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Bibliography written:
December 1955

LAMS-1979 Part II

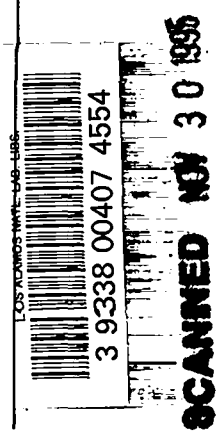
C.3

This document consists of 20 pages, [redacted]

A LITERATURE SURVEY ON SHIELDING: OCTOBER 1954 TO DECEMBER 1955

Compiled by

Soliska R. Harris



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This Bibliography covers the classified report literature abstracted in ABSTRACTS OF CLASSIFIED REPORTS since the compilation of TID-3031 (Suppl. 1). It is arranged alphabetically by issuing agency.

Argonne National Lab. - REACTOR ENGINEERING DIVISION QUARTERLY REPORT (FOR) APRIL 1, 1954 THROUGH JUNE 30, 1954. July 15, 1954. 206p. ANL-5297) Rpt: Secret-RD
...The accuracy of modified diffusion theory (removal theory) for calculating the photon source distribution from neutron captures in the EBR shield was determined by comparison with measured values. Discrepancies noted are attributed to variations in the U^{238} fission rates and the use of point source geometry. New data have been obtained from a Monte Carlo calculation of neutron transmission and reflection by slabs of H_2O... ACR 11-455 (1955)

Argonne National Lab. - REACTOR ENGINEERING LECTURES. Stuart McLain. Sept. 1954 143p. Contract W-31-109-eng-38. (ANL-5311(pt.2)) Rpt: Secret
Notes from 14 classified lectures of the total of 34 presented in the ANL course on reactor engineering are included; the other 20 (9 unclassified) are bound in Parts 1 and 3 of this report. Topics covered include selection and preparation of materials; preparation of alloys; preparation of fuel elements; corrosion of reactor materials; radiation damage; maintenance of coolants; xenon and samarium; changes in reactivity; reactor control; shielding γ-ray heating; seals, pumps, and heat exchangers; loading, unloading, and cooling after shutdown; operational problems; and economic considerations. (L.M.T.) ACR 10-2596 (1954)

Armament Research Establishment (Gt. Britain) - THE ABSORPTION OF GAMMA-RADIATION IN LEAD, STEEL, AND CONCRETE. R. Halmshaw and R. Knapp. March 1954 21p. (AD-21112) ARE-3/54 (Rpt. Official Use Only)
Absorption curves have been produced for the γ radiation from Rn, Co^{60}, and Ir^{192}, in Pb, steel, and concrete. These curves have been obtained under open field conditions where scattered radiation is not eliminated. Ionization chambers and films have been used as detectors and the results are compared. Radiographic exposure charts, sizes of protective containers for γ-ray sources, and protection barrier thicknesses are derived. ACR 11-951 (1955)

Atomic Weapons Research Establishment, Aldermaston, Berks (England) - THE PHYSICAL EFFECTS OF ATOMIC BOMBS. PART 13. BACK-SCATTERING AND REFLECTION COEFFICIENTS FOR GAMMA RAYS. (J. Corner and R.H.A. Liston. Dec. 1949). Part 14. THE PENETRATION OF ISOTROPIC GAMMA RADIATION THROUGH PLANE SHIELDS. (J. Corner, R. Cave, A.E. Glennie, and R.E. Weir, Apr. 1950) PART 19. SHADOW AND EDGE EFFECT IN GAMMA-RAY SHIELDING. (J. Corner, R.H.A. Liston, and F.A.G. Day, July 1950) J.W. Notman, ed. 33p. (AWRE-1/48(Pt.13 (X): AWRE-1/48 (Pt.14); AWRE-1/48(Pt.19))
...Results are given also for a half-slab, which is useful for building up re-entrant angles by superposition. The penetration of gamma rays, arriving from all directions, through a plane slab of finite thickness and infinite extent has been evaluated for a range of gamma-ray quantum energies and slab thicknesses. The results are only approximate but should be of sufficient accuracy for shelter calculations. Pari-creation and photoelectric absorption have been neglected. This permits the screening material to be specified by only one parameter, namely the number of electrons, free or bound, per unit volume, and is a good approximation for materials such as concrete, bricks, earth and water, exposed to the gamma rays from an atomic bomb. Two problems of gamma-ray scattering under wide-beam conditions have been studied theoretically as illustrations of (a) the effects due to finite width of the shielding and (b) edge effects. The first example is a circular shield of small geometrical thickness. The second example is a

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slab of shielding material of finite thickness; in plan it consists of half an infinite plane, bounded by a straight edge. Conditions behind the shield have been studied when the front face is subject to monochromatic gamma-rays arriving at perpendicular incidence.. Computations have been carried out for a quantum energy near 2 Mev and for shields four mean free paths thick. Pair-creation and photoelectric absorption have been neglected in the computations, though they could easily be incorporated if required. ACR 11-696(1955)

(Atomic Weapons Research Establishment, Aldermaston, Berks (England)) - GAMMA RADIATION STUDIES AND DECONTAMINATION EXPERIENCE. July 23, 1954. 35p. (FWE-7) Secret

Equipment is discussed and results are presented for γ radiation dose measurements from the Monte Bello and two Totem bursts; ion-chamber data for the γ angular distribution are also given. Gamma shielding results are given for slit trenches, foxholes, a steel box representative of a ships compartment, and for concrete cubicles/slabs. Experiments which have been performed to determine the protection afforded by ships against penetrating radiation from atomic explosions are described. Results of β/γ ratios measured over fission-product-contaminated ground are given...
ACR 11-38 (1955)

Brookhaven National Lab. - QUARTERLY PROGRESS REPORT FOR MAY 16-AUGUST 15, 1954. (CLASSIFIED SECTION). 47p. (BNL-309) Confidential
...Experiments on the oxidation of graphite show that the rate, when exposed to a γ field, is about the same as that with no radiation. The oxidation rate with pile irradiation is about 7 times as great as either of the other cases. The transmission of neutrons and γ rays through cylindrical air ducts in reactor shielding has been measured for a variety of geometric configurations and reactor operating conditions. (For preceding period see BNL-297.) ACR 11-274 (1955)

Brookhaven National Lab. - EFFECT OF SPHERICAL VOIDS ON GAMMA RAY PENETRATION. William W. Pratt and Herbert J. Kouts. Feb. 8, 1952 4p. (BNL-2158)

Preliminary results are presented on the effect of aluminum spheres submerged in water on γ-ray penetration through the water. The spheres varied in diameter from 4 to 18 in. and were submerged from 0 to 36 in. below the surface of the water. It was found that the increase in γ-ray leakage integrated over the surface of the water was not very sensitive to the depth of the sphere.
ACR-11-495 (1955)

Chemical and Radiological Labs., Army Chemical Center, Md.- PROTECTION AFFORDED BY FIELD FORTIFICATIONS AGAINST 1.2 Mev. GAMMA RADIATION FROM GROUND CONTAMINATION. Interim Report. Ralph E. Rexroad and Robert P. Beckelheimer. Sept. 1954. 44p. Project 4-12-75-001. CRLR-325 (Rpt: Confidential-RD)

A study was made of the amount of shielding provided by field fortifications located in uniform fields of γ radiation derived from Co^{60} placed in the surrounding ground. Analysis of results led to the conclusion that nearly complete protection against γ radiation is provided by normal field fortifications. (C.H.)
ACR 11-2081 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - TACTICAL NUCLEAR POWERED AIRPLANE EVALUATION: SHIELDING. Mar. 1, 1954. 248p. Contract AF33(038)-21117 (FZK-9-064) CVAC-200T (Rpt: Secret-RD)

Included in this report are revisions A, dated June 1, 1954; and B, dated October 1, 1954.

