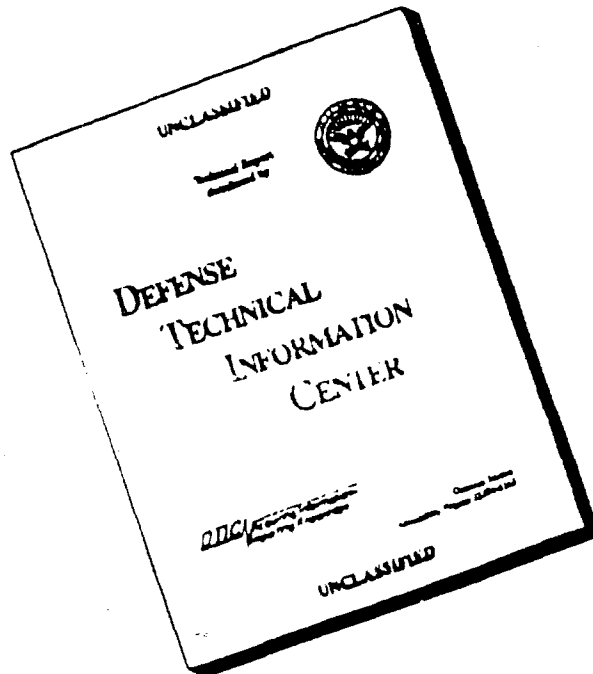


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QUARTERLY REPORT

NN-Q-8

Contract DAI-19-020-501-ORD-(P)-58

NATIONAL NORTHERN

West Hanover, Massachusetts

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**DETONATION VELOCITY DETERMINATIONS
OF VARIED SYSTEMS AND CONDITIONS**

**Contract DAI-19-020-501-ORD-(P)-58
SEVENTH QUARTERLY REPORT**

NN-Q-8

December 1956, January, February 1957

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The Technical Division of National Fireworks Ordnance Corp.

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West Hanover, Massachusetts

DETONATION VELOCITY DETERMINATIONS
OF VARIED SYSTEMS AND CONDITIONS

Contract DAI-19-020-501-ORD-(P)-58

SEVENTH QUARTERLY REPORT

NN-Q-8

December 1956, January, February 1957

Submitted by:

Arthur W. O'Brien, Jr.

Approved by:

C. M. Saffer, Jr.

C. M. Saffer, Jr.
Technical Director

Approved by:

S. J. Porter

S. J. Porter
Manager

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The Technical Division of National Fireworks Ordnance Corp.

1.0 INTRODUCTION

This is a Quarterly Report of testing accomplished during the period 10 December 1956 through 9 March 1957 for Picatinny Arsenal under supplemented Contract No. DAI-19-020-501-ORD-(P)-58, and is designated NN-Q-8. The first four Quarterly Reports of this contract, NN-Q-1 through NN-Q-4, dealt with free-air blast testing and are summarized in National's Summary Report NN-P-34. The fifth and sixth Quarterly Reports described the work on detonation velocities of various RDX systems. This work is summarized in the sixth report for September, October, and November 1956, NN-Q-7.

2.0 OBJECT OF TESTS

The next task assigned under this contract is a survey of varied explosive systems for the purpose of determining any change in detonation velocity with changes in altitude, charge diameter, and degree of confinement.

3.0 CHARGE DATA

3.1 To survey possible changes in behavior of varied explosive systems with changes in altitude, diameter, or confinement, a number of specific conditions have been taken as starting points. In each combination of conditions, five measurements of the detonation velocity of the explosive system will be made.

3.2 The explosive systems to be included in these tests are TNT, H-6, 70/30 RDX/TNT, 70/30 HMX/TNT, and MOX-2B.

3.3 These systems will be measured at ground and at simulated altitudes of 30,000, 60,000, and 90,000 feet.

3.4 We now intend to test these systems in cylinders one-half and one-and-one-half inches in diameter. The length of the cylinder will be limited by the weight of explosive we are able to test in our altitude simulating chamber. The explosive

weight limits of our chamber at varied altitudes have not yet been completely determined.

3.5 These explosive systems will be measured for detonation velocities in two conditions of confinement. One with no confinement, except for paper tape where it is necessary, and the other with one-quarter-inch-thick steeltubing of the appropriate inside diameter.

3.6 From some preliminary testing, we have determined that MOX-2B will probably not propagate, unconfined, in less than a three-inch-diameter column, and that propagation is not probable under the conditions of confinement (above) in columns under one-inch in diameter. We must determine, in conference with Picatinny Arsenal, whether to gear all of our testing to these limits of MOX-2B, or determine those tests in smaller diameters where MOX-2B will propagate. The only other alternative is to substitute another explosive, such as MAX-2, that is near MOX-2B in structure.

4.0 TEST EQUIPMENT

4.1 The measurement of detonation velocity is accomplished by electrical probes inserted in the column of explosive at known points. These probes generate a sharp, high-voltage pulse (rising to approximately 300 volts in 0.1 microsecond). These pulses may be used to mark a single sweep on an oscillograph and/or used to operate the start or stop circuit of an electronic counter chronograph. The oscillograph used is the DuMont 303 and recording is accomplished by a view camera, the Burke and James 5 x 7. Timing on the oscillograph is accomplished by crystal-oscillator-timing-generator marking either ten or one microsecond intervals.

4.2 The tests at simulated altitudes will be accomplished in our chamber. The chamber has approximate inside dimensions 12 x 14 x 9 feet and is evacuated to approximately 120,000 feet (3mm. Hg) by a Kinney KD-780 vacuum pump run by

a forty-horsepower electric motor.

5.0 TEST RESULTS

Preliminary determinations have been made on these explosives to determine that they would sustain detonation in appropriate columns. These tests were made in 1/4-inch thick steel tubes with the indicated inside diameter. The tubes were twelve inches long, except where indicated, and impressions were made against a steel plate to determine the extent of the detonation.

<u>Explosive</u>		<u>Column Diameter</u>			
		<u>1/2"</u>	<u>3/4"</u>	<u>1"</u>	<u>1 1/2"</u>
TNT	(1)	Yes	Yes	Yes	--
	(2)	Yes	Yes	Yes	--
	(3)	Yes	Yes	Yes	--
RDX/TNT 70/30	(1)	Yes	Yes	Yes	--
	(2)	Yes	Yes	Yes	--
	(3)	Yes	Yes	--	--
H-6	(1)	Yes	Yes	Yes	--
	(2)	Yes	Yes	Yes	--
	(3)	Yes	Yes	Yes	--
MOX-2B	(1)	No	No	(1"x6) Yes	Yes
	(2)	No	(3/4"x6) No	(1"x6) Yes	Yes
	(3)	No	(3/4"x6) No	(1"x6) Yes	Yes
MAX-2	(1)	Yes	Yes	Yes	--
	(2)	Yes	Yes	Yes	--
	(3)	Yes	Yes	Yes	--

6.0 FUTURE WORK

With final determination of charge data, the test program will proceed as outlined above.

7.0 MAN-HOURS

A total of 366 man-hours have been expended on this contract during this report period. Work involving 177 of these man-hours was reported in our NN-Q-7 Quarterly Report in order to complete one phase of the program.

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