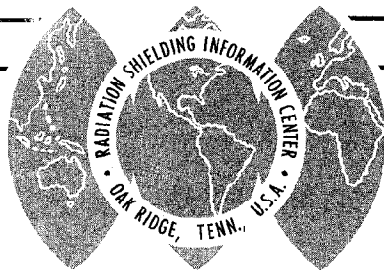


RSIC Newsletter



RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION • FOR THE U.S. ATOMIC ENERGY COMMISSION

POST OFFICE BOX X •
OAK RIDGE, TENNESSEE 37831

No. 41

April, 1968

*What we know here is very little, but
what we are ignorant of is immense... Laplace*

PACKAGING OF RADIOACTIVE MATERIALS MEETING AT GATLINBURG

The Second International Symposium on the Packaging and Transportation of Radioactive Materials will be held October 14-18 in Gatlinburg, Tennessee (near Oak Ridge). The meeting is sponsored by the Union Carbide Corporation Nuclear Division and the U. S. Atomic Energy Commission. Topics to be discussed include new transport regulations and their implications, operating experience in national and international shipments, and shipping containers for unirradiated fissile material, isotopes, and spent fuel. The program will also cover specifications for shipping containers, research and development in container design and testing, insurance problems, carrier problems, and anticipated problems for the period 1970 to 2000. Readers of the Newsletter are requested to inform others at their laboratories who might be interested in this symposium.

For further information, please contact L. B. Shappert, Symposium Chairman, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee, 37830.

NEW DASA HANDBOOK CHAPTER ISSUED

At the request of the Defense Atomic Support Agency, the third Weapons Radiation Shielding Handbook chapter to be issued has been distributed by RSIC to those on the reactor-weapons distribution list. This report, titled "Chapter 3, Methods for Calculating Neutron and Gamma-Ray Attenuation," DASA-1892-3 (March 1968) by Paul N. Stevens and David K. Trubey, surveys the presently used methods for solving the transport equation, presents selected computer code abstracts, and presents certain data useful to shield designers. The previously issued Handbook chapters are available from RSIC. These are "Methods for Calculating Effects of Ducts, Access Ways, and Holes in

Radiation Shields," ORNL-RSIC-20 by W. E. Selph and H. C. Claiborne and "Neutron and Gamma-Ray Albedos," ORNL-RSIC-21, by W. E. Selph. Subsequent unrestricted Handbook chapters will be announced as they become available.

DISCRETE ORDINATES SEMINAR PROCEEDINGS ISSUED

The proceedings of the RSIC and CTC sponsored seminar on the discrete ordinates method and ANISN code, held in August, 1967, in Oak Ridge, is now available. This report is titled "A Review of the Discrete Ordinates S_n Method for Radiation Transport Calculations", ORNL-RSIC-19 (March 1968). It was distributed to those on the reactor-weapons and code distribution lists.

NEW CODE PACKAGES AVAILABLE

Operable, tested with a sample problem, and available for distribution are the following code packages:

CCC-94/KAP-V	Kernel Integration Code in Complex Geometry, contributed by Westinghouse Astronuclear Laboratory, Pittsburgh, Pennsylvania and the Nuclear and Plasma Physics Division, NASA George C. Marshall Space Flight Center, Huntsville, Alabama
CCC-95/TAPAT	Multigroup One Dimensional Discrete Ordinates Code (includes data generator POINT and a data library), contributed by Westinghouse Astronuclear Laboratory, Pittsburgh, Pennsylvania and the Nuclear and Plasma Physics Division, NASA George C. Marshall Space Flight Center, Huntsville, Alabama
CCC-96/TIC-TOC-TOE	On-Axis Liquid Hydrogen Propellant Tank Heating Code, contributed by Westinghouse Astronuclear Laboratory Pittsburgh, Pennsylvania and the Nuclear and Plasma Physics Division, NASA George C. Marshall Space Flight Center, Huntsville, Alabama
CCC-97/ODD-K	Multigroup Two Dimensional Discrete Ordinates Code (includes POINT and library), contributed by Westinghouse

Astronuclear Laboratory, Pittsburgh,
Pennsylvania and the Nuclear and
Plasma Physics Division, NASA George
C. Marshall Space Flight Center,
Huntsville, Alabama