A parametric study of shielding necessary for nuclear powered aircraft has been made. The reflector moderated and direct cycle reactors have been used as the basic power plants. The reactor parameters considered include power level, power density, and reactor shield outside diameter. The results are presented in a form

which allows direct comparison of the various shielding configurations to allow the consideration of shield effects along with the usual aircraft design parameters in obtaining an optimum aircraft. (M.P.G.) ACR 11-2121 (1955)

Consolidated Vultee Aircraft Corp. - AIR SCATTERED GAMMA DOSE PER UNIT SOURCE STRENGTH FOR VARIOUS SHADOW SHIELD ANGLES AND CREW SHIELD CONFIGURATIONS. (PROJECT MX-1569). R.L. Seale and C.E. Humphries. Apr. 9, 1954. 74p. (MR-N-18) CVAC-244T (Rpt: Secret-RD)

The NDA data presented in the Reactor Handbook have been used extensively in determining the scattered γ dose for the ANP parametric shield studies. These data are presented in the form of scattered γ dose per unit source strength as a function of the angle of emergence of the radiation from the source. In this report, the scattered γ dose per unit source strength has been determined for various shadow shield geometries. The dose shielded by the shadow shield has also been calculated. ACR 11-848 (1955)

Consolidated Vultee Aircraft Corp. - A SHADOW SHIELD EXPERIMENT IN THE XB-36 AIRPLANE. (EXPERIMENT 1.1E--CVAC-163.) J.W. Harris, W.P. Kunkel, and L.V. Woodruff. Apr. 29, 1954. 46p. (MR-N-36) CVAC-249T (Rpt: Confidential)

The effect of aircraft structure on air and ground scattered dose rates of γ radiation has been investigated. The scattered dose rates inside the airplane were determined as functions of separation distance between source and detector, angle subtended by shadow shield at the source, and position of source and detector relative to the structure of the airplane. Comparison of the data with data on air and ground scattering in the absence of aircraft structure indicates that the structure has a shielding effect. (M.P.G.) ACR 11-849 (1955)

Consolidated Vultee Aircraft Corp. - CALCULATION OF THE MINIMUM NEUTRON SHIELDING WEIGHT REQUIRED FOR A SPHERE USING TWO MATERIALS. G.S. Weller. Nov. 25, 1953. 22p. (MR-A-334) CVAC-252T (Rpt: Confidential-RD)

For a given total attenuation using two materials which differ in density and attenuation factors but have similar attenuation characteristics, the overall neutron shield weight is less than that of a single material. This is due to the fact that a heavy material with high attenuation characteristics is best for minimum with a small attenuation factor effects more weight savings as the shield thickness increases. The optimum thicknesses for materials of various densities and attenuation factors to give a minimum spherical shield weight are calculated and tabulated in graphical form. ACR 11-820(1955)

Consolidated Vultee Aircraft Corp. - THEORETICAL STUDY OF GAMMA PENETRATIONS OF CYLINDRICAL CREW SHIELDS. PART 2. Earl Feinauer. May 28, 1954. 93p. (MR-N-39) CVAC-256T (Rpt: Secret-RD)

The effect of neutron shielding materials upon the gamma dose penetrating a cylindrical crew shield was investigated. Analyses were made of the air-scattered dose from a Co^{60} source of the direct beam dose from both Co^{60} and Cs137 sources, each of strength 1 curie. To determine the effectiveness of such neutron shielding materials as rubber and plastic, calculations were made of dose rates inside a crew compartment consisting only of lead. These calculations were then compared with calculations of dose rates inside the same compartment with layers of rubber 1, 2, and 3 inches in thickness applied to the side and frontal walls and layers of 2, 4, and 5.75 inches in thickness

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respectively applied to the rear wall. The results of the calculations show that, for the low energy contributions of the air scattered dose from the Co^{60} source and the direct beam of the Cs^{137} source, a rubber thickness of 3 inches on the walls of the compartment will reduce the penetrating gamma dose to approximately one third the value calculated for lead only. For the direct beam of the Co^{60} source a rubber thickness of 3 inches on the walls will reduce the penetrating gamma dose to approximately one half the value calculated for lead only. Results are tabulated. ACR 11-1040 (1955)

Consolidated Vultee Aircraft Corp. - AIR AND GROUND SCATTERING OF Co^{60} GAMMA RAYS USING A SHADOW SHIELD GEOMETRY. (EXPERIMENT 1.1C--CVAC-163). J.W. Harris, W.P. Kunkel, and L.V. Woodruff. July 23, 1954. 32p. (MR-N-51) CVAC-259T (Rpt: Confidential)

Results of an investigation of the scattered gamma dose rate due to the combined effects of air and ground scattering are reported. The dose rates from a Co^{60} source were measured as a function of separation distance between source and detector and of the angle subtended by the shadow shield at the source as it is moved along the source-detector axis. Data are presented in graphical and tabular form and are compared with dose rate measurements inside an aircraft fuselage. The results indicate that the aircraft structure has a shielding effect for large shadow shield angles for all separation distances and shadow shield angles. The effect of the structure at the smallest shadow shield angle measured is to increase the dose rate for all distances less than 63 ft. (M.P.G.) ACR 11-851 (1955)

Consolidated Vultee Aircraft Corp. - QUARTERLY PROGRESS REPORT FOR PERIOD JULY 1 THRU SEPTEMBER 30, 1954. (PROJECT MX-1589). 145p. Contract AF33(038)-21117, Report No.19. (NARF-54-5P)

Progress is reported from studies on the operation and fuel-element inspection of the Ground Test Reactor; design of a remotely controlled mechanism for making electrical connections between the Aircraft Shield Test Reactor and the nuclear test airplane; fabrication, design of cooling systems, and fabrication and testing of control systems of the Aircraft Shield Test Reactor; the transmission characteristics and build-up factors associated with Pb and rubber shielding materials; determinations of air and ground scattered fast neutron and γ dose rates as a function of height above ground for the Ground Test Reactor; theoretical shield systems calculations... ACR 11-135 (1955)

Consolidated Vultee Aircraft Corp. - QUARTERLY PROGRESS REPORT NO.20 FOR PERIOD OCTOBER 1 THRU DECEMBER 31, 1954. (PROJECT MX-1589). 111p. Contract AF33(038)-21117. NARF-55-2P (Rpt: Secret-RD)

The power level of the Ground Test Reactor (GTR) was raised from 1 to 80 kw during the period, in order to study thermopile and operating behavior at high power. Initial criticality of the Aircraft Shield Test Reactor (ASTR) was achieved. Pile period measurements have shown that the dynamic control rod is worth 25 cents, and total rod values are about $2.10 per rod. A 50-c Co^{60} source was used to measure air-scattered γ transmission for various shadow shield angles in a small cylindrical crew shield. Air plus ground scattered neutron and γ dose rates were also measured in 3 crew shield designs. Calculations were performed on scattering from aircraft wing panels and the air-ground scattering of neutrons and γ radiation in the crew shield. Progress on the design and assembly of the Nuclear Test Airplane and components is reported. Testing of

