

TATB PERFORMANCE AND SENSITIVITY

P. E. Kramer

DEVELOPMENT DIVISION

JANUARY - MARCH 1976

MASTER

*Normal Process Development
Endeavor No. 106*



Mason & Hanger - Silas Mason Co., Inc.

Parlex Plant

P. O. BOX 647
AMARILLO, TEXAS 79177
806-335-1581

operated for the
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under
U. S. GOVERNMENT Contract DA-11-173-AMC-487(A)

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately-owned rights.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

TATB PERFORMANCE AND SENSITIVITY

P. E. Kramer

DEVELOPMENT DIVISION

January - March 1976
Endeavor No. 106

M-1

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ep

ABSTRACT

Eleven gap test series were conducted with TATB powder and RX-03-BB. Tests on RX-03-BB Blends 8 and 9 revealed nothing unusual. Five series conducted with Teledyne-produced powders again indicated a wide range of sensitivities for TATB from that source. Tests on other powders suspected of possessing abnormal sensitivity revealed no notable shifts.

The temperature controlled wedge tests on RX-03-BB were completed. Final results for the hot (68 C) tests are presented and results for all RX-03-BB tests are plotted for comparison.

DISCUSSION

GAP SENSITIVITY

Routine testing of RX-03-BB made with LLL blends continued with Blends 8 and 9. Blend 8 was the first material to be tested both before and after reformulation. The most notable effect observed was a 0.005 Mg/m^3 decrease in pressed density after reformulation. About 0.3 mm of the 0.36 mm change in sensitivity can be attributed to the density change; thus, no true sensitivity shift occurred in reformulation. Blend 9 was slightly more sensitive than Blend 8 but both fell within the range of results for previous LLL blends.

All gap test results appear in Table I. The column entitled Expected Results indicates the most probable results for an LLL blend (powder or RX-03-BB, whichever is appropriate) at the listed density. Differences of less than 0.25 mm are not considered significant.

The report for July - September 1975 discussed tests on three batches of Teledyne TATB which spanned the range from the least to most sensitive TATB tested at Pantex. These three batches have since been formulated into RX-03-BB and were tested again. A wide sensitivity range was still evident but none were particularly insensitive. Instead, a shift upward in sensitivity was observed, with Batch 2 (very insensitive as a powder) being near normal for RX-03-BB. The sensitivities of Batches 9 and 18 relative to Batch 2 remained about the same as with the powders.

An additional Teledyne powder, Lot B-337, was tested at two densities. It was found to be about midway between the blends and Teledyne Batch 18 in sensitivity.

Lot 5281-16-01R3 was produced in a study involving reuse of the toluene solvent in the amination stage. Sensitivity was low enough to be considered actually different from the blends, but the difference was not great enough to be of concern.

Table I. Gap Test Results

<u>HE</u>	<u>Density</u> (g/cm ³)	<u>G₅₀ (mm of Brass)</u>	
		<u>Observed</u>	<u>Expected</u>
RX-03-BB Blend 8 (First Formulation)	1.904 ± 0.001	1.55	1.5
RX-03-BB Blend 8 (Reformulated)	1.899 ± 0.001	1.91	1.9
RX-03-BB Blend 9	1.906 ± 0.001	1.65	1.4
RX-03-BB (Teledyne Batch 2)	1.897 ± 0.001	2.31	2.1
RX-03-BB (Teledyne Batch 9)	1.895 ± 0.002	3.08	2.3
RX-03-BB (Teledyne Batch 18)	1.878 ± 0.001	5.81	3.8
TATB Teledyne Batch 2	1.844 ± 0.002	5.54	7.7
TATB Teledyne Batch 9	1.856 ± 0.001	6.81	6.5
TATB Teledyne Batch 18	1.838 ± 0.001	11.00	8.3
TATB Teledyne Lot B-337	1.852 ± 0.001	8.46	6.8
TATB Teledyne Lot B-377	1.800 ± 0.001	12.93	11.7
TATB Lot 5281-16-01R3	1.862 ± 0.001	5.28	5.7
TATB United Technology Lot R-553	1.861 ± 0.001	5.16	5.8
TATB Cordova Lot 1B-034-002	1.861 ± 0.001	5.77	5.8

Table II. Final Wedge Test Results for RX-03-BB @ 68 C

$$\rho_{\text{amb}} = 1.900 \text{ g/cm}^3 \quad \rho_{68} \sim 1.88 \text{ g/cm}^3$$

Average Detonation Velocity $\sim 7.51 \text{ km/sec}$

<u>Transmitted Pressure</u> (GPa)	<u>Distance to Detonation</u> (mm)	<u>Time to Detonation</u> (μs)	<u>Excess Transit Time</u> (μs)
10.8	8.5	1.66	0.53
14.2	4.8	0.92	0.28

United Technology Lot R-553 was of interest because it possessed an unusually narrow particle distribution. A small but real difference in sensitivity from the blends was evident.