CCC-98/FASTER

Monte Carlo Transport Code in Complex
Geometry, contributed by Westinghouse
Astronuclear Laboratory, Pittsburgh,
Pennsylvania and the Nuclear and Plasma
Physics Division, NASA George C. Marshall
Space Flight Center, Huntsville, Alabama

CCC-99/PLUME

Gamma-Ray Dose Rate from a Radioactive
Cloud - Kernel Integration Code, con-
tributed by Operations Division, Oak
Ridge National Laboratory, Oak Ridge,
Tennessee

PERSONAL ITEMS

W. E. (Bill) Edwards is now manager, Systems Analysis and Evaluation in the new Nuclear Systems Programs Department, Missile and Space Division of the General Electric Co., Cincinnati, Ohio.

Yo T. Song has recently left the U.S. Naval Civil Engineering Laboratory to accept a position in the Nuclear Engineering Department of the University of Tennessee at Knoxville.

Robert J. Janda, formerly with Goddard Space Flight Center, is now with HRB-Singer, Inc., Reston, Virginia.

W. R. (Ross) Burrus, formerly with ORNL, is now president of Tennecomp, Inc., a subsidiary of Tennelec Instrument Co. in Oak Ridge, Tennessee. Tennecomp manufactures nuclear and analytic instrumentation emphasizing human-computer interaction.

Lt. Col. F. A. Verser is now at Kansas State University, Manhattan, Kansas.

LETTER TO THE EDITOR

Gentlemen:

In recent months we have noted with interest and slight frustration the quotations heading your RSIC Newsletter. We are fraught with indecision as to the worth and profundity of these quotations due to our ignorance of the authors. Among these have been Ivan Bunin and E. B. Lytton. Without further disclosing the extent of our ignorance, we would appreciate a few words of explanation regarding their identity.

If this is impossible, we would like to have the address to which to send our own contributions, lest our thoughts be "given over to the sepulchre of oblivion".

N. Endres
Westinghouse Electric Corp.
Bettis Atomic Power Laboratory

EDITORS NOTE:

We hasten to assure Reader Endres that the quoted gentlemen are not RSIC staff members. We believe one is Lord Edward Bulwer-Lytton, 19th century English novelist and the other is Ivan Alekseyevich Bunin (1870-1953), Russian novelist. We trust that the present quote will cause less consternation.

Contributions to the RSIC Newsletter are invited, especially those of interest to shielders.

VISITORS TO RSIC

Visitors to RSIC during the month of March are: Jacob Weitman, Head, Radiation Shielding Group, Studsvik, Sweden; E. D. Cashwell, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; G. A. Graves, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; C. W. Watson, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; Ricardo Garcia Leon, Commission Nacional De Energia Nuclear, Mexico City; Reginald Prescott, ENEA/Computer Programme Library, Ispra, Italy; W. H. Wilkie, Nuclear Engineering Dept., Georgia Institute of Technology, Atlanta, Georgia.

APRIL ACCESSION LIST OF LITERATURE

The RSIC is now aware of the literature cited in the following list. This literature has either been obtained by RSIC or has been placed on order. When received, this material will be examined and assigned to various files if suitable for our information system. The accession list is divided into three fields of (1) reactor and weapons shielding, (2) space and accelerator shielding, and (3) shielding computer codes. These titles are announced before processing and indexing so that there will be no delay and can serve as a prompt announcement of current literature.

RSIC is not a documentation center. Copies of the literature cited must generally be obtained from the author or from a documentation center such as the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

RSIC maintains a microfiche file of literature entered into its information system. Computer searches of this system (which produces a

a special bibliography) and duplicate microfiche copies of literature in our file are available upon request. Naturally we cannot supply copies of literature which is copyrighted (such as books or journal articles) or whose distribution is restricted. Neither service is yet available for the codes literature.

