RESEARCH MEMORANDUM

This is a working paper. It may be expanded,
modified, or withdrawn at any time.

DO NOT
PHOTOSTAT

The **RAND** *Corporation*
SANTA MONICA • CALIFORNIA

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.

Prepared under Contract
with
U. S. Atomic Energy Commission Contract No. AT(29-1)-1477

RESEARCH MEMORANDUM

SPACE PLOTS OF PRESSURE, DENSITY AND PARTICLE
VELOCITY FOR THE BLAST WAVE FROM A POINT SOURCE
IN AIR

H. L. Brode

RM-1913-AEC
(SUPPLEMENT TO RM-1824-AEC)

ASTIA Document Number AD 133043

June 3, 1957

Assigned to _____

This is a working paper. It may be expanded, modified, or withdrawn at any time.

CONTENTS

DISCUSSION.....	1
-----------------	---

FIGURES

Figures 1 - 20 - Pressure vs Radius for Various Times.....	3
--	---

Figures 21 - 41 - Particle Velocity vs Radius for Various Times.....	23
---	----

Figures 42 - 49 - Density vs Radius for Various Times.....	44
--	----

This report contains graphs of pressure, density and particle velocity versus radius at specified times throughout the course of an explosion in air originating from an instantaneous release of energy at a point. These curves are basic to the results and analysis reported in RM-1824-AEC and are published here as supplementary reference data for those who have occasion to require more information or detail than is presented in that report.

All the details of the computation, all the analysis and discussion of results are contained in RM-1824-AEC, and no attempt is made here to repeat that material.

There are eight pages of density plots (ρ/ρ_0 vs radius), covering only the first part of the problem. The pressure plots (twenty pages of P/P_0 vs radius) extend the entire length of the problem, but show the results of the real air calculation out to a time $\tau = 1.037$, beyond which the pressure curves are for the ideal gas extension of the calculation. Similarly the twenty one pages of particle velocity curves cover the ideal gas extension at times greater than 1.30.

As computed and as reported all quantities are dimensionless, the units being as follows:

Radius: $\lambda = R/\alpha$

Time: $\tau = tc_0/\alpha$

where the length α is defined as $\alpha^3 = W/P_0$, with W = total blast energy.

Pressure: $\pi = P/P_0$

Density: $\eta = \rho/\rho_0$

Particle velocity: $\beta = u/c_0$

where P_0 , ρ_0 , c_0 are the pressure, density and sound speed in the ambient or pre-shocked air.

THIS PAGE
WAS INTENTIONALLY
LEFT BLANK

Fig. 1 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 2 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 007

Fig. 4 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 5 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 010

Fig.8 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig.9 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 012

RM-1913-AEC
6-3-57
-11-

Fig.10— Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 014

Fig. 12 - Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 13 — Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

267 017

RM-1913-AEC
6-3-57
-16-

Fig. 18—Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 20—Pressure ($\pi = P/P_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 024

Fig.22— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

Fig.23—Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig.24— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 25— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

367 030

Fig.29—Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

267 032

Fig. 30— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 32— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig.33— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

Fig. 34—Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig.35— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

267 039

Fig. 37 — Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

LIBRASCOPE NO. 1010A GRAPH PAPER FOR USE WITH LIBRASCOPE X-Y PLOTTER AND RECORDER

Fig. 38—Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

Fig. 39— Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

Fig. 41—Particle velocity ($\beta = u/c_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

Fig. 44 - Density ($\eta = \rho/\rho_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

267 048

RM-1913-AEC
6-3-57
-47-

Fig. 46—Density ($\eta = \rho/\rho_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 47—Density ($\eta = \rho/\rho_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = tc_0/a$)

Fig. 48—Density ($\eta = \rho/\rho_0$) vs radius ($\lambda = r/a$)
for various times ($\tau = t c_0/a$)

The RAND Corporation, Santa Monica, Calif.
USAF Project RAND

RM-1913-AEC

SPACE PLOTS OF PRESSURE, DENSITY AND PARTICLE VELOCITY
FOR THE BLAST WAVE FROM A POINT SOURCE IN AIR by H. L. Brode;
Research Memorandum RM-1913-AEC, June 3, 1957, Unclassified.
52 pp. incl. illus.

ASTIA Document No. AD 133043.

Supplementary reference data for RM-1824-AEC, Point Source Explosion in Air. The present study contains graphs of pressure, density, and particle velocity versus radius at specified times throughout the course of an explosion in air originating from an instantaneous release of energy at a point.

The RAND Corporation, Santa Monica, Calif.
USAF Project RAND

RM-1913-AEC

SPACE PLOTS OF PRESSURE, DENSITY AND PARTICLE VELOCITY
FOR THE BLAST WAVE FROM A POINT SOURCE IN AIR by H. L. Brode;
Research Memorandum RM-1913-AEC, June 3, 1957, Unclassified.
52 pp. incl. illus.

ASTIA Document No. AD 133043.

Supplementary reference data for RM-1824-AEC, Point Source Explosion in Air. The present study contains graphs of pressure, density, and particle velocity versus radius at specified times throughout the course of an explosion in air originating from an instantaneous release of energy at a point.

The RAND Corporation, Santa Monica, Calif.
USAF Project RAND

RM-1913-AEC

SPACE PLOTS OF PRESSURE, DENSITY AND PARTICLE VELOCITY
FOR THE BLAST WAVE FROM A POINT SOURCE IN AIR by H. L. Brode;
Research Memorandum RM-1913-AEC, June 3, 1957, Unclassified.
52 pp. incl. illus.

ASTIA Document No. AD 133043.

Supplementary reference data for RM-1824-AEC, Point Source Explosion in Air. The present study contains graphs of pressure, density, and particle velocity versus radius at specified times throughout the course of an explosion in air originating from an instantaneous release of energy at a point.

The RAND Corporation, Santa Monica, Calif.
USAF Project RAND

RM-1913-AEC

SPACE PLOTS OF PRESSURE, DENSITY AND PARTICLE VELOCITY
FOR THE BLAST WAVE FROM A POINT SOURCE IN AIR by H. L. Brode;
Research Memorandum RM-1913-AEC, June 3, 1957, Unclassified.
52 pp. incl. illus.

ASTIA Document No. AD 133043.

Supplementary reference data for RM-1824-AEC, Point Source Explosion in Air. The present study contains graphs of pressure, density, and particle velocity versus radius at specified times throughout the course of an explosion in air originating from an instantaneous release of energy at a point.

DO NOT
PHOTOCOPY