit

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MONTHLY HISTORICAL REPORT

JULY 1954

MX-776 PROJECT

One XB-63 Launching was accomplished during the month of July 1954, using Missile number 1016B. Captive flights were accomplished on 15 and 16 July 1954, to check operations of all systems in the missile and director aircraft. Missile number 1016B was launched on 27 ~~August~~ July with the following primary purposes: To test operation of guidance equipment in the missile. To evaluate testing of the pressure sensing system for development of the warhead fuzing system. To test the operation of the low pressure power plant system and tank expulsion systems, and to check out all the systems in the missile and director aircraft. This launching was considered unsuccessful due to a power plant shut down at X + 3 or 4 seconds, at which time the missile became unstable and entered a vertical dive. Destruct was initiated at 18,000 feet MSL, and recovery was made of the nose section, which was returned in very good condition. Tests are now being conducted to determine the cause of the above malfunction. At this time the cause for power plant shut-down has not been determined.

Missile Number 21B arrived at HADC on 28 July 1954, complete with all necessary modification kits.

One director B-36 aircraft #51-5710 arrived at HADC on 22 July 1954 and tests were initiated to check the launch equipment, and the airplane. Captive flights using this aircraft are scheduled to convene the latter part of this year and "Hot Launchings" should start in the early part of 1955.

JOHN E. RICHARDS
Captain, USAF
[redacted] Test Unit

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HDF4 54-214

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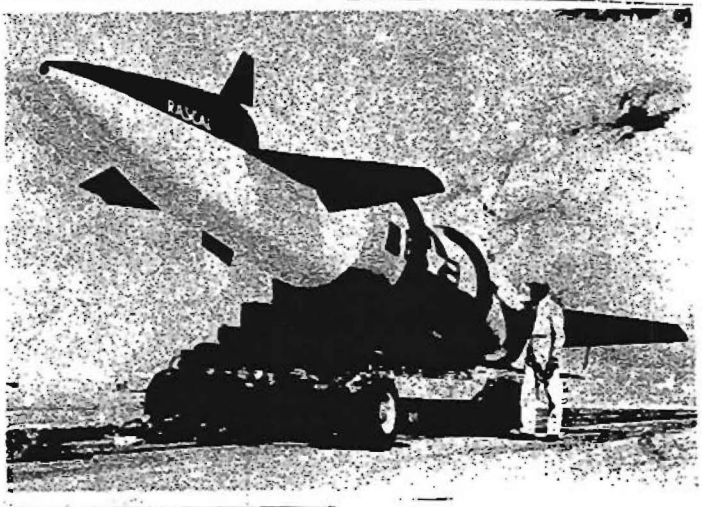
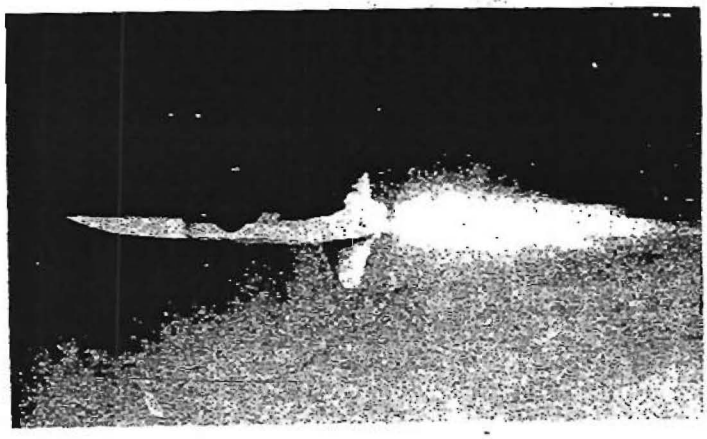
RASCAL 1-1-3-1-2-2

