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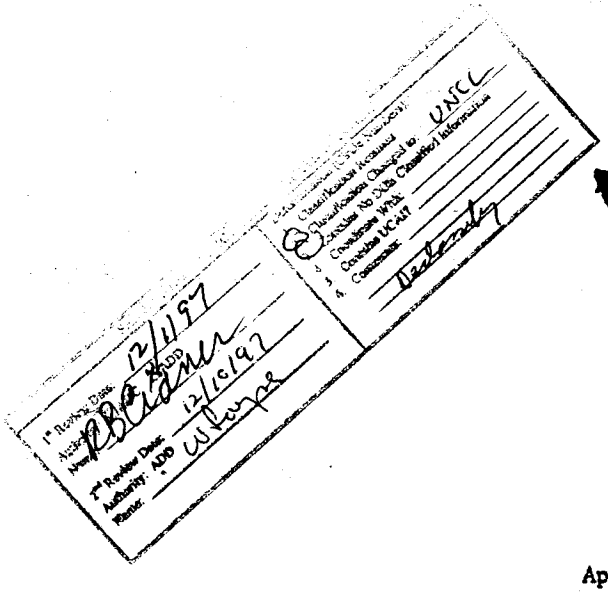
REPORT OF FLIGHT TEST NO. 44 OF THE MB-1 AIR-TO-AIR ROCKET WITH THE XW-25 WARHEAD



SCDR 245-59

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Fred R. Edwards, 1247

December, 1959

Approved by [redacted]
R. S. Wilson - 1240

ABSTRACT

This document is a report on Flight Test Number 44 for the XW-25 warhead, the fifth of six flights designed to prove compatibility of the warhead with the MB-1 air-to-air rocket/F-106A aircraft. Test objectives, results, and conclusions are presented herein. This is considered a successful test.

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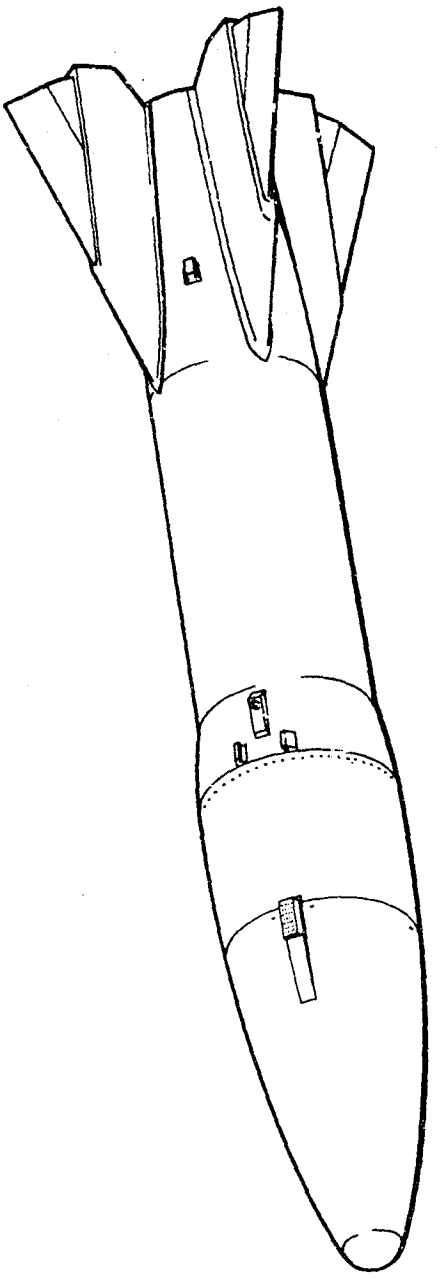

Figure 1. MB-1 Air-To-Air Rocket

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REPORT OF FLIGHT TEST NO. 44 OF THE MB-1 AIR-TO-AIR ROCKET WITH THE XW-25 WARHEAD

Summary

Flight Test 25.11-44 of the MB-1 air-to-air rocket (Figure 1) with an XW-25 warhead equipped with instrumentation for telemetering was performed at 1001 hours MST on 25 June 1959 at the Air Force Missile Development Center, Holloman Air Force Base, New Mexico. The rocket was carried inside the missile bay of an F-106A aircraft (Figure 2) and was ejection launched. The aircraft used for this test did not contain an automatic fire control system; therefore, manually operated switches were installed to allow the pilot to perform the prelaunch functions.

Six stainless steel screws containing radioactive antimony (Sb^{124}) were installed in the rocket fins, and a helicopter-borne scintillation counter was used to locate the rocket after impact.