Reactor and Weapons Shielding

AD-662586 (FTD-HT-66-691)

Shielding in Nuclear Engineering. Collection of Articles

AD-663372 (FTD-MT-64-291)

Dosimetry and Protection from Ionizing Radiation
B. P. Golubev

AERE-M-1848

Neutron Measurements Around Nuclear Reactors
J. W. Leake; A. K. Burt
March 1967

COO-1269-15

Gamma-Radiation Detection of Water Content in Two-Dimensional
Evaporation Prevention Experiments
Don Kirkham, D. E. Rolston, D. D. Fritton
June 1967

EGG-1183-2163

Energy and Angular Dependence of Air Scattered Gamma Ray Distri-
bution Functions
J. A. Michael, H. A. Lamonds
November 6, 1967

EURAEC-1938

The Reprocessing of Irradiated Fuels Gamma and Neutrons Protection
Calculations
F. Servais
October 1967

GA-7544

Approximate Method for Multidimensional Diffusion Theory Problem
K. F. Hansen, S. R. Johnson
May 18, 1967

GA-8065

Shielding Studies for the Public Service Company of Colorado HTGR
B. A. Engholm
July 24, 1967

GA-8187

Recursion Formulae for Semi-Analytical Multiple Scattering Calculations in Slab Geometry
F. H. Froehner
August 25, 1967

JINR-P4-3614

Mirror Reflection of Neutrons and Gamma-Quanta (In Russian)
V. G. Baryshevskii
1967

K-05-68-1

Modular Nuclear Vehicle Study Phase III
NGTM Computational Model and Test Facility Support
Lockheed Missiles and Space Co., Sunnyvale, Calif.
February 29, 1968

KN-68-71 (R)

Some Principles of Activation Analysis
D. E. Wood
February 1968

N68-10595 (ORNL-TR-1757-Translation)

Dosimetry and Shielding in a 14 MeV Neutron Generator
J. Hacke
1967

NAA-SR-Memo-12467

Neutron and Gamma Ray Attenuation in Sodium Shields
A. W. Thiele
June 30, 1967

NASA-TN-D-4315

Preliminary Considerations for Fast-Spectrum, Liquid-Metal Cooled Nuclear Reactor Program for Space-Power Applications
G. P. Lahti, E. Lantz and J. V. Miller
March 1968

NCRP Report No. 33

Medical X-Ray and Gamma-Ray Protection for Energies up to 10 MeV
Equipment Design and Use
National Council on Radiation Protection and Measurements
February 1, 1968

NDL-TR-94

Exposure-Rate Dependence of Selected Gamma Dosimeters
Thomas W. Crimmins, Nancy N. Gibson, et. al.
January, 1968

NSJ-TR-93

Analysis of Photoneutron Flux Distribution in Water-Shielded Reactors
Takashi Tagami and Mitsuyuki Kitazume

ORNL-4086

Estimation of Radiation Doses Following a Reactor Accident
F. T. Binford, F. B. K. Kam, et.al.
February 1968

ORNL-4215

On the Relationship of Collision Theory to the Interpretation of
Relative Biological Effectiveness
J. E. Turner and Hal Hollister
January 1968

ORNL-tr-1666 (Translation of N68-10840, Jaderna Energie 12, 296-98, 1966)

Equivalent Thicknesses of Materials for Attenuation of Gamma-
Radiation
Arnost Honig
1967

ORNL-tr-1757 (Translation of N68-10595, Intern. J. Appl. Isotop. 18,
33-44, January 1967)

Dosimetry and Shielding in a 14 MeV Neutron Generator
J. Hacke

ORNL-tr-1840 (Translation of KFK-603, German, EURFNR-385)

Radiation Dose Rate of Reprocessed Na 1 Breeder Fuel
H. Zimmermann
July 1967

ORNL-tr-1842 (Translation of UJV-1546, Czech)

Increase of the Detection Efficiency in the Use of Sulfur as a Fast
Neutron Detector
V. Kadlec and P. Otopal

ORNL-tr-1843 (Translation of UJV-1547, Czech)

Absolute Measurement of the Activity of Threshold Detectors and
Evaluation of the Fast-Neutron Flux in the Core
V. Kadlec, P. Otopal and M. Vitek
1966

ORNL-tr-1884 (Translation of Zh. Vychisl. Mat. Mat. Fiz., 7, 953-7)

