For more information on:

NASA Space Radiation Health Project
http://srhp.jsc.nasa.gov/

NASA Space Radiation Health Project
NASA Johnson Space Center
Houston, Texas 77058
Dr. Francis A. Cucinotta
francis.a.cucinotta@nasa.gov

NASA space radiation research opportunities
http://spaceresearch.nasa.gov/

Office of Biological and Physical Research
National Aeronautics and Space Administration
Washington, D.C. 20546
Dr. Walter Schimmerling
walter.schimmerling@hq.nasa.gov

NASA Space Radiation Laboratory
http://server.c-ad.bnl.gov/esfd/nsrl/index.html

NASA Space Radiation Laboratory at
Brookhaven Lab
P. O. Box 5000
Upton, New York 11973-5000
Dr. Frank M. Sulzman
frank.m.sulzman@nasa.gov

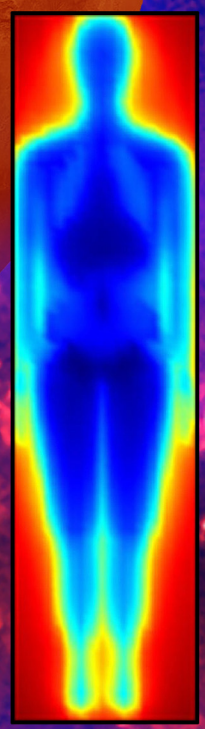
Brookhaven National Laboratory
http://www.bnl.gov

Brookhaven National Laboratory
P. O. Box 5000
Upton, New York 11973-5000

serving the NASA vision...fulfilling the NASA mission

serving the NASA vision...fulfilling the NASA mission

NASA Space Radiation Health Project



The NASA Vision:
"To improve life here,
To extend life to there,
To find life beyond."

The NASA Mission:
"To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers
...as only NASA can."

Once astronauts leave Earth's protective atmosphere, they will encounter harmful space radiation—galactic cosmic rays (GCR), particles of high energy and high charge (HZE), protons, and secondary particles including neutrons. Space radiation ionizes, or deposits energy, as it traverses through material and living tissue. Space radiation differs drastically from the x-rays or gamma rays that we experience on Earth by producing more complex types of DNA or cellular damage that may lead to adverse health risks even at low doses.

The Space Radiation Health Project (SRHP), based at the NASA Johnson Space Center (JSC), is one facet of NASA's overall Space Radiation Health Program and leads the overall integration and implementation of spaceflight safety. NASA's Office of Biological and Physical Research (OBPR) tasks its Bioastronautics, Fundamental Space Biology, and Microgravity Sciences Divisions to understand and quantify the space radiation environment and its effects on astronauts. Under the direction of the Bioastronautics Division, the JSC Space Radiation Health Project coordinates and integrates a radiobiology research program; develops and maintains a database of risk prediction models; and seeks to develop technology leading to countermeasures that will prevent, reduce, and ameliorate harmful radiation effects.

Radiobiology Research Program

NASA has teamed with the Department of Energy (DOE) to construct the NASA Space Radiation Laboratory (NSRL), a high-energy, heavy-ion irradiation facility at the Brookhaven National Laboratory (BNL) in Upton, N.Y. Using this new NSRL facility, scientists from several universities and medical centers across the nation will be able to simulate the space radiation environment to investigate radiation-caused chromosomal damage and mutations; potential radiation damage to eye, skin, and brain tissues; and radiation effects on the formation of cataracts and tumors. In addition, new methodologies for assessing the radiation protection from spacecraft shielding and potential new dietary and pharmacological measures to counteract harmful radiation effects will be analyzed.

Computational Risk Modeling Tool

NASA has developed, and continues to refine, mathematical models of the space radiation environment, radiation transport, and DNA damage and repair for projecting astronaut risks. These models agree with physical measurements in Earth and Mars orbit to an accuracy of ±20% and are used both as a science application and an engineering design tool for space radiation shielding studies. Results from experimental studies at the NSRL will be used to improve the NASA computational risk model. In concert with estimations and standards for the biological effects of radiation, these models are used to estimate the amount of time an astronaut can safely live and work in space.

Design of Countermeasures

Countermeasures to mitigate radiation risk include limiting the time and duration of radiation exposure (carefully scheduling spacewalks) and designing shielding for spacecraft and spacesuits. Countermeasures that may hold promise for the future include pharmaceutical radioprotectants and gene therapy to repair or eliminate damaged cells.

As astronauts leave our home planet for exploration missions and safely return, we aim to see that lives on Earth benefit from the research and technology that enabled their leap into the cosmos.