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counter equipment and other instrumentation is under way. Radiation effects on system test panels were studied with satisfactory results. The variation in resistance of a 1N158 Ge diode as a function of thermal nvt was determined. Activation experiments were performed with a rabbit carrier system on a group of plastics, fuels, and lubricants. Calculations were made on the radiation resistance of Prestone anti-freeze, alkylbenzenes, ethylene glycol, and a group of possible organic shield materials. The current status of ground handling equipment installation is reviewed. (For preceding report in series see NARF-54-5P.) (K.S.) ACR 11-821 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth Tex. - GTR DOSE RATE DISTRIBUTION IN AIR. (EXPERIMENT 1.2B-CVAC-163). F.W. Smith. Mar. 31, 1955. 33p. Contract AF 33(038)-21117, Exhibit-B-8, Task III, Item 2c. (MR-N-56) NARF-55-13T (Rpt: Secret-RD)

This experiment consisted of a determination of the dose rate distribution in air about the GTR in a cylindrical shield tank with an elliptical cross section. Fast neutron and gamma dose rates were obtained along the reactor centerline to a maximum distance of 90 feet. Measurements were also made over one octant at a radius of 32 feet. Checks were made in the horizontal plane to ascertain the symmetry of the reactor shield. The results indicate that both gammas and neutrons follow approximately an inverse square relationship along the centerline over the distances investigated. The deviations from an isotropic source for this shield geometry were found to be a factor of about three for fast neutron dose rates and a factor of about two for gamma dose rates. ACR 11-2221 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth Tex. - QUARTERLY PROGRESS REPORT NO. 21 FOR PERIOD JANUARY 1, 1955 THRU MARCH 31, 1955. (PROJECT MX-1589). 156p. CONTRACT AF33(038)-21117. NARC-55-18P (Rpt: Secret-RD)
...Data are presented on the direct beam penetration of Co^{60} γ radiation through rubber slabs. Measurements were performed to determine the shielding properties of the engineered crew shield and cylindrical crew shields for scattered radiations, and results are summarized... ACR 11-1635 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth Tex. - PENETRATION OF GTR RADIATION THROUGH CREW SHIELDS. (EXPERIMENT2.2D and E-CVAC-163). C.F.Johnson. Apr. 29, 1955. 94p. Contract AF33(038)-21117. (MR-N-81) NARF-55-20T (Rpt: Secret-RD)

Scattered dose rate measurements were made inside the thin crew shield, a full-sized cylindrical crew shield, and a half-sized cylindrical crew shield with the same shielding thicknesses. Data were taken with each component in the same relative position it will occupy in the nuclear test airplane: between crew shield and reactor, and 13 feet above the ground. The neutron dose rate inside the shields was fairly uniform along the centerline. Comparison of the neutron dose rate for the three shields shows generally good agreement, although the dose rate for the thin shield is slightly lower than that for the two cylindrical shields. The gamma dose rate along centerline was lowest in the aft end, and increased by a factor of almost 2 near the front end. The gamma dose rate did not agree for any of the three shields, but again the dose rate in the thin crew shield was lowest. Survey points off the centerline in the thin crew shield were in general 10% to 20% lower than the corresponding points on the centerline. Relaxation lengths in the sides of the small cylinder were

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determined by varying the constituent thickness. For scattered gammas, the dose rate entering through the side of the cylinder was not controlling and thus the results were not amenable to calculation of relaxation lengths. ACR 11-1861 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - AIR, GROUND, AND AIRCRAFT STRUCTURE SCATTERING OF GTR RADIATION. (EXPERIMENT 1.2F-CVAC-163). F.W. Smith. Apr. 29, 1955. 48p. Contract AF 33(038)-21117. (MR-N-82) NARF-55-21T (Rpt: Secret-RD)

Scattered radiation measurements were obtained along fuselage centerline of the XB-36 and inside a small cylindrical crew shield mounted in the aircraft. Total radiation measurements were obtained outside the fuselage as well as inside along the centerline. A comparison of the centerline dose rate with and without the aircraft indicates (a) that the structure reduces the total centerline gamma and fast neutron dose rates and (b) that the structure increases the centerline scattered dose rates near the wing root for both neutron and gammas and reduces the rates in the crew compartment. The scattered dose rate distributions along the centerline of the cylindrical crew shield are similar for gammas and neutrons. The values are lowest near the rear wall and increase in the forward direction. The relaxation length for the scattered fast neutrons in a portion of the side wall is given. The scattered gamma distribution was not amenable to the calculation of a single relaxation length. Upon increasing the small cylindrical shield side thickness the gamma and neutron dose rates at the geometric center of the cavity were decreased. The fast neutron dose rate distribution in the cylinder was found to be very sensitive to the side shaping on the shield. ACR-11-1862 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - PENETRATION OF SCATTERED Co^{60} GAMMAS THROUGH THE ENGINEERED CREW SHIELD. (EXPERIMENTS 2.1C and D-CVAC-163). J.W. Harris, W.P. Kunkel, W.J. Trautvetter. Apr. 27, 1955. 35p. Contract AF 33(038)-21117. (MR-N-83) NARF-55-22T (Rpt: Secret-RD)

This experiment was conducted to determine the dose rate inside the thin crew shield due to scattered Co^{60} gamma radiation. Curves are included to present data obtained as a function of the detector position relative to the crew shield for different shadow shield angles. The air scattered data were obtained with a 2 π lead shield placed below the source to restrict scattering to the upper air hemisphere. Data were also obtained for air and ground scattering... ACR 11-1863 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - EFFECT OF AIRCRAFT STRUCTURE ON THE PENETRATION OF SCATTERED Co^{60} GAMMAS THROUGH A CREW SHIELD. J.W. Harris, W.J. Trautvetter, and W.P. Kunkel. May 18, 1955. 24p. Contract AF 33(038)-21117. (MR-N-85) NARF-55-24T (Rpt: Secret-RD)

The effect of XB-36 structure on the penetration of scattered Co^{60} gamma radiation through the small cylindrical shield has been observed at a separation distance of 38.8 feet... ACR 11-1864 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - DIRECT BEAM TRANSMISSION THROUGH THE LARGE CYLINDRICAL CREW SHIELD. (EXPERIMENT 2.11-CVAC-163). S.C. McGarry, E.W. Bradford, S.C. Dominey, and W.P. Kunkel. June 6, 1955. 28p. Contract AF 33(038)-21117. (MR-N-86) NARF-55-25T (Rpt: Secret-RD)

This report contains the results of an experimental investigation of direct-beam gamma rays incident on a cylindrical crew shield. The purpose is to study the transmission properties and shielding integrity of the walls of the cylinder... ACR 11-1865 (1955)

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Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - PENETRATION OF Co^{60} GAMMAS THROUGH RUBBER SLABS. (EXPERIMENT 2.1G, CVAC-163). W.A. Hilton, S.C. Dominey, and E.A. Kostyniak. June 9, 1955. 33p. Contract AF33(038)-21117. (MR-N-87) NARF-55-26T (Rpt: Confidential)

