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SCDR 418-62

REPORT OF THE HOTPOINT/MK 34 MOD 3 AIR GUN TESTS [redacted]

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April 1963

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ABSTRACT

This report describes the four HOTPOINT air gun tests conducted at LASL, during April and May 1962, to evaluate the ability of the Mk 34 Mod 3 warhead to withstand simulated laydown shock.

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REPORT OF THE HOTPOINT/MK 34 MOD 3 AIR GUN TESTS

Introduction

The Mk 34 is being modified to include the MC-1606 switch-filter pack and the MC-1607 bleeder circuit to improve the safety of the warhead. In addition, the MATTA Zipper is being evaluated for use in the Mk 34. Present plans do not include retrofitting the Mk 34 with MATTA Zippers; however, if stockpile life requires the replacement of the present MC-825 or MC-1640 Zipper and if production quantities are sufficient, it may be desirable to use MATTA Zippers for the replacement.

The MC-1606 switch-filter pack was added to the warhead to minimize and protect the WH from EMR induced currents. The MC-1607 bleeder circuit was added to the WH to discharge the X-unit at a predictable rate in case of an accidental charge.

These components were incorporated in the Mk 34 warhead for a drop test program at Tonopah Test Range. Four drops were made: two of Mk 34's with the MC-1606, MC-1607, and MATTA Zippers, and two of Mk 34's with the MC-1607 and MATTA Zippers but without MC-1606's. The results of these tests were satisfactory; there was no discernible damage to the components. These tests were all low altitude (nominal 100 feet) releases. To obtain additional data, it was decided to use the LASL air gun to propel the HOTPOINT weapon case, with warhead installed, into concrete targets. Four tests were scheduled: two at 180 ft/sec with a 30-degree impact angle, one at 165 ft/sec with a 60-degree angle, and one at 165 ft/sec with a 90-degree angle. These conditions are approximately a 25-percent overtest of velocity at these impact angles.

The HOTPOINT ballistic tables and data from the drop test program show impact angles of about 30 degrees and velocity of about 145 ft/sec with a 200-foot release and an angle of about 60 degrees and velocity of about 130 ft/sec (terminal) with a 500-foot release. A 90-degree impact would never materialize unless pitch and yaw were present.

Test Objective

The test objective was to verify the structural adequacy of the Mk 34 modified to include the MC-1606 switch-filter pack, MC-1607 bleeder circuit, and MATTA Zippers to withstand concrete impacts at velocities and impact angles that would result from aircraft releases of 200 feet and greater.

Conclusions

All components operated satisfactorily after the weapon was subjected to a nominal 25-percent overtest of impact velocities that would result from aircraft releases of 200 feet and greater. These results verify that the Mk 34 Mod 3 warhead (with MATTA Zippers) is structurally adequate for aircraft releases of 200 feet and greater. The previous drop test program (described under "Introduction") demonstrated the ability of the warhead to withstand impact shock with aircraft releases of 100 feet.

Weapon Description and Assembly

Four HOTPOINT weapon cases were used in these tests. The aerodynamic fairings were not included and the fuzes were all inert.

The case was supported in the air gun with four equally-spaced wooden sabots, and the air gun pressure plate was in contact with the rear of the weapon case. When the air gun pressure was released, the pressure plate accelerated the weapon down the barrel and the sabots kept the weapon centered and stable. After the weapon cleared the gun, the sabots and pressure plate separated from the case. The impact targets were 10 x 10 x 1-foot slabs of nonreinforced concrete tilted to give the desired impact angles. The backfill was compacted earth and gravel retained by wooden forms and/or sand bags.

The assembly of the individual test units was as follows:

Test No.	1	2	3	4
Sphere P.O.	12661	12664	12663	12662
HOTPOINT case	64	223	198	378
1A Item	JP-068-H6	JP-099-H6	Dummy	JP-041-H6
MC-680	AA-5000-60	AA-3496-H8	AA-4698-G0	AA-4985-G0
MC-724	AA-2308-C0	JP-51809-E7	AA-2347-D0	AA-1063-D8
MC-825	219047	219041	219037	219045
MC-825	219033	219042	219043	219049
MC-1607	X028	X023	X026	X027
MC-1606	X026	X029	X024	X023
MC-1606	X030#			

#Test Unit No. 1 was modified to contain two MC-1606's, instead of the usual single component, to obtain additional information on the 30-degree slap down environment.