Cordova Lot IB-034-002 was of interest because it contains 4 - 5% of solvent extractable impurities. However, no sensitivity shift was observed.

WEDGE TESTS

After much difficulty the high temperature wedge test series on RX-03-BB was completed. Results for these tests are listed in Table II which supplants Table II in the report for July-September 1975. Results for all TATB wedge tests conducted thus far are plotted in Figs. 1 and 2. The relative slopes for the hot, cold and ambient tests on the 1.90 Mg/m³ material indicate that the initial RX-03-BB temperature is relatively unimportant at high levels of input pressure but becomes increasingly important at lower pressures. Since only two data points were available for each of the temperature controlled series, the results were plotted with the usual linear relationship in log-log coordinates. It may well be, however, that additional data might indicate a deviation from this pattern which is well established for ambient tests.

It is fairly certain that the difficulties with the high temperature tests can be attributed to bonding problems between the aluminum driver plate and the RX-03-BB test sample. The problem was finally overcome by using Adiprene L-100 as the bonding agent, but even with this material extreme care was required to obtain adequate adhesion. Primary evidence of the bonding problem on the hot shots was obtained from framing camera records. On the cold shots severe frosting on the shot container prevented use of a framing camera, so it is not known whether or not a problem existed in those tests. Thus, the validity of the cold test data is not certain.

IMPACT SENSITIVITY

In these reports, little mention has been made of impact sensitivity testing of TATB. In fact, several powders and almost all TATB formulations have been tested. Thus far no TATB powder or formulation has displayed any reaction at the maximum height (200 cm) in our tester (2.5 kg hammer, Type 12 tools, with and without grit).

FUTURE WORK

Wedge testing of pure TATB is scheduled to begin very soon. Only ambient tests are anticipated presently.

Cylinder tests using pure TATB are planned in the near future.