The purpose of this experiment was to determine the attenuation of Co^{60} gamma radiation through rubber slabs as a function of thickness and angle of incidence. An anthracene dosimeter was used with a 70-curie Co^{60} source. The attenuation of Co^{60} gamma radiation through rubber slabs increased exponentially with increasing slant thickness. Multiple readings were taken and reproducibility found to be within 5%. These deviations were mainly due to air-scattered radiation and the departure from broad-beam conditions. The relaxation length of Co^{60} gamma radiation in rubber was measured from the curves and found to be approximately 10 inches. ACR 11-1834 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - DIRECT BEAM Co^{60} PENETRATION THROUGH THE ENGINEERED CREW SHIELD. (EXPERIMENT 2.1H, CVAC-163). W.P. Kunkel, W.J. Trautvetter, and J.W. Harris. June 30, 1955. 22p. Contract AF33(038)-21117, Task III. (MR-N-89) NARF-55-28T (Rpt: Secret)

Direct-beam Co^{60} surveys have been made of the dose rates within the crew shield of the Nuclear Test Airplane. The results indicate that there is no significant weakness in the gamma shielding. Small irregularities in dose rate curves due to internal shielding have been observed. Predictions based on a cylindrical model of the gamma penetration through the walls are shown to be in good agreement with the experimental results. ACR 11-1981 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - QUARTERLY PROGRESS REPORT NO. 22 FOR PERIOD APRIL 1 THRU JUNE 30, 1955. 152p. Project No. MX-1589. Contract AF33(038)-21117. NARF-55-52P (Rpt: Secret-RD)

GTR shielding tests were continued. The ASTR was remotely assembled and disassembled. ASTR direct beam shields, experimental arrangements, loading equipment, dummy vibration test, revolving drive mechanism, and forward shield are shown. ASTR modifications are described in detail. Experiments with the GRT are described. Integral and differential scattering effects for the elliptical and circular shield tanks are shown. Results of measurements of the source term for the elliptical tank are also given. Geometry of the GTR shadow shield experiments in H_2O is shown, and dose rates are given as a function of reactor to detector separation for various shadow shield thicknesses. The shadow shield cut-off at various distances behind the shield for one thickness is also shown. The investigation of air and ground scattered Co^{60} γ rays in the large cylinder was completed. Air-scattered radiation dose rates vary as $1/a$ while the variation of air and ground-scattered radiation lies between $1/a$ and $1/a^2+1/a$. Dose rates of scattered radiation are shown. ASTR shielding configurations and experimental arrangements for dosage measurements are shown. Results of dosage measurements using various shielding configurations are given... ACR 11-2215 (1955)

Consolidated Vultee Aircraft Corp., Fort Worth, Tex. - MINUTES OF THE ORNL-CONVAIR-GE SHIELDING COORDINATION MEETING (HELD AT) CONVAIR, FORT WORTH (ON) JULY 7-8, 1955. R.L. Seale and E.L. Secrest. Aug. 26, 1955 14p. NP-5770 (Rpt: Secret-RD)

Shielding problems are tabulated along with their priority. The status of the work on each problem, suggestions for future work, and comments are presented. (M.P.G.) ACR 11-2233 (1955)

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Division of Reactor Development, AEC - REACTOR SHIELDING INFORMATION MEETING, SCHENECTADY, MAY 13 AND 14, 1954. Aug. 1954. 286p. (WASH-174). Secret

Thirty-one papers covering practically all phases of reactor shielding and related studies are included. A chronology of reactor shielding and the present status of shielding theory and microscopic nuclear data as presented in Papers 1 and 2, respectively, lay the foundation for the more specific papers which follow. Actual shield design for the STR, a power breeder reactor, and the SFR and PWR reactors is discussed. Papers related to the nuclear aircraft shielding problem include light-weight shield design, effects of altitude, radiation sources in the Fireball shield, measurements on the Ge-ANP ^{4}-1 divided shield, and a γ air-scattering calculation. Specific related theoretical computations and experimental measurements discussed include: neutron and γ attenuation in Hanford shielding materials; neutron and γ transmission through air slots; penetration of 6-Mev γ rays in H_2O, Fe, and Pb; moments method calculation of neutron penetration through light materials; stochastic calculations of γ diffusion; use of Boral in shielding; dose measurements around the GTR in air and H_2O; γ dose due to irregular geometry in slab shields; flux characteristics of extended sources; secondary γ production; broad-beam γ attenuation; thermal neutron flux calculation for EBR; survey of the BNL shielding program; and Monte Carlo calculation of neutron penetration in H_2O. A book-type subject index has been prepared to facilitate the locating of the information. (L.M.T.) ACR 10-2424 (1954)

Division of Reactor Development, AEC - REACTOR SHIELDING INFORMATION MEETING. NOVEMBER 15-16, 1954, GENERAL ELECTRIC COMPANY, AIRCRAFT NUCLEAR PROPULSION DEPARTMENT, CINCINNATI, OHIO. PART 1. Feb. 1955 296p. (WASH-185(Pt.1)) Report: Secret-RD

A group of 33 papers are presented on topic related to the transmission and attenuation of γ and neutron radiations in reactor materials and particular shield designs. Theoretical formulations of typical problems are considered, largely in connection with aircraft reactor shields. ACR 11-590 (1955)

Division of Reactor Development, AEC - REACTOR SHIELDING INFORMATION MEETING, NOVEMBER 15-16, 1954, GENERAL ELECTRIC COMPANY, AIRCRAFT NUCLEAR PROPULSION DEPARTMENT, CINCINNATI, OHIO. PART 2. Feb. 1955. 29p. (WASH-185(Pt.2)) Rpt: Secret-RD

Three papers on aircraft shield parameter studies, the GE Core Test Facility and the NDA shielding materials program for the study of "unconventional" materials are presented. ACR 11-626 (1955)

Fairchild Engine and Airplane Corp. Nepa Div., Oak Ridge, Tenn. - LINE OF SIGHT GRAPHIC STUDY FOR ANNULAR DUCTED SHIELD. J.Y. Estabrook and John J. O'Blenis. Apr. 12, 1949. 8p. Contract (W-33-08-ac-14801). NEPA-981 (Rpt: Confidential-RD)

ACR 11-1452 (1955)

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General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati. - SHIELD DESIGN CALCULATIONS FOR AC-SERIES POWER PLANTS. T.R. Mitchell, July 5, 1954. 36p. Contract (W-31-109-Eng-52.) XDC-54-7-20 (Rpt: Secret-RD)

Shield thickness and weight calculations which were performed in the fall of 1953 primarily for the purpose of furnishing trends of shield weight variation with reactor size are reported in detail. The shield weights reported are not optimum largely because gamma shadow shielding at the reactor was not used in these designs. The calculation methods, which essentially are still being used for parametric type shield weight studies, are described in detail.
ACR 11-1538 (1955)

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati - PROGRAMMING NUCLEAR AIRCRAFT SHIELD ANALYSIS METHODS ON IBM-701. STATUS REPORT FOR QUARTER ENDING JUNE 30, 1955. J.E. MacDonald and W.E. Edwards. June 9, 1955. 30p. XDC-55-6-109 (Rpt: Secret-RD)

