The Commission continually reviews radiation science with the aim of identifying areas in which the development of guidance and recommendations can make an important contribution.

The ICRU's Relationship with Other Organizations

In addition to its close relationship with the ICRP, the ICRU has developed relationships with other organizations interested in the problems of radiation quantities, units, and measurements. Since 1955, the ICRU has had an official relationship with the World Health Organization (WHO), whereby the ICRU is looked to for primary guidance in matters of radiation units and measurements and, in turn, the WHO assists in the worldwide dissemination of the Commission's recommendations. In 1960, the ICRU entered into consultative status with the International Atomic Energy Agency (IAEA). The Commission has a formal relationship with the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), whereby ICRU observers are invited to attend annual UNSCEAR meetings. The Commission and the International Organization for Standardization (ISO) informally exchange notifications of meetings, and the ICRU is formally designated for liaison with two of the ISO technical committees. The ICRU also enjoys a strong relationship with its sister organization, the National Council on Radiation Protection and Measurements (NCRP). In essence, these organizations were founded concurrently by the same individuals. Presently, this long-standing relationship is formally acknowledged by a special liaison agreement. The ICRU also corresponds and exchanges final reports with the following organizations:

Bureau International de Métrologie Légale
Bureau International des Poids et Mesures
European Commission
Council for International Organizations of Medical Sciences
Food and Agriculture Organization of the United Nations
International Committee of Photobiology
International Council for Science
International Electrotechnical Commission
International Labor Organization
International Organization for Medical Physics
International Radiation Protection Association
International Union of Pure and Applied Physics
United Nations Educational, Scientific and Cultural Organization

The Commission has found its relationship with all of these organizations fruitful and of substantial benefit to the ICRU program.

Operating Funds

In recent years, principal financial support has been provided by the European Commission, the National Cancer Institute of the US Department of Health and Human Services, and the International Atomic Energy Agency. In addition, during the last 10 years, financial support has been received from the following organizations:

American Association of Physicists in Medicine
Belgian Nuclear Research Centre
Electricité de France
Helmholtz Zentrum München
Hitachi, Ltd.
International Radiation Protection Association
International Society of Radiology
Ion Beam Applications, S.A.
Japanese Society of Radiological Technology
MDS Nordion
National Institute of Standards and Technology
Nederlandse Vereniging voor Radiologie
Philips Medical Systems, Incorporated
Radiological Society of North America
Siemens Medical Solutions
Varian Medical Systems

In addition to the direct monetary support provided by these organizations, many organizations provide indirect support for the Commission's program. This support is provided in many forms, including, among others, subsidies for (1) the time of individuals participating in ICRU activities, (2) travel costs involved in ICRU meetings, and (3) meeting facilities and services.

In recognition of the fact that its work is made possible by the generous support provided by all of the organizations supporting its program, the Commission expresses its deep appreciation.

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Reference Data for the Validation of Doses from Cosmic-Radiation Exposure of Aircraft Crew

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Preface

One of the objectives of the ICRU is to provide recommendations and reference data for radiation dosimetry. The purpose of this joint ICRU and ICRP Report is to provide reference data of ambient-dose-equivalent rates of cosmic-radiation exposure at aircraft altitudes derived from measurements, against which the results of routine methods of assessing annual doses of effective dose for aircraft crew, made using calculations, can be compared for validation purposes.

The establishment of the increasing rate of absorbed dose with increasing altitude, other than the immediate decrease in rates from terrestrial radiation sources, was first observed by Hess in 1912. In 1925, Millikan attributed the term "cosmic rays" and "cosmic radiation" to the radiation field. In the 1960s, there was concern about the consequence of high absorbed-dose rates, especially those from solar-particle events, for high-altitude supersonic passenger aircraft. From that time, increasing knowledge of the absorbed-dose rates at jet-aircraft cruising altitudes from experimental data and results of calculations on the galactic cosmic-radiation fields in the atmosphere has accumulated. It became clear that some categories of aircraft crew should be considered as being occupationally exposed to cosmic radiation. ICRP Publications 60 and 75, and recently Publication 103, classified the exposure of aircraft crew as occupational.

The radiation field inside an aircraft is to a large extent uniform, and the exposure of aircraft crew is generally predictable; events comparable to unplanned exposure in other radiation workplaces are unusual. The routine assessment of annual doses of aircraft crew is based on calculated values of effective-dose rate and staff-roster information. In routine radiation protection, traceable measurements are the basis of the overall system of individual dose assessment, and it is generally accepted that methods of annual dose assessment for aircraft crew based on radiation-transport calculations of effective-dose rates should be periodically verified by measurement. Among the many measurements by researchers, there were a particular series of European Commission projects on this topic, including a well-characterized set of measurements of ambient dose equivalent. There was very good statistical agreement of two combined standard uncertainties of 25 % for these measurement results, which used a variety of techniques and a range of methods of calibration. The detector assembly responses were traceable to National Metrology Institutes. The measurand was ambient-dose-equivalent rate using the conversion coefficients from neutron, photon, electron, proton, muon, and pion fluence rates established by Pelliccioni. These results published by the European Commission are the basis for a set of reference values of ambient-dose-equivalent rates published in this Report for three different time periods of solar cycle 23, for altitudes of 31 000, 35 000, and 39 000 ft (FL310, FL350, and FL390), and for latitudes from the equator to the poles.

In a joint report, ICRP and ICRU have defined computational adult reference phantoms (ICRP, 2009) for the calculation of conversion coefficients from particle fluence to effective dose. Values of conversion coefficients from fluence to effective dose for radiation incident from the superior hemisphere, considered appropriate for the exposure of aircraft crew, are calculated for the radiation fields at the reference conditions considered in this Report. The ratios of ambient dose equivalent and effective dose are tabulated, allowing the calculation of effective dose from values of ambient dose equivalent. These data may be used to test conformity of assessments of effective doses for aircraft crew. These reference values of effective dose should facilitate international harmonization of dose assessments for aircraft crew by airlines and their regulators.

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