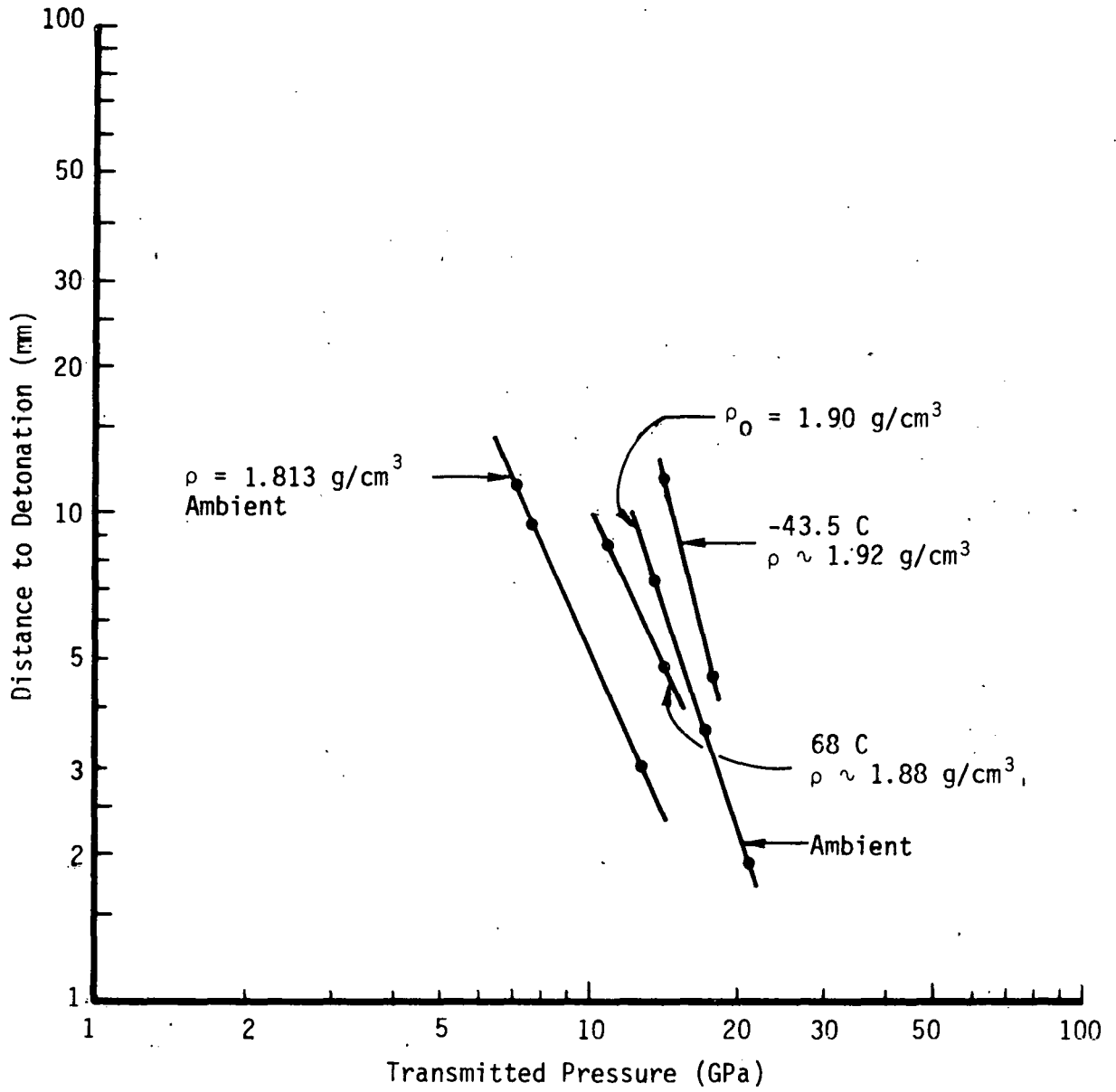


Fig. 1. Distance to Detonation vs. Transmitted Pressure for RX-03-BB

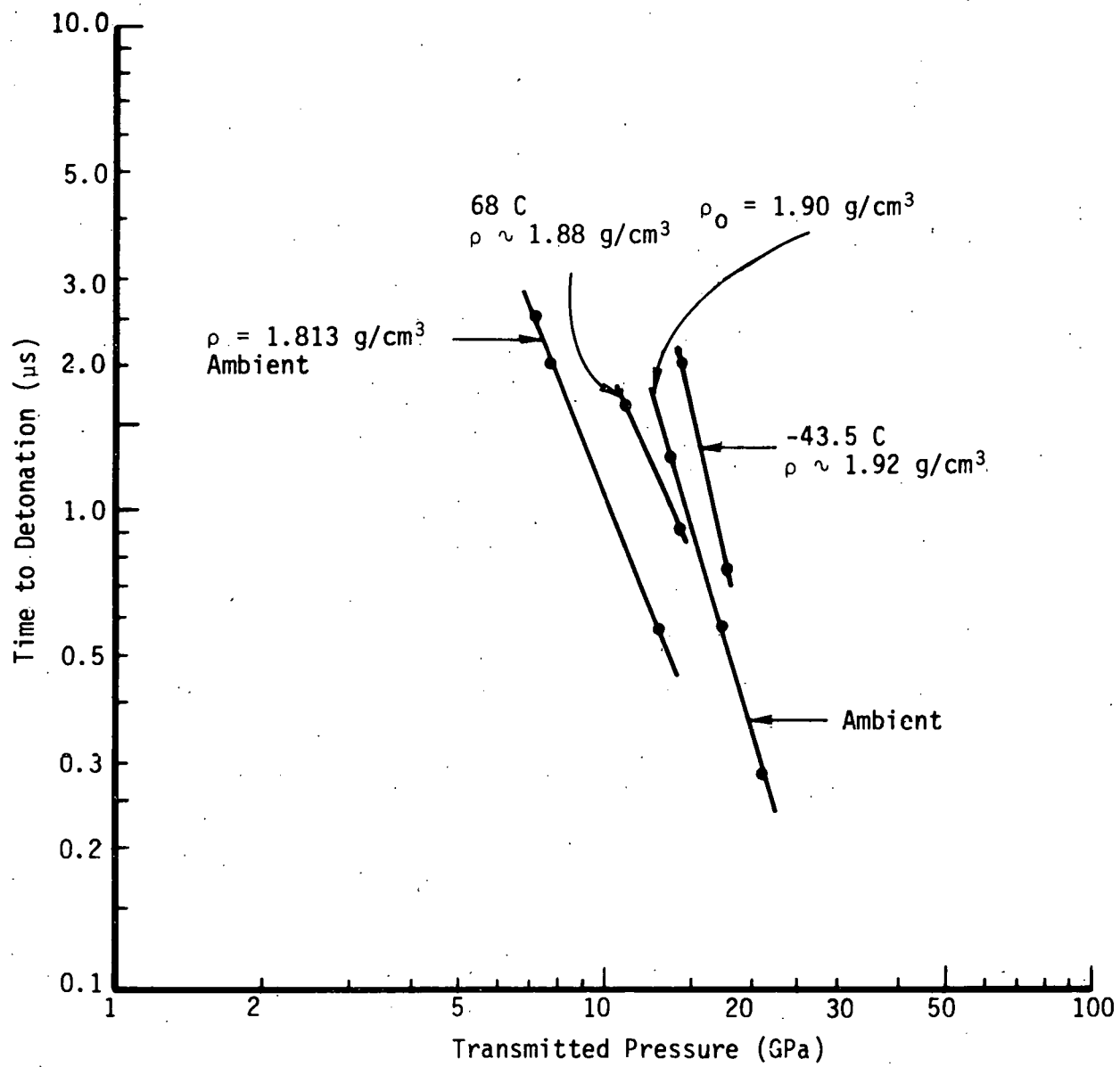


Fig. 2. Time to Detonation vs. Transmitted Pressure for RX-03-BB