Programs for calculating direct beam fast neutron and γ dose rates in and around cylindrical shield regions coaxial with cylindrical source regions have been coded for the IBM-701. Check-out of the fast neutron program using the Albert-Welton point kernel and the present status of the program are discussed. Instructions for using the fast neutron program are included.
ACR 11-1776 (1955)

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati. - CURRENT GE-ANPD SHIELD DESIGN DATA. W.E. Edwards. July 27, 1955. 11p. XDC-55-7-104 (Rpt: Secret-RD)

Miscellaneous shield design data, including fast neutron removal cross sections and gamma ray absorption coefficients, are compiled on various possible materials so that shield designs will consistently be based on the same nuclear constants.
ACR 11-1986 (1955)

Hanford Atomic Products Operation, Richland, Wash. - DEVELOPMENT AND CONSTRUCTION OF CONCRETE BIOLOGICAL SHIELDS FOR THE NEW PRODUCTION REACTORS AT HANFORD. Harold S. Davis. p.343-70 of NUCLEAR SCIENCE AND TECHNOLOGY. VOL. 1A, No.2. Aug. 1955. 28p. Charge $0.80. TID-2507(p.343-70) (Rpt. Conf.-RD)

Descriptions are presented of the steel and concrete biological shields which enclose the new Hanford production reactors. High-density concrete containing steel aggregate and limonite was placed in prefabricated steel forms by means of the prepacked method; in low intensity areas the steel aggregate was replaced with magnetite. ACR 11-2144 (1955)

Hanford Works - HANFORD SHIELDING PROGRAM. PROCEDURES FOR RADIOACTIVE FOIL PREPARATION AND COUNTING. R.L. Tomlinson. Jan. 1, 1955 40p. Contract W-31-109-Eng-52. HW-33121 (Rpt: Official Use Only)

Procedures are described which have been devised to air engineering and laboratory assistants in carrying out their specific assignments in Hanford shield attenuation measurements and at the same time in obtaining an understanding of some of the more basic fundamentals associated with the field of beta counting and neutron flux determinations. It is not intended to be a strictly technical document but merely a guide that may answer many of the

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routine questions that arise from time to time when working with low level radioactivity. This manual may also serve as reference for the laboratory procedures used in obtaining the large amount of shield attenuation data taken at Hanford. ACR 11-1266 (1955)

Kidde (Walter) Nuclear Labs., Inc., Garden City, N.Y. - ARMY PACKAGE POWER REACTOR: KIDDE COMPANIES PROPOSAL. James J. Barker, John Faas, and William L. Webb. P. 275-92 of NUCLEAR SCIENCE AND TECHNOLOGY. Vol. 1A, No.2. Aug. 1955. 18p. Charge $0.80. TID-2507(p.275-92) (Rpt. Confidential-RD)
...Ordinary concrete, supplemented by water and earth, is used for shielding. Concrete thicknesses range from 5 to 8 ft around the reactor compartment to 2 ft around the remainder of the primary circuit... ACR 11-2137 (1955)

Naval Research Lab.- NRL QUARTERLY ON NUCLEAR SCIENCE AND TECHNOLOGY. PROGRESS REPORT FOR THE PERIOD OCTOBER-DECEMBER 1954. Jan. 1, 1955 41p. NP-5561 (Rpt: Secret-RD)

Six new neutron thresholds have been found in Ne^{20} by studying the F19 9d, n γ) Ne^{20} reaction. It is pointed out that the internal momentum of a target nucleon within a nucleus plays an important part in describing nucleon-nucleus reactions even for very energetic incident particles. Differential elastic scattering cross sections for 14-Mev neutrons are reported for Bi, Ta, In, Fe, and S. Calculations were made to study the usefulness of random-sampling techniques in treating discontinuities at sources and boundaries in a radiation shield. Preliminary studies of slowing down and diffusion of fission neutrons in a fertile sphere were made. The control rod position indicator device for the STR was completed and tested. The transient response of a light-water moderated and cooled heterogeneous reactor was studied under conditions where the fuel element surface temperature reaches the boiling point of the moderator. The results are compared with BORAX measurements. New corrosion data for low-carbon steel by H_2O is presented. The same steady-state corrosion rate was obtained for distilled H_2O and solutions with a pH of 10.6. (K.S.) ACR 11-863 (1955)

North American Aviation, Inc. - SODIUM GRAPHITE REACTOR QUARTERLY PROGRESS REPORT, JULY - SEPTEMBER 1954. Sidney Siegel and Guy M. Inman, eds. Dec. 1, 1954. 105p. (NAA-SR-1109) Rpt: Secret-RD
...Gamma dose rates at the surface of the top shield were measured, together with the heat generation in the top thermal and biological shields... ACR 11-371 (1955)

Nuclear Development Associates, Inc., White Plains, N.Y. - ANP REACTOR DEVELOPMENT (FOR) JANUARY 1, 1955 THROUGH MARCH 31, 1955. (15E-102). Apr. 15, 1955. 54p. Contract AT(30-1)-862. NDA-1 (Rpt: Secret-RD)
...Preliminary designs of the Compact Core Reactor are outlined, emphasizing the CCR-5 and CCR-4 configurations. These designs are basically similar to previously described reactors in this series, except for the fuel rod design in CCR-4 and the fuel pins for CCR-5. Shield weight criteria are established for these designs, together with an investigation of flow in the coolant passages of CCR-4 and CCR-5... ACR 11-1454 (1955)

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Nuclear Development Associates, Inc., White Plains, N.Y. - SHIELD MATERIALS PROJECT. INTERIM PROGRESS REPORT (FOR) JANUARY 1, 1955 THROUGH MARCH 31, 1955. (15G-9). Apr. 15, 1955. 31p. Contract AT(30-1)-862. NDA-5 (Rpt: Secret-RD)

Studies on the radiation stability of LiH under typical neutron shield conditions are reported. Experimental equipment has been developed to measure the rate of gas evolution from this material in an in-pile test. A survey of unconventional shield materials is continuing, together with an evaluation of minimum size and weight criteria. (K.S.)

Nuclear Development Associates, Inc. - INTERIM REPORT ON SHIELDING MATERIALS PROJECT. K. Held. Aug. 13, 1954. 55p. Contract AT(30-1)-862. (NDA-15G-3). Rpt: Secret

This is an interim report on a study of shielding materials being carried out for the U.S. Atomic Energy Commission. The program is intended to provide a survey of shielding materials of possible interest; evaluation of their effectiveness on the basis of present information in the field of shielding physics; supporting experimental work on ordinary physical properties (for example, measurement of density as a function of temperature); consideration of engineering properties and problems; and selection of promising unconventional materials for more detailed examination. The work thus far has been mainly concerned with evaluation of shielding effectiveness (with emphasis on aircraft applications) and with the supporting measurement and/or compilation of ordinary physical properties. ACR 10-2304 (1954)

Nuclear Development Associates, Inc. - THE 1954 NDA SHIELDING MATERIALS PROGRAM. FINAL REPORT. W.L. Brooks, K. Held, and B. Minushkin. Dec. 7, 1954 89p. Contract (AT(30-1))-862-G. NDA-15G-7 (Rpt: Secret-RD)

Several materials have been evaluated on the basis of their effectiveness in shields. Choice of this type of shield decreases the problem of production effects in the shield and therefore comparisons between materials may be made on the basis of attenuation only. Three different lead-water shields were considered and the effect of substituting materials of interest was determined. Engineering considerations such as temperature and radiation stability, air reactivity, toxicity, etc., limit the number of materials which are suitable. A discussion of the physical and engineering properties of some potential shielding materials is included. ACR 11-1035 (1955)

Nuclear Development Associates, Inc., White Plains, N.Y. - LiH SHIELD MATERIAL. W.A. Loeb. Dec. 16, 1953. 10p. NDA-Memo-14-21 (Rpt: Secret-RD)

Work performed under contract with the Detroit Edison Co. and The Dow Chemical Co.

