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REPORT OF TEST FLIGHT NO. 7.8-24
XW-7/NIKE HERCULES WARHEAD INSTALLATION

SCDR-221-59

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RS 3466 (29831)

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ABSTRACT

This report describes the XW-7/NIKE HERCULES warhead installation test No. 7.8-24 and the data resulting from the test. This test was considered unsuccessful because of the short flight time.

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REPORT OF TEST FLIGHT NO. 7.8-24
XW-7/NIKE HERCULES WARHEAD INSTALLATION

Flight No. - 7.8-24

Type of Flight - XW-7.8 System Flight

Date - 7/9/58

Time - 1300 hrs MST

Carrier - NIKE HERCULES

Missile No. - 1810C-217

Round No. - B137

Summary

This flight test took place on July 9, 1958 at White Sands Missile Range, New Mexico. The round was fired from L161 at an angle of 5 degrees from vertical against a simulated 650 knot target. Designated intercept was at 80,000 feet msl and 100,000 yards range. The following Sandia Corporation components were contained in the test vehicle:

1. XW-7-X2 warhead (less HE, detonators and nuclear material)
2. XM51 adaption kit
3. Twenty channels of FM/FM telemetry

This test was unsuccessful due to the fail-safe destruction of the missile at 3.8 seconds. This was caused by the loss of the beacon at liftoff.

Test Objective

The primary objective of this flight test was to obtain data for the evaluation of the XW-7/NIKE HERCULES warhead installation. It was also desired to obtain data on warhead compartment pressure and vibration.

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Test Unit Configuration

The mechanical configuration of the XW-7.8 warhead was modified by replacing HE, nuclear material, and detonators with ballast. A detonator box was mounted on the cartridge near the MC-577's to indicate X-unit discharge. The self-aligning static tube, Serial No. 7, (Edcliff Model 4-4-2) was connected to two MC-586 baroswitches and to two Giannini pressure transducers.

The electrical circuitry differed from the tactical unit as follows:

1. The MC-586 fuze baroswitch was electrically isolated from the system so that each element could be individually telemetered. The elements were set at 5500, 6500, 7500, and 8500 feet pressure altitude.

2. Telemetry leads were added to monitor battery, filament, and capacitor voltages.

Instrumentation

Instrumentation supplied by Sandia Corporation included 20 channels of FM/FM telemetry. It was mounted on two trays in the rear of the missile around the blast tube. Three vibration pickups were mounted to the cartridge structure near the junction box. Three Giannini pressure transducers were mounted to the MC-490 In-Flight-Insertion mechanism. Two were used to measure probe static pressure, and the other to monitor the warhead compartment pressure. The following is a list of the telemetry channel assignments.

Carrier 223.5 mc

Subcarrier frequency (kc)	Information
2.3	Arm-safe No. 1 Bridge wire
3.0	IFI "in" signal No. 1 IFI "out" signal No. 1
3.9	Fire signal
5.4	Battery No. 1 voltage
7.35	X-unit filament No. 1
10.5	Fuze baro element No. 1 Fuze baro element No. 3 Command signal No. 1
22.0	Static pressure (Giannini No. 1)
30.0	X-unit capacitor voltage
40.0	X-unit charge current No. 1
70.0	Vibration, longitudinal

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Carrier 227.5 mc

Subcarrier frequency (kc)	Information
2.3	IFI "in" signal No. 2 IFI "out" signal No. 2
3.0	Fuze baro element No. 2 Fuze baro element No. 4 Command signal No. 2
3.9	Arm-safe No. 2 Bridge wire
5.4	Battery No. 2 voltage
7.35	X-unit filament No. 2
10.5	X-unit charge current No. 2
22.0	Static pressure (Giannini No. 2)
30.0	Warhead compartment pressure
40.0	Vibration, lateral
70.0	Vibration, vertical

Discussion of Test Results

Fuzing and firing sequence data are shown on Table I.

TABLE I

Event No.	Function	Time after launch (sec)	Altitude (msl)
	Launch	0	4040
1	Arm-safe No. 2 (operate)	1.51	-
2	Arm-safe No. 1 (operate)	1.60	-
3	Fuze baro (element No. 1 open)	3.06	6780
4	Fuze baro (element No. 2 open)	3.62	7826
5	End of telemetry	3.8	-

MC-577 (T105) Arming-Safing Mechanisms

The arming-safing mechanisms used in this test were preliminary development models which had been adjusted to a threshold operational acceleration of 9±1 g (missile) and were set to operate within 1 to 2 seconds after exceeding this threshold value. Both devices operated within these limits. Table II shows the performance of these devices.

TABLE II

Unit No.	Serial No.	Test time	Time in seconds after launch	Missile Acceleration
1	647	2.14	1.60	19.0
2	633	2.12	1.51	19.0

The test times were determined by using a T278 with a 760 gram weight.

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Static-Pressure Sensing System

Due to failure of the missile at 3.8 seconds, very little static-pressure data was received. The static pressure measured by two Giannini aneroid-type transducers was not reduced.

Position data from range tracking facilities were used to determine the missile trajectory, which was reduced to obtain altitude. Mach number was not reduced.

Meteorological data were obtained from a balloon released before launch. The data were used in conjunction with position data to calculate the ambient pressure (P_a).

The P_m/P_a values calculated with baroswitch P_m, that is, assuming that the baroswitch elements closed during flight at their calibrated pressure setting, are shown on Table III.

MC-586 Baroswitch

Since the two baroswitches operate as end devices of the static-pressure sensing system, analysis of their operation can be made only after consideration of the other elements of the pressure-sensing system.

The four elements of the fuze baro were individually monitored. The first element was set to a nominal pressure altitude of 5500 feet, and elements 2, 3, and 4 were set at 6500, 7500, and 8500 feet, respectively. Elements 1, 2, 3, and 4 actually operated as shown on Table III when checked by bench test.

The arm baro had all four elements set at a nominal 15,000-foot pressure altitude, with the contacts connected in a series-parallel network. Bench test calibration showed that operation would actually occur at the values shown in Table III.

The ratio of the calibrated operating pressures of the baros (baro P_m) to the ambient pressure at time of operation during flight is shown in Table III.

TABLE III

MC-586 Baroswitch Operation

Baroswitch Serial No.	Element	Time after launch (sec)	Baro P_m Press. Alt.	Baro P_m In. Hg.	Range P_a In. Hg	Baro P_m divided by Range P_a
AH-0222-K7	1 open	3.06	5504	24.43	23.66	1.033
	2 open	3.62 *	6500	23.53	22.81	1.032

*Missile destroyed at 3.8 seconds.

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Warhead Vibration

Due to the short time of flight, the vibration data was not reduced.

Conclusions

This test was unsuccessful due to the short time of flight.

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