Instrumentation

No instrumentation was installed in the weapon. The components were tested before assembly and after impact.

Two cameras were used to obtain flight and impact information. A Mitchell camera was by the air gun looking down the line of flight, and a Fastax was by the target with the field of view perpendicular to the flight path.

Test Results

Tests and inspections conducted before and after the impact tests showed no damage to the warhead components. The test conditions were as follows:

Test No.	1	2	3	4
Impact angle (degrees from target surface)	30#	33	56	80
Impact velocity (ft/sec)	183.0#	179.4	174	162

#Impact camera coverage not available; angle is estimated and velocity is the exit velocity from the gun.

The weapon cases did not fail in any of the tests, and warhead post-mortems found no warhead damage. The MC-1606's, MC-1607's, and MATTA Zippers performed satisfactorily in the electrical tests conducted after recovery.

Test No. 1

Because the Fastax cameras did not operate properly, impact data is not available. However, the exit velocity from the gun was measured as 183 ft/sec; this should be approximately the same as impact velocity. The trajectory and the emplacement angle of the target were calculated to give a 30-degree impact angle. Test No. 2, which was a repeat of this test, had an impact angle and velocity of 33 degrees and 179.4 ft/sec.

The weapon was stable in flight, and the impact was near the center of the target. After impact, the weapon tumbled forward and up and did not go through the concrete target. The weapon tumbled a number of times in the air and impacted a second time on an expended concrete slab approximately 15 feet from the target. This impact was on the side of the slab and transverse to the weapon at the pressure hull-adapter section joint.

Test No. 2

The impact angle and velocity were 33 degrees and 197.4 ft/sec, respectively, as determined by the Fastax camera data.

The weapon was stable in flight and impact was similar to Test No. 1; however, in this test, the discarded concrete slab was not hit on the second impact. Figure No. 1 shows stills of the Fastax coverage at impact.

Test No. 3

The air gun pressure was higher than required and an impact velocity of 174 ft/sec was obtained rather than the expected 165 ft/sec. However, the concrete target was hit at an angle of 56 degrees.

The weapon went through the concrete and rolled forward slapping the concrete slab, but it did not tumble. The weapon came to rest with the nose in the hole and the tail at the top of the target. Figure 2 shows Fastax stills during impact.

Test No. 4

The impact angle and velocity were 80 degrees and 162 ft/sec, respectively.

The weapon penetrated through the target, fell out of the hole, and came to rest below the point of impact. Figure 3 shows Fastax stills of impact.

