Technical Evaluation of the NASA Model for Cancer Risk to Astronauts Due to Space Radiation

Committee for Evaluation of Space Radiation Cancer Risk Model, National Research Council, National Academies

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NASA's current missions to the International Space Station (ISS) and potential future exploration missions involving extended stays by astronauts on the lunar surface, as well as the possibility of near- Earth object (NEO) or Mars missions, present challenges in protecting astronauts from radiation risks. These risks arise from a number of sources, including solar particle events (SPEs), galactic cosmic rays (GCRs), secondary radiation from surface impacts, and even the nuclear isotope power sources transported with the astronauts. The serious early and late radiation health effects potentially posed by these exposures are equally varied, ranging from early signs of radiation sickness to cancer induction. Other possible effects include central nervous system damage, cataracts, cardiovascular damage, heritable effects, impaired wound healing, and infertility.

Recent research, much of which has been sponsored by NASA, has focused on understanding and quantifying the radiation health risks posed by space radiation environments. Although many aspects of the space radiation environments are now relatively well characterized, important uncertainties still exist regarding biological effects and thus regarding the level and types of risks faced by astronauts.

This report presents an evaluation of NASA's proposed space radiation cancer risk assessment model, which is described in the 2011 NASA report, *Space Radiation Cancer Risk Projections and Uncertainties--2010*. The evaluation in *Technical Evaluation of the NASA Model for Cancer Risk to Astronauts Due to Space Radiation* considers the model components, input data (for the radiation types, estimated doses, and epidemiology), and the associated uncertainties. This report also identifies gaps in NASA's current research strategy for reducing the uncertainties in cancer induction risks.

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