Selected chemical and physical properties of LiH and other hydrides were investigated. The use of these hydrides as shielding materials is discussed. (C.W.H.) ACR 11-1758 (1955)

Nuclear Development Associates, Inc., White Plains, N.Y. - ATTENUATION OF LiH REACTOR SHIELD PLUG. H. Goldstein and R. Aronson. Mar. 9, 1954. 9p. NDA-Memo-14-28 (Rpt: Secret-RD)

Work performed under contract with the Detroit Edison Company and the Dow Chemical Company.

A preliminary calculation has been made of the attenuation of neutrons through a lithium hydride shield plug. It has been proposed that a neutron shield be placed between the reactor core and blanket to prevent the fuel element handling mechanism from becoming so active that it cannot be repaired in case of damage. These approximate results indicate that a plug with a thickness of approximately 70 cm. will reduce the neutron current by 10^{-6}. ACR 11-1761 (1955)

Oak Ridge National Lab. - SOME CONSIDERATIONS REGARDING THE USE OF URANIUM HYDRIDE IN A SHIELD. W.K. Ergen. Dec. 12, 1949. 8p. Contract (W-7405-eng-26). CF-49-12-58 (Rpt: Secret-RD)

It is computed that a U-H_2O-B_4C shield weighs 46% more than a UH_3-B_4C shield, the amount of H being equal in both shields. This weight difference is mainly due to the high density of the UH_3, as compared to the U-H_2O mixture. The analysis neglects the difference in the two shields with regard to the production of secondary gammas, and with regard to the neutron multiplication. In these two respects the U-H_2O-B_4C shield would be the more favorable shield, because of the possibility of separating the uranium from the hydrogen by layers of B_4C. This consideration would tend to decrease the computed weight saving due to the hydride and, until the secondary gammas and the neutron multiplication are investigated more fully, no materials development program on uranium hydride is recommended. It also should be emphasized that uranium hydride is, apart from the unfavorable effect of neutron multiplication, a very favorable hydride, because of the high gamma absorption in uranium, the large amount of hydrogen per cc, and the high density. The above calculations thus do not prove that hydrides other than UH_3 are desirable from the shielding viewpoint. ACR 11-2059 (1955)

Oak Ridge National Lab. - ESTIMATE OF SHIELDING REQUIREMENTS FOR THE HRT DUMP TANKS. C.L. Segaser. Mar. 16, 1954. 7p. Contract (W-7405-eng-26). CF-54-3-175 (Rpt: Secret-RD)

An estimate has been made of the shielding requirements of a proposed dump tank arrangement for the HRT. The dose rate on the surface of the dump tank shield one day after a dump has been calculated as a function of shield thickness. It was found that $3\frac{1}{3}$ ft of Barytes concrete of density 3.5 g/cm^3 will reduce radiation dosage to 1 r/hr 24 hr after a shutdown when the reactor has been in operation for a long period of time. (M.P.G.) ACR 11-1616 (1955)

Oak Ridge National Lab. - REQUIREMENTS FOR HRT TOP PLUG. P.N. Haubenreich. May 27, 1954. 14p. Contract (W-7405-eng-26). CF-54-5-200 (Rpt: Secret-RD)

The shield directly over the HRT core should be no thicker than 5 ft. Various shielding materials and arrangements have been investigated, and the results are summarized. Shields composed of iron-aggregate concretes and 1 in. of Pb appear to be the most satisfactory. A shield of Fe and H_2O would also be satisfactory but might be much more expensive. (M.P.G.) ACR 11-1619 (1955)

Oak Ridge National Lab. - ORR SHIELDING STUDIES. I. BASIC DESIGN INFORMATION. N.F. Lansing. Aug. 9, 1954. 16p. Contract (W-7405-eng-26). CF-54-7-95 (Rpt: Secret-RD)

Basic design criteria which will be used in shielding studies on the ORNL Research Reactor are presented. These criteria include: reactor power level; radiation tolerance; γ-ray absorption coefficients and relaxation lengths; build-up factor; radiation intensities; permissible temperature differences in concrete; and thermal and mechanical properties of materials. (C.W.H.) ACR 11-2131 (1955)

Oak Ridge National Lab. - REACTOR RADIATIONS THROUGH SLABS OF GRAPHITE. R.G. Cocharn, J.D. Flynn, K.M. Henry, and G. Estabrook. July 30, 1954 22p. Contract (W-7405-eng-26). (CF-54-7-105) Rpt: Secret-RD

Measurements have been completed to determine the attenuation of large thicknesses of graphite next to a reactor. These measurements are of interest for evaluation of a graphite reflector as a shield component, and they also provide a direct comparison with LTSF determinations of the carbon removal cross section. Graphite thicknesses of 1, 2, and 3 ft were used, and the usual gamma-ray, thermal-neutron, and fast-neutron dose measurements were made behind each slab thickness. In

addition, the fast-neutron spectrum (above 1.3 Mev) through 1 ft of graphite was measured. ACR 10-2431 (1954)

Oak Ridge National Lab. - BULK SHIELDING FACILITY TESTS ON THE GE-ANP R-1 DIVIDED SHIELD MOCKUP. H.E. Hungerford. Feb. 17, 1955. 67p. (CF-54-8-94) Rpt: Secret-RD

The aft and forward sections of the ANP R-1 reactor divided shield mock-up were tested prior to more complete measurements on the entire mock-up at the Tower Shielding Facility. The experimental arrangement is described, and measurements for each section are presented and compared. ACR 11-605 (1955)

Oak Ridge National Lab. - FRACTION OF BIOLOGICAL DOSE DUE TO THERMAL NEUTRONS IN AIRCRAFT REACTOR SHIELDS. E.P. Blizard. Dec. 3, 1954 5p. CF-54-11-113 (rev.) Rpt: Secret-RD

ACR 11-264 (1955)

Oak Ridge National Lab. - TOWER SHIELDING FACILITY TESTS ON THE GE-ANP R-1 DIVIDED SHIELD MOCKUP. PART 1. C.E. Clifford, Dec. 15, 1954. 63p. Contract (W-7405-eng-26). CF-54-12-3 (Rpt: Secret-RD)

Two of a series of experiments to be performed on the mock-up of the GE-ANP R-1 divided shield design have been completed at the TSF. The first experiment consisted of measurements of radiation leakage from the reactor shield in water; the results are compared with extensive measurements made previously at the BSF. The second experiment consisted of measurements in the detector tank. Measurements of the scattered neutrons (thermal-neutron detector) as a function of the reactor-detector altitude are given. A complete map of the thermal-neutron flux and the fast-neutron and gamma-ray dose rates was made in the detector tank at the maximum altitude. Single measurements of the fast-neutron and gamma-ray dose rates just in front of the detector tank are also reported. ACR 11-871 (1955)