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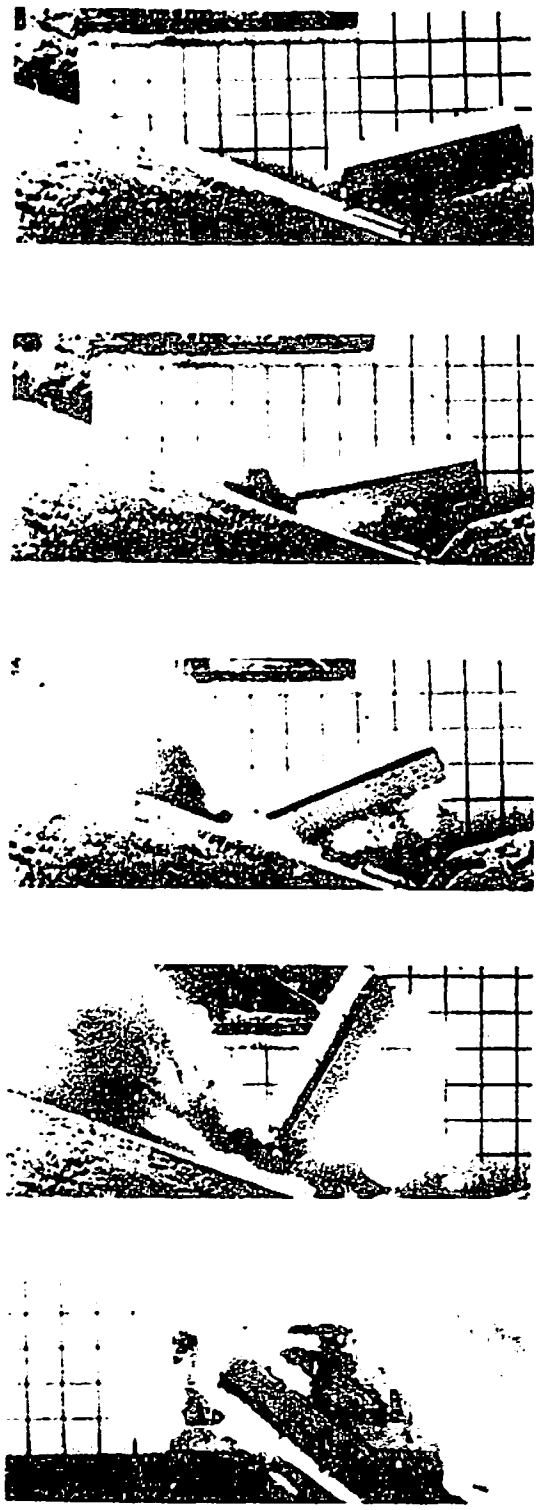

Test No. 2

Impact Angle = 33 degrees

Impact Velocity = 179.4 ft/sec

Figure 1.

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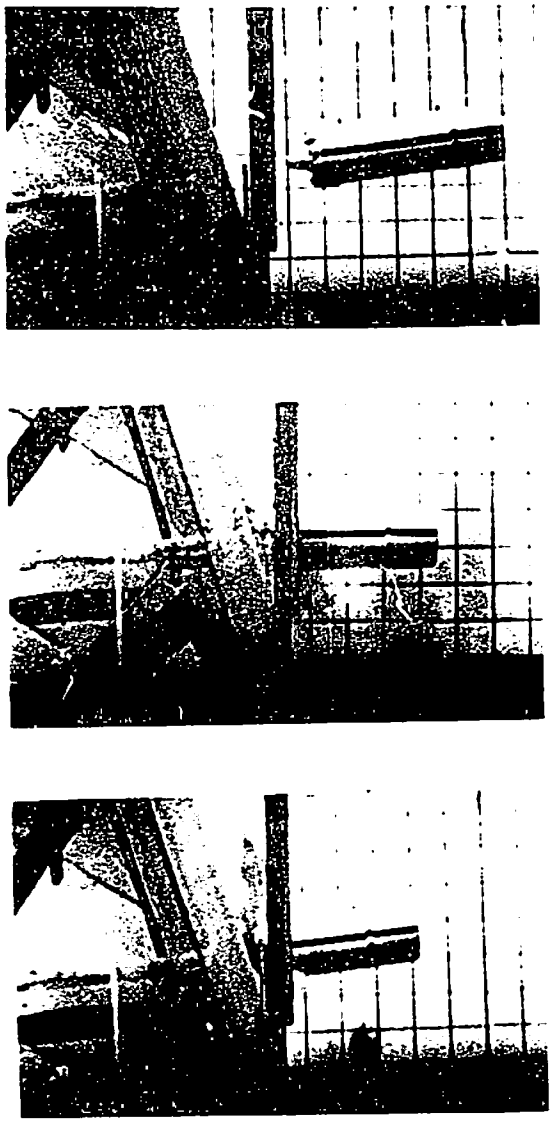
TEST NO. 3

Impact Angle = 56 degrees

Impact Velocity = 174 ft/sec.

Figure 2.

[redacted]



Test No. 4

Impact Angle = 80 degrees

Impact Velocity = 162 ft/sec.

Figure 3.