

# **Radiation and Human Space Flight**

## **Space Science Institute**

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### **PROGRAM DESCRIPTION**

Radiation exposure in space is a major challenge for human space flight. A combination of technology, materials, and an understanding of the physics involved, and knowledge about how the human body and other biological systems respond to radiation are all needed to meet this challenge. As such, radiation exposure during human space flight presents an excellent educational opportunity to engage students in multi-disciplinary science content that is both exciting and extremely relevant to NASA's space exploration mission.

The Radiation and Human Space Flight Project created videos and hands-on classroom activities that provide students an opportunity to discover the dangers of space radiation. The activities and videos created in collaboration with Marshall Space Flight Center (MSFC), Ames Research Center (ARC), and the Space Science Institute in Colorado, teach students what radiation is, how it affects the human body, and how we can be protected during space travel. There are two separate videos, one for high school and one for middle school. Each video has nearly identical content, but delivered in a manner most suitable for the intended age group. The activities, written using National Science Standards, compliment the video, but can also be used as stand alone activities, thereby maximizing their usefulness.

These activities and videos will reach a broader audience by supporting educators through professional development and connections made through the NASA Digital Learning Network (DLN).

### **PROGRAM RELEVANCE TO NASA**

The Radiation and Human Space Flight Project contributes to "enabling participants to become proactive 21<sup>st</sup> Century Explorers and journey with NASA through the series of exploration steps required to achieve the Vision for Space Exploration." Meeting the challenges of radiation exposure during human space flight is one of the key steps to achieving the space exploration mission.

NASA's emphasis on inspiring the next generation of explorers and filling the pipeline of scientists, engineers, and other technologists is extremely well served by this project. Radiation science is wonderfully multi-disciplinary covering the physics of light, matter, and the sub-atomic particles as well as human physiology, engineering, and materials science. As such, it stands to engage a wide range of students of varying interests and it lends itself to a great variety of multi-sensory activities.

### **PROGRAM BENEFITS TO SOCIETY**

The Radiation and Human Space Flight Project equips teachers with materials to engage their students in radiation science by increasing the teachers' comfort level with the necessary background knowledge, education tools, links to standards, and effective,

innovative professional development.

The Space Science Institute formed the 4-Corners Alliance for Science- a coalition of museums, science centers, community groups and formal classroom teachers in Arizona, Colorado, New Mexico, and Utah. These dedicated educators, often working on or near Native American reservations, in rural areas had previously had little or no access to organized professional development, much less direct interaction with scientists. As a result, they are eager for interaction with NASA and methods to bring NASA science into their communities in culturally relevant ways. There is a potential to reach between 20,000-40,000 participants with this project.

## **PROGRAM GOALS**

The Radiation and Human Space Flight Project will:

- *Familiarize pre-service and practicing educators with radiation science content, classroom activities, and innovative methods of delivery.*  
The project creates a 20-minute video in complementary hands-on activities complete with teaching and training materials and workshops based on radiation science content innovatively delivered through live 2-way professional development sessions on-line as well as in person.
- *Involve educators and/or students in the development and implementation of radiation science content-focused products and experiences.*  
Involving educators from the 4-Corners for Alliance for Science and the project ASTRO