Oak Ridge National Lab. - CALIBRATION OF THE REVALET, A REMOTELY VARIABLE LEAD-TRANSMISSION GAMMA-RAY DOSIMETER. D.L. Gilliland. (1955) 16p. Contract (W-7405-eng-26). CF-55-2-111 (Rpt: Secret-RD)

In order to aid in the optimization of gamma-ray shielding, a method has been developed in which increments of lead shielding can be easily added to simulate a gamma shield. This is effected by enclosing an anthracene scintillation counter in a thick lead shield which has an aperture in one side that can be covered with 0- to 0.7-in. thick lead discs. This instrument (the Revalet) has been experimentally operated in a known geometry with a source of known energy (Co^{60}). A comparison of the measured lead attenuation with Monte Carlo calculations indicated excellent agreement for 0 and 30° angles of incidence and good agreement of 60°. The cone angle of detection was 120°. ACR 11-825 (1955)

Oak Ridge National Lab. - AN ABBREVIATED CHRONOLOGY OF EXPERIMENTAL REACTOR SHIELDING RESEARCH AT ORNL, 1947 - 1954. E.P. Blizard. Apr. 25, 1955. 22p. Contract (W-7405-eng-26). CF-55-4-134 (Rpt: Secret-RD)

ACR 11-1281 (1955)

Oak Ridge National Lab., Tenn. - COMPARISON OF HYDROGENOUS MATERIALS FOR USE IN AIRCRAFT SHIELDS. J.Van Hoomissen and H.E. Stern. June 9, 1955. 10p. Contract (W-7405-eng-26). CF-55-6-40 (Rpt: Secret-RD)

High-performance hydrogenous shield materials should be intercompared on the basis of the weight of the shield which uses them. The method presented gives a first estimate of weight comparison on the basis of very simple attenuation

calculations. It is intended for the use of persons whose primary effort is in developing new materials. ACR 11-1868 (1955)

Oak Ridge National Lab., Tenn. - MINUTES OF THE ORNL-CONVAIR-GE SHIELDING COORDINATION MEETING. J.B. Dee, R.W. Peele, and J.E. Van Hoomissen. June 23, 1955. 32p. Contract (W-7405-eng-26). CF-55-6-187 (Rpt: Secret-RD)

A summary of major aircraft shielding problems is presented. The problems include biological hazards, radiation damage, induced activation of aircraft components, and general problems on shield weight and design. General recommendations are made concerning future experiments and studies. Abstracts of talks given at the meeting are presented. (M.P.G.) ACR 11-1987 (1955)

Oak Ridge National Lab. - LID TANK SHIELDING TESTS FOR THE REFLECTOR-MODERATED REACTOR. F.H. Abernathy, A.P. Fraas, M.E. LaVerne, R.M. Spencer, F.N. Watson, and F.R. Westfall. Oct. 19, 1954. 243p. Contract W-7405-eng-26. ORNL-1616 Rpt: Secret-RD

Approximately 80 configurations simulating the preliminary basic shield design for the reflector-moderated reactor have been tested in the Lid Tank Shielding Facility. From these experiments it has been concluded that: (1) the Be reflector region should be about 12-in. thick to minimize the over-all reactor shield weight and still remain consistent with core reactivity requirements, (2) the thickness of the heat exchanger region has relatively little effect on neutron and γ dose curves as a function of distance from the source plate, (3) the substitution of Pb for H_2O over the range covered (0 to 7.5 in.) in the region just outside of the heat exchanger has practically no effect on the neutron attenuation curve well out in the shield. The effect of Pb in this region on the γ dose is greatest for the first 4 in. and is appreciably smaller for thicknesses greater than about 7 in., (4) a 0.13 in. thick layer of B^{10} (density = 2.1) is as effective in depressing the thermal-neutron flux and consequent capture gammas as 1 in. of B_4C (density = 1.95), (5) dividing the Pb region into layers separated by borated hydrogenous material gives some reduction in the γ dose for a given thickness of Pb, however, the full-scale shield design is simplified structurally by placing all of the Pb together just outside the pressure shell. While lumping the Pb in this fashion increases the Pb thickness required, keeping its radius to a minimum largely compensates for this so that very nearly minimum over-all shield weights can be obtained in this manner for Pb thicknesses up to 6.0 in., (6) transformer oil is as effective H_2O on a volumetric basis for attenuating the neutron flux. Since its density is about 0.87, an appreciable saving in shield weight can be obtained through its use provided it can be borated to a few percent by weight by the addition of some compound such as borazole or trimethylborate. Some of this weight saving is offset by the fact that the thickness of the Pb layer must be increased because the attenuation of the flux is not as great in the oil. (7) Be is more effective than H_2O on a thickness basis for neutron attenuation. (8) It is important that a B curtain be used between the heat exchanger and the pressure shell as well as between the reflector and the heat exchanger. (9) It does not appear worth while to use Ru in place of Na or NaK as a secondary collant. K is preferable to Na with regard to activation, but it is inferior as a heat transfer medium. As a consequence of these measurements, an effective preliminary shield was designed. Dose rate curves were obtained for the designed shield by correcting observed data from configurations which closely approximated it. These in turn can be used for shield weight calculations. ACR 10-2609 (1954)

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Oak Ridge National Lab. - DOSE MEASUREMENTS ON THE SIR ROTATING TOP PLUG MOCKUP AT THE BULK SHIELDING FACILITY. R.E. Rungerford. May 23, 1955. 101p. Contract W-7405-eng-26. ORNL-1621 Rpt: Secret-RD

A brief description of the SIR iron and boron carbide rotating top plug mockup and the experimental measurements made on it are presented. The results of the measurements showed that in general the doses leaking through were less than the predicted doses. There was some streaming around the control rod holes and the outer air gaps which could be reduced by use on plastic caps 15 cm thick over those positions. The results of the experiments showed that: (1) streaming through the air gap region near the edges of the plug would have been increased by about 80% for fast neutrons and by about 40% for thermal neutrons and gamma rays if the BSR had been completely surrounded by an iron thermal shield instead of the pool water; (2) boration of the polyethylene contemplated for use as plastic caps probably is unnecessary; (3) replacing the lower part of the plug (section next to reactor) with an iron bulk shield made little difference in the radiation measurements on the outer side of the plug. ACR 11-1532 (1955)

Oak Ridge National Lab. - GAMMA RADIATION IN A DIVIDED AIRCRAFT SHIELD. PARTS 1 AND 2. F.C. Maienschein, F.T. Bly, and T.A. Love. Sept. 14, 1954. 143p. Contract W-7405-eng-26. ORNL-1714. Rpt: Secret-RD

Measurements made with the multiple-crystal scintillation gamma-ray spectrometer and the reactor portion of a divided shield mockup are described. The mockup was a simplified model of the reactor aircraft shield described by the 1950 ANP Shielding Board, and gamma-ray spectra and angular distributions were determined at several positions along the shield boundary. The second section of this report describes a calculation of the gamma-ray air scattering and subsequent crew shield penetration. Dose values inside the crew shield are determined as a function of pre- and post-scatter energies and source and receiver angles. ACR 10-2432 (1954)

Oak Ridge National Lab. - PHYSICS DIVISION SEMIANNUAL PROGRESS REPORT FOR PERIOD ENDING MARCH 10, 1954.