At the time of rocket ejection, the aircraft was traveling at Mach 2 at 41,880-feet altitude. The rocket attained a velocity of 3210 feet per second.

This flight was completely successful; all system functions were correctly performed, and the environment encountered was within the design limits of the warhead.

Test Objectives

The objectives of Flight Test 25.11-44 were (1) to gather environmental data, (2) to measure the fuze outputs under firing conditions, and (3) to assure compatibility of the XW-25 warhead with the MB-1 rocket and the F-106A aircraft.

Test Unit Configuration

The warhead flown consisted of an MC-672 sphere case and an MC-656 X-unit. The telemetry was contained on a structure which replaced the HE and nuclear assembly in the sphere case. One detonator cable emergence hole was enlarged to accommodate the telemetry wiring. The X-unit differed from standard in that wiring was added to allow all system functions to be monitored, and holes were drilled in the mounting plate and the aft mounting ring to allow the telemetry wiring to reach the telemetry structure. Ballast was added to attain correct warhead weight.

Two XMC-1107 acceleration switches were installed in the X-unit--one in each thermal battery arm line. Both the normally closed and the normally open contacts were monitored.

Six bolts containing radioactive antimony were installed in the rocket fins to aid in locating the impact area.

The F-106A aircraft used for this test did not contain an automatic fire control system; thus manually controlled switches were installed to allow the pilot to perform the prelaunch functions.