Calculation of Dose Derivatives by Monte Carlo for Optimization of
Shape and Composition of Shields
M. Z. Brainina, V. L. Generozov, V. G. Kuznetsov, et. al.
July-August, 1967

RHEL-R-154

Neutron Spectrometry from 0.025 eV to 25 GeV
G. R. Stevenson
November, 1967

USNCEL-Tech. Report R-569

Neutron and Gamma-Ray Streaming through Thin-Steel Shelter
Entranceways
L. B. Gardner
March 1968

USNCEL-Tech. Report R-570

Calculating the Dose Variation of Fast-Neutrons Streaming through
an Iron Duct
Yo Taik Song
March, 1968

USNRDL-TR-67-144

X-Ray Shield Properties of Tantalum-Aluminum Laminar Slabs: Monte
Carlo Calculations Compared with Experimental Measurements
L. G. Haggmark, N. Goldstein, et. al.
November 21, 1967

Brit. J. Appl. Phys. 18(11), 1497-1515(1967)

The Thermal-Neutron Milne Problem
M. J. Lancefield et. al.

Giho, 5(35), 1-12 (January, 1966) (In Japanese)

Investigations of Radiation Meters. Neutron Shielding Properties
of Various Materials
Technical Research and Development Institute, Japan Defence Agency
Jiro Yuhara and Tatsuo Urai

J. Appl. Phys., 37(13), 4826-4831 (December, 1966)

Age Approximation to X-Ray Transport
William S. Hogan

J. Nucl. Sci. Technol. 4(12) 607-613 (December 1967)

Backscattering of Gamma Rays from Polyethylene, Aluminum and
Lead Slabs
Koichi Mizukami, Takaaki Matsumoto, Tomonori Hyodo

Lead Shielding, Bulletin No. 1

Lead Shielding Applications
Lead Development Association
34 Berkeley Square, London W1
January 1968

Memoirs of the Faculty of Engineering, Kyoto University, Vol. XXIX,
Part 4, October 1967, 474-82

Backscattering of Gamma Rays from Tin Slabs
Masataugu Nishi, Takashi Nakamura and Tomonori Hyodo
Kyoto, Japan

Nucl. Sci. and Eng., Vol. 31, No. 2, 254-271

Neutron Scattering from Light Water
J. R. Beyster

Nucl. Sci. Eng., 31(2), 318-324, (February, 1968)

Accuracy of Transport Theory Calculations of an Anisotropic
Neutron Flux
Pekka Jauho and Heikki Kalli

Powder Met., 10, 156-73 (Autumn 1967) (CONF-671108)

Production of Tungsten Alloy Penetration Radiation Shields
D. J. Jones

Soviet Atomic Energy, 22(4) 358-363 (April, 1967)

Backward Scattering of Gamma-Radiation from Aluminum Barriers
of Finite Thickness
D. B. Pozdneev, S. A. Churin, and L. F. Gokhshtein

Soviet Atomic Energy, 22(4), 383-384 (April, 1967)

Gamma-Ray Energy and Number Albedos
B. P. Bultov and N. F. Andrushin

Soviet Atomic Energy, 22(4), 385 (April, 1967)

Scattering of Gamma-Radiation by Iron Barriers
D. B. Pozdneev

Soviet Atomic Energy, 22(4), 418 (April, 1967)

Reactor Shielding Physics Research (Book Review)
Yu. A. Kazanskii, V. I. Kukhtevich, E. S. Matusevich, et. al.

BOOK

Effects of Radiation on Structural Metals
Special Technical Publication
American Society for Testing and Materials, 1916 Race St.,
Philadelphia, Pa. 19103

BOOK

International Civil Defence Symposium on Nuclear Radiation Hazards
2d, MONACO, 1967
Complete Report of the Proceedings, W. M. Miller et. al.

BOOK

NATO Advanced Study Institute on Transport Theory, Middle East Technical University, 1965. Developments in Transport Theory: A NATO Advanced Study Institute on Transport Theory held at Ankara, Turkey
Ed. by E. Onönü and P. F. Zweifel
New York, Academic Press, 1967

BOOK

Physical Research into Reactor Shielding (In Russian)
Y. A. Kazanskii, V. I. Kukhtevich, E. S. Matusevich, B. I. Sinitsy, S. G. Tsypin

BOOK

Radiation Dosimetry, V. 1: Fundamentals
Ed. by F. H. Attix and W. C. Roesch
New York, Academic Press, 1968 2nd ed.