...A series of experiments designed to study the penetration of fast neutrons through slant thicknesses of material indicates that most of the dose comes from neutrons penetrating the shield along the undeviated path. A reduction of 20% in the γ dose behind an Fe shield has been effected by coating the Fe with B_2O_3. Fast-neutron doses from the BSF and fast neutron γ doses from the Tower Shielding Facility have been measured... ACR 10-1942 (1954)

Oak Ridge National Lab. - AIRCRAFT NUCLEAR PROPULSION PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 10, 1954. A.W. Savolainen, ed. Oct. 29, 1954. 197p. (ORNL-1771) Rpt: Secret-RD

...shielding analysis (slant penetration of composite slabs shields by γ radiation air scattering of neutrons in presence of the ground, multiple scattering in a uniform medium, ground scattering of neutrons, focusing of radiation in a cylindrical crew compartment); Lid Tank Shielding Facility (thermal and fast neutron flux and γ dose in sugar solutions, helical air duct neutron flux measurements); Bulk Shielding Facility (reactor radiations through slabs of graphite, reactor air glow); and Tower Shielding Facility (fast neutron ground and air scattering measurements). (For preceding period see ORNL-1729) ACR 11-150 (1955)

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Oak Ridge National Lab. - AIRCRAFT NUCLEAR PROPULSION PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING DECEMBER 10, 1954. Ann W. Savolainen, ed. Jan. 6, 1955. 177p. Contract W-7405-eng-26. ORNL-1816 (Rpt: Secret-RD)

The operation of the ARE throughout the test period is described. Design and engineering activity will now be devoted to the reflector-moderated reactor, to be known as the Aircraft Reactor Test. Further developments are proceeding on the design of fluoride-fuel pumps, heat exchangers, and corrosion test apparatus. Criticality conditions were determined for the second RM-CF reactor mockup. Phase studies of the NaF - ZrF_4 - UF_4 system and UF_3 bearing fluoride systems are reported. Chemical reactions in molten salts are being studied for purposes of fluoride purification procedures. Values for the solubility of Xe in fused salts were determined. Corrosion studies of Inconel, 316 stainless steel, and Hastelloy B were continued. Other corrosion research is reported on the attack of Inconel by molten Ru, mass transfer in liquid Pb, the development of an acid-base theory for fused hydroxides, the flammability of Na - Bi alloys, and the effect of temperature and Cr additions on the corrosion of Inconel by fluoride melts with NiF_2 additions. The physical properties and fabricability of Ni - Mo base alloys, including Hastelloy B are being studied as reactor materials with superior corrosion characteristics to that of Inconel. The oxidation resistance of several new brazing alloys were tested with Inconel as the parent metal. The enthalpies and heat capacities of NaF - ZrF_4-UF_4 and LiF-KF-UF_4 were determined, together with the viscosity and thermal conductivity of NaF-ZrF_4-UF_4 and the thermal conductivity of NaF-KF-Lif. A group of new capsules and fuel loops are being bench-tested for radiation damage studies in the MTR and LITR. Metallographic studies of stainless steel - UO_2 fuel elements have given additional information on the relationship between UO_2 particle size and radiation damage. A number of tentative methods have been developed for the determination of S, U^0, and UF_3 in fluoride fuels. Flowsheets and decontamination data were obtained for a fluoride volatility process plant designed to recover U from ARE fuels. Monte Carlo calculations were made on the slant penetration of γ rays through composite slab shields and the heating in Be slabs from adjacent sources. Neutron scattering experiments were also performed for the GE-ANP R-1 shield mockup. The neutron removal cross section of Li was measured. Neutron and γ dose rates were investigated beyond the GE-ANP helical air ducts. Thermal neutron and γ flux measurements around the GE-ANP R-1 divided shield mockup were made at the Tower Shielding Facility. (For preceding report in series see ORNL-1771.) (K.S.) ACR 11-894 (1955)

Oak Ridge National Lab. - EFFECTIVE NEUTRON REMOVAL CROSS SECTIONS FOR SHIELDING. G.T. Chapman and C.L. Storrs. Sept. 19, 1955. 154p. Contract W-7405-eng-26. ORNL-1843 (Rpt. Secret-RD)

The effective removal cross section concept as applied in shield calculations is discussed, and a method of determining the numerical value of this cross section from LTSF experimental data is presented. Radiation intensity measurements in water beyond some 20 elements and compounds and the corresponding removal cross section values are reported. These values are useful in determining the relative shielding effectiveness of the various materials, but can be used with complete assurance for shielding calculations only when the geometry under consideration closely resembles that employed at the LTSF. Specifically there must be many relaxation lengths of hydrogenous shield following the material. A graphical comparison of the effective removal cross sections and the total cross sections at a high neutron energy (8Mev) is also made and should be applicable to shield calculations. In addition, calculations are presented of correction factors for various values of the water thickness, sample thickness, and attenuation lengths in order to facilitate the calculation of the removal cross section from future measurements. ACR 11-2208 (1955)

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Oak Ridge National Lab. - AIRCRAFT NUCLEAR PROPULSION PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING MARCH 10, 1955. Mar. 25, 1955. 205p. Contract W-7405-eng-26. ORNL-1864 (Rpt: Secret-RD)

...The first experiment with the mockup of the GE-ANP- R-1 reactor shield has been completed at the Tower Shielding Facility with measurements of the γ-ray dose rates along the three axes of the detector tank. A γ-ray dosimeter is described with which it is possible to simulate the addition of thicknesses of lead to an aircraft crew compartment. The exposure of primates to high γ and fast-neutron dose rates is described. (For preceding period see ORNL-1816.) (M.P.G.) ACR 11-1455 (1955)

Oak Ridge National Lab. - AIRCRAFT NUCLEAR PROPULSION PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JUNE 10, 1955. A.W. Savolainen, ed. June 28, 1955. 246p. Contract W-7405-eng-26. ORNL-1896 (Rpt: Secret-RD)

...A method is presented for interpretation of the differential shielding experiments in terms of the probability of fast neutrons scattering into the sides of a crew compartment... ACR 11-2159 (1955)

Technical Information Service, AEC - RADIATION SHIELDS AND SHIELDING. A BIBLIOGRAPHY OF CLASSIFIED REPORT LITERATURE. Hugh E. Voress, comp. Nov. 1954. 35p. (TID-3031 (suppl. 1)) Rpt: Secret-RD

This annotated bibliography contains 194 references to classified report literature. Reports available at the Technical Information Service from Sept. 1952 to October 1, 1954, were reviewed. Author, subject, and report number indexes are included. ACR 11-441 (1955)

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh - LARGE SHIP REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD JANUARY 20, 1955 TO MARCH 20, 1955. Mar. 20, 1955. 133p. Contracts AT-11-1-GEN-14 and NObs-56404. WAPD-MRL-4 (Rpt: Secret-RD)

...Neutrons and γ-ray flux distributions in the primary shield were studied. Consideration is given to the primary coolant flow requirement based on an analysis of a loss-of-coolant flow transient... ACR 11-1449 (1955)

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