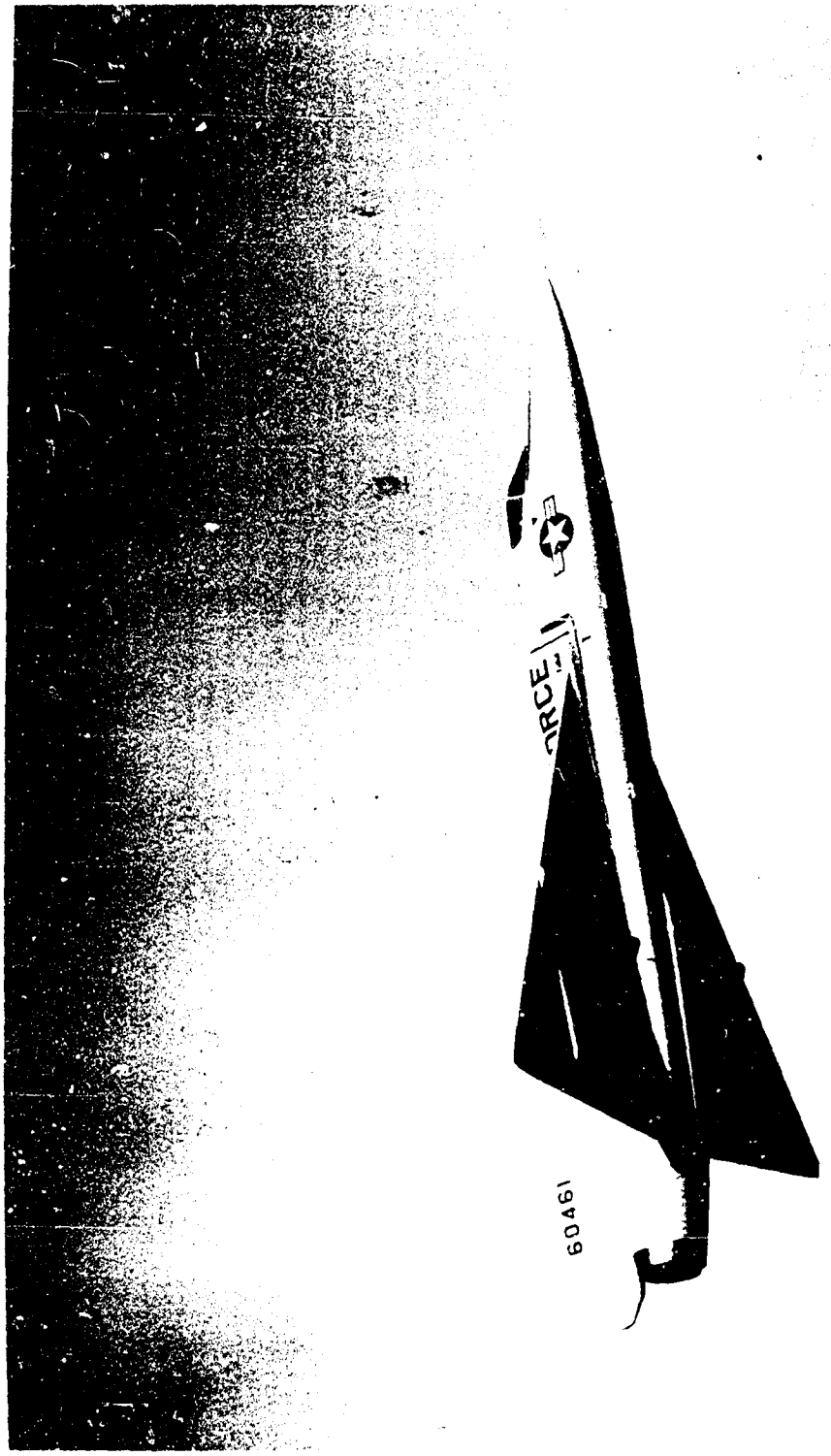

Figure 2. F-106A Aircraft

Instrumentation

In place of the HE sphere in the sphere case was an FM transmitter, 12 transistorized subcarrier oscillators, and associated components and wiring. Transmitter control was accomplished through the normally unused pins of the warhead connector.

Another pressure-sealed connector was installed in the X-unit cover to connect the transmitter output to the antenna (which was part of the nose cone) and still maintain pressure in the warhead.

Warhead function signals were sampled directly from their respective pins of the warhead connector. Capacitor voltage was sampled from a voltage divider connected to the capacitor bank. Detonator initiation was monitored directly from two bridge wires connected to X-unit output.

Temperature was measured with a chromel-alumel thermocouple imbedded in the warhead case, which is part of the missile skin.

Vibration pickups were attached to the X-unit back-up plate, and an acceleration pickup was mounted on the telemetry structure.

An air pressure transducer was installed inside the pressure-sealed warhead case on the telemetry structure.

Launch Conditions

Desired launch conditions for this test were those conditions which subject the warhead to maximum aerodynamic heating. This was computed to be maximum aircraft velocity at nearly 40,000 feet above mean sea level.

Actual launch conditions were as follows:

Altitude: 41880 MSL
True Airspeed: 1939 feet per second
Mach Number: 2.00
Wind Direction: From 287°
Wind Velocity: 18.6 feet per second
Aircraft Heading: 1.16°
Pitch Angle: 3.6° nose down
Free Air Temperature: -55.2°C
Rocket Serial Number: $D_1$36/S
Rocket Location: Missile bay

Test Results

The rocket attained a maximum velocity of 5310 feet per second, which caused the skin temperature at the thermocouple to rise at a maximum rate of approximately 25°F per second to a maximum of 348° at 20 seconds.

All system functions were correctly performed.

Both XMC-1107's operated correctly. All environmental conditions were within the design limits of the warhead. For complete results, see Table I.

[redacted]

Conclusion

This was a successful test. All system functions were correctly performed. Environmental conditions encountered during this test were less severe than the design criteria of the warhead; therefore, the warhead should function properly when subjected to these conditions.

[redacted]

TABLE I

Test Results, Flight Test 25.11-44
Flight Date: June 25, 1959

Information	Subcarrier freq (kc)	Pickup range	Pickup accuracy	Pickup location	Information recorded
Temperature	1.3	0° to 600°	10%	Skin Sta. 32.76	295°F at 12 sec 348°F max at 20 sec
Detonator initiation	2.3	On-Off	.015 sec	X-unit	7.548 sec
Internal pressure	3.0	0 to 30 psia	±5%	Sphere	Remained constant at 30.4 psia
Thermal battery arm No. 2	3.9	On-Off	.015 sec	X-unit	2.244 sec
Fire signal No. 2	3.9	On-Off	.015 sec	X-unit	7.538 sec
Capacitor voltage	5.4	0 to 3000 v	±10%	X-unit	2370 v prior to fire signal
Longitudinal acceleration	7.35	-50 to +100 g	±10%	Sphere	58 g max at 2.04 sec
Capacitor voltage	10.5	0 to 3000 v	±10%	X-unit	2370 v prior to fire signal
Acceleration switch No. 2	14.5	2 step	.015	X-unit	N.C. opened .198 sec N.O. closed .428 sec
Vertical vibration	30.0	±10 g 20 to 1000 cps	±10%	X-unit back-up plate	No appreciable vibration
Arm-safe switch	40.0	On-Off	.015 sec	X-unit	Operated correctly
Thermal battery arm No. 1	40.0	On-Off	.015 sec	X-unit	2.249 sec
Fire signal No. 1	40.0	On-Off	.015 sec	X-unit	7.538 sec
Acceleration switch No. 1	52.5	2 step	.015 sec	X-unit	N.C. opened .193 sec N.O. closed .413 sec
Longitudinal vibration	70.0	±10 g 20 to 1000 cps	±10%	X-unit back-up plate	No appreciable vibration

*All times are from first vertical motion.