Bell Rascal On Carriers, In Flight





Bell GAM-63 Rascal air-to-surface pilotless bomber is mounted on carrier (above), which also is built by Bell. Three cylinders of rocket motor in vertical line are outlined in the in-flight photograph of the pilotless bomber (left). Rascal, with 100 mi. range, is designed to be dropped from bomber out of reach of enemy fighters (AW Feb. 4, p. 27). Speed of Rascal, which has both canard and conventional control surfaces, is about Mach 1.5. Lower fin aft has not been assembled to the vehicle mounted on the carrier. Bell Aircraft Corp., which also builds the liquid propellant rocket motor that uses acid-gasoline as a fuel, has received two recent contracts totaling more than $22 million for research and development work on the Rascal.

conveyors attached to studs which double as seat tie-downs in the troop carrying configuration and a loading dock of approximately the same height as the cargo floor. Cargo is pallet-mounted or bound to ½-in. or ¾-in. plywood panels. Heavy cargo is positioned by a winch in the forward end of the cabin. Barrier nets and hold-down nets are suspended by palleys from the right sidewall and the ceiling and can easily be dropped over the loaded cargo and secured by snap hooks.

The short turnaround time made possible by the technique requires that loads be planned before the airplane reaches the loading dock to control center of gravity position and to allow for cargo off-loading at intermediate station. Eight-by-ten foot plywood panels serve as low cost pallets which can handle 10,000 lb. of small cargo items. A long cargo item may be placed on two or more panels and loaded as a single unit.

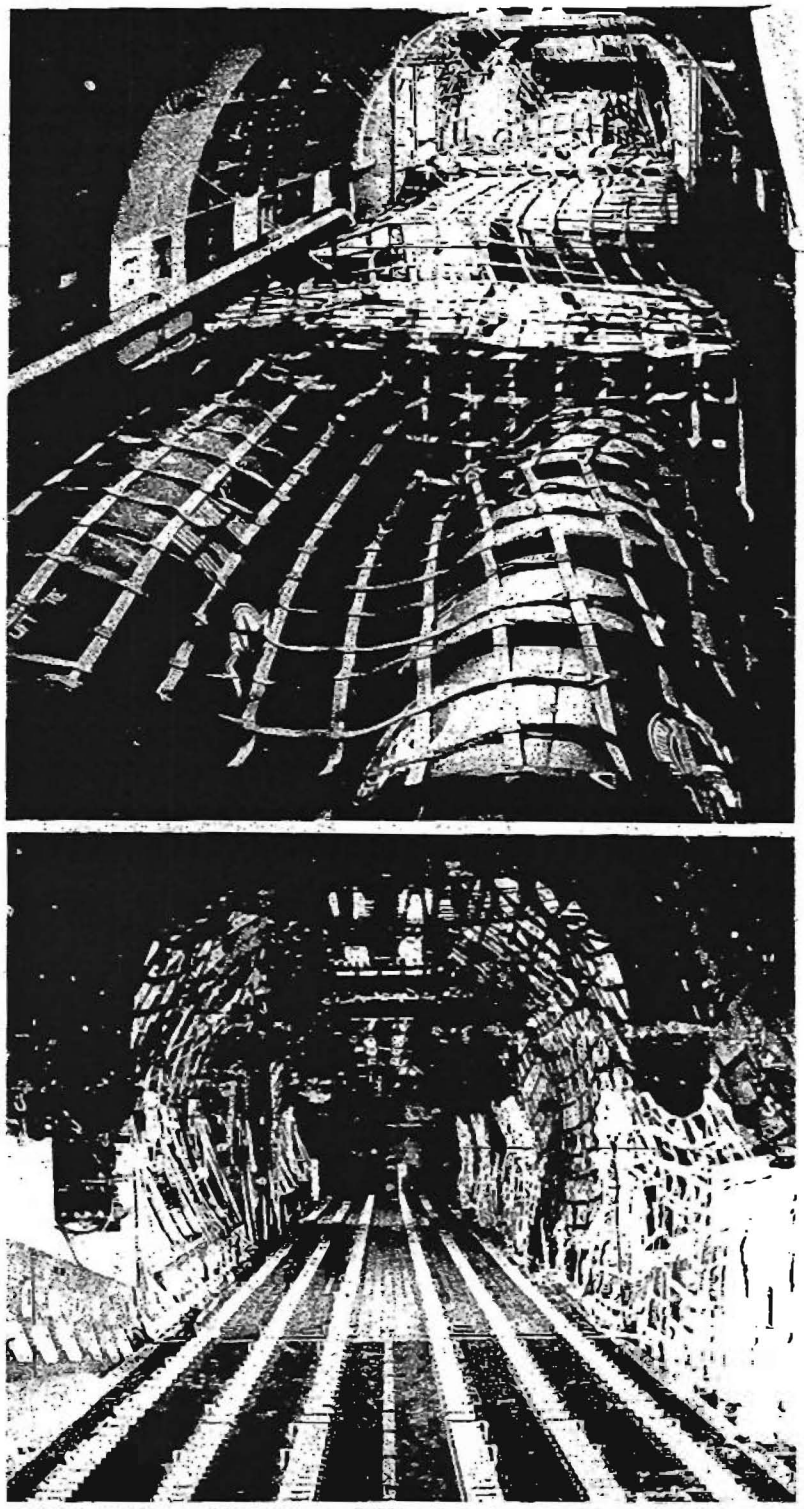
The conveyors may be installed to handle standard 40-in. x 48-in. MATS pallets. Pallets may be moved sidewise at the cabin entrance by mounting them on roller-borne transfer dollies (base equipment) or by installing the conveyors at an angle. The conveyor system consists of 52 ten-foot sections and two eight-foot sections. Four men can install the conveyor system in six minutes and remove it in four minutes.

Total tare weight of loading and tie-down equipment is 2,788 lb. The system is capable of handling a load of general cargo weighing 70,000 lb. A conveyor system using magnesium rails and plastic rollers is being studied which would cut the weight of the conveyor system from 1,288 lb. to 800 lb.

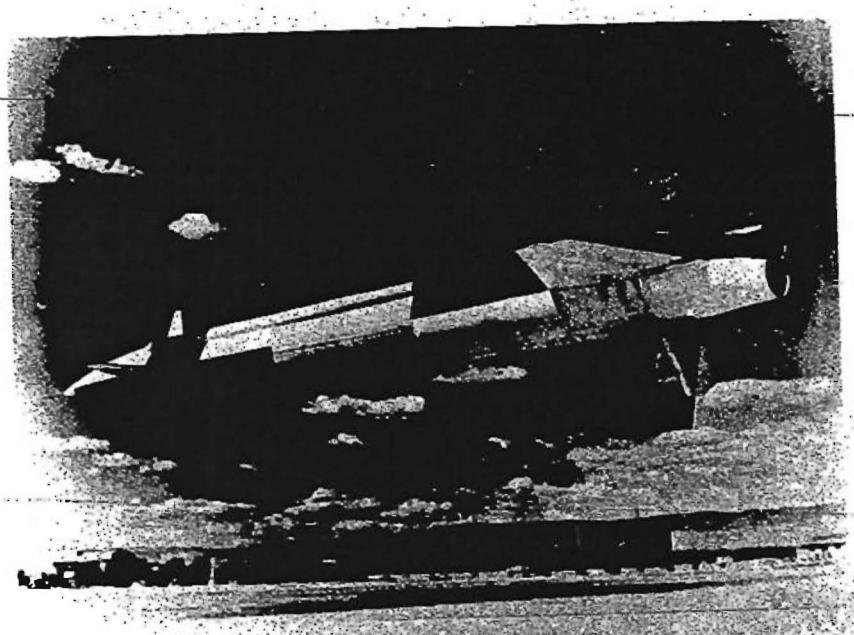
Width of a pallet load is limited to 120 in. and height is limited to 68 in. by the dimensions of the stern loading door. This allows 3 in. of clearance on all sides. A 100-in. x 106-in. forward cargo door makes it possible to load the airplane from both ends.

The net tie-down system consists of six barrier nets for forward and aft restraint and six hold-down webs to prevent vertical and lateral jostling. The barrier nets weigh 56 lb. apiece and will hold 16,000 lb. when extended to their full 110-in. height. When the cargo group is low enough to permit the barrier to be drawn back across its top, the barrier effectiveness is improved as it forms a catenary which divides the load between the floor fittings and the top lateral web. A cargo group weighing 21,500 lb. can be restrained in this way.

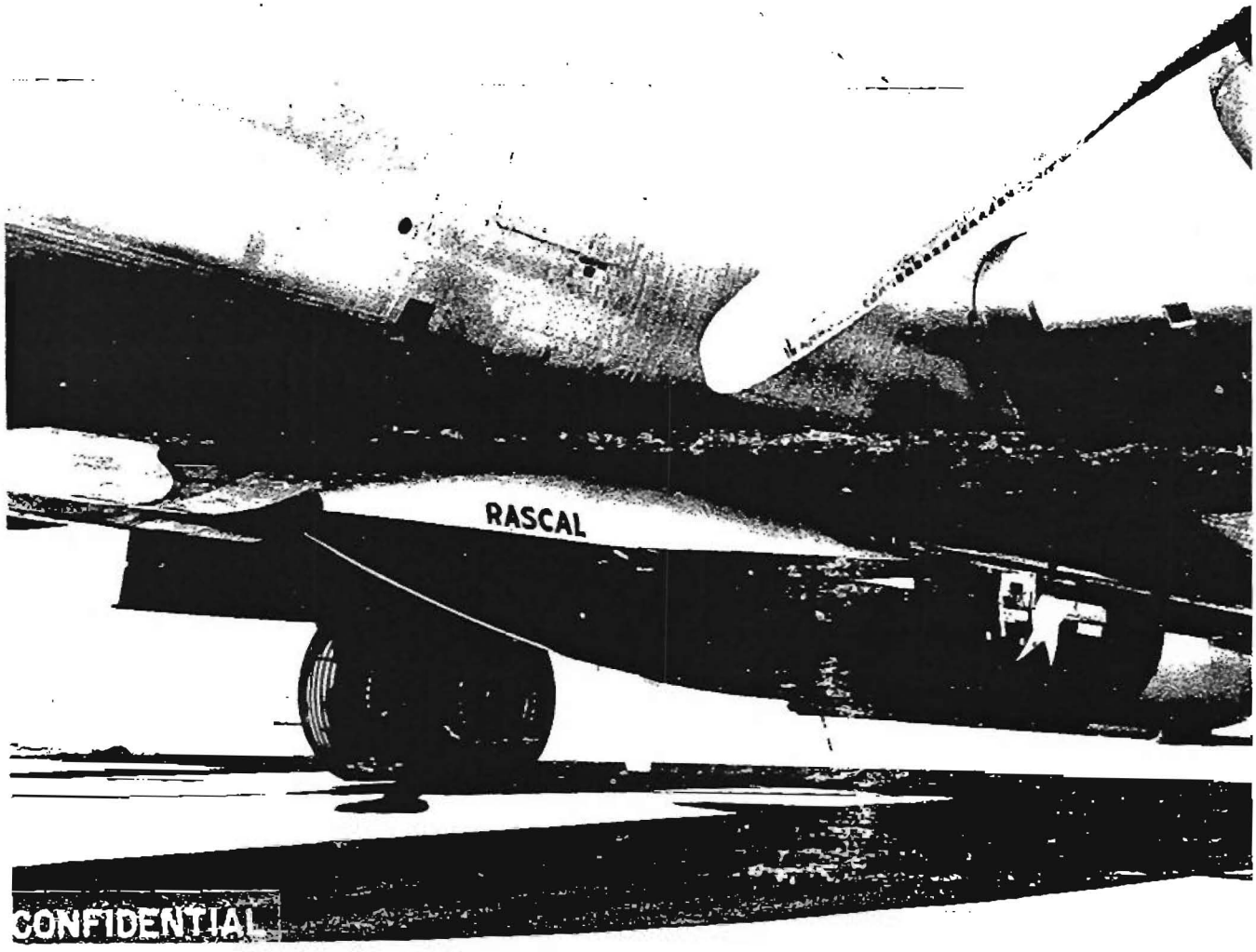
The ramp built into the aft loading door will support 25,000 lb. in the horizontal position. The hydraulic door actuator will lift the ramp from the ground with a 10,000 lb. load secured to it.



CARGO is quickly secured by few men in C-133A with barrier and hold-down webs suspended by pulleys from ceiling and right side which are dropped over cargo and attached to ring bolts in floor by snap hooks. Conveyor system allows heavy cargo to be winched aboard by small crew.



BELL "SHRIKE"
PTV-A-2 MX-776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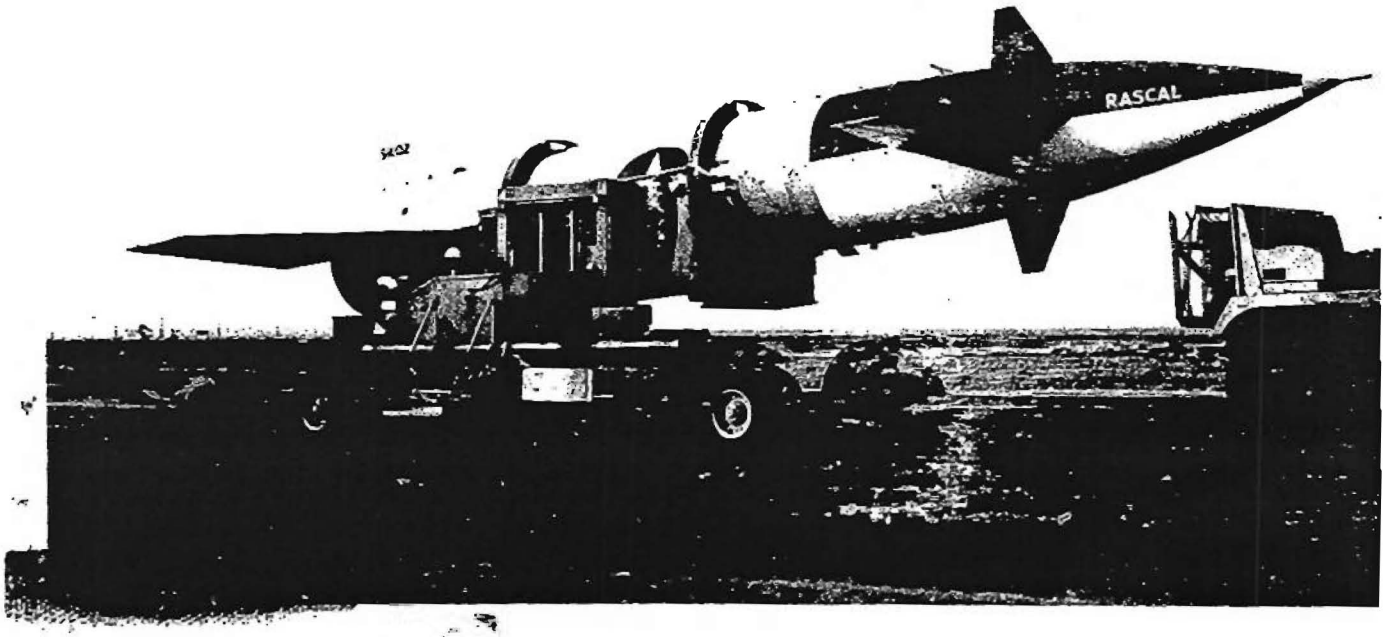
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