Space and Accelerator Shielding

AD-646-555

Experiment D8: Radiation in Spacecraft
M. F. Schneider, J. F. Janni, B. Brentnall
May 1966, Vol. VI

NASA-SP-3024 (Vol. IV)

Models of the Trapped Radiation Environment
Vol. IV: Low Energy Protons
Joseph H. King
1967

ORNL-4032

Tissue Current-to-Dose Conversion Factors for Neutrons with Energies from 0.5 to 60 MeV
D. C. Irving, R. G. Alsmiller, Jr., et. al.
August 1967

ORNL-4183 (N68-10152) (ORNL-P-3580, condensed version)

Gamma Rays from Bombardment of ${}^7\text{Li}$, Be, ${}^{11}\text{B}$, C, O, Mg, Al, Co, Fe, and Bi by 16-To 160-MeV Protons and 59-MeV Alpha Particles
W. Zobel, F. C. Maienschein, et. al.
November 1967

RHEL/R-146

Energy Loss Distributions of Heavy Particles in Thick Absorbers
Tschalaer, C.
June, 1967

UCRL-Trans-1350 (Translation of Industries Atomiques, 11 (3/4) 53-60)

Contribution to the Experimental Study of Radiation Transmission
through Control Passages in the Shielding of High Energy Accelerators
A. Rindi, Phillippe Tardy-Joubert
April, 1967

Cosmic Research 4(4) 554-57 (July-August, 1966)

Radiation Protection During The Flight in Satellites "Voskhod I"
and "Voskhod II"
Yu. M. Volynkin, V. V. Antipov, B. I. Davydov, N. N. Dobrov,
M. D. Nikitin, N. F. Pisarenko, P.P. Saksonov

Phys. Rev. 161, 310-21

Electron-Induced Cascade Showers in Copper, Tin, and Lead
Carol Jo Crannell
September 10, 1967

Phys. Rev. 161 (4), 971-81, (September 20, 1967)

Neutron and Proton Spectra from Targets Bombarded by 160 MeV Protons
J. W. Wachter, W. R. Burrus, W. A. Gibson

Soviet Physics Jept 24 (3), 498-505, (March 1967)

Investigation of Showers Produced by 45, 130, 230, and 330 MeV
Electrons in Lead
O. A. Zaimidoroga, Yu. D. Prokoshkin, V. M. Tsupko-Sitnikov

Nucl. Phys. B2, 669-89 (1967)

Measurements on 6.3 GeV Electromagnetic Cascades and Cascade-
Produced Neutrons
G. Bathow, E. Freytag, K. Tesch

Computer Codes Literature

IN-1062

November 1967

INCITE

INCITE--A Fortran-IV Program to Generate Thermal Neutron
Spectra and Multigroup Constants Using Arbitrary Scattering
Kernels
by R. L. Curtis and R. A. Grimesey
FORTRAN IV for IBM 7040

ARL 67-0168

August 1967

ALBEGADE

Computer Programs for the Analysis of Gamma-Ray Angular
Correlation Measurements
by A. K. Hyder, Jr.; and D. D. Watson
FORTRAN IV for IBM 7094(II)

- GEMP 582 February 1968 SURF
Conical and Plane Surface Scattering Program - SURF
by J. E. MacDonald
FORTRAN IV for GE 625
- SC-RR-67-746 December 1967 SPECTRA
A Technique for Unfolding Neutron Spectra from Activation
Measurements
by C. R. Gree, J. A. Halbleib, and J. V. Walker
FORTRAN for CDC 3600
- UNC-5179 June 1967 AIRTRANS
AIRTRANS - A Time-Dependent Monte Carlo System for Radiation
Transport in a Variable Density Atmosphere and the Ground
by M. O. Cohen
FORTRAN
- UCRL-50358 December 1967 SORS
SORS Monte Carlo Photon-Transport Code for the CDC 6600
by John Kimlinger, Ernest F. Plechaty, and John R. Terrall
FORTRAN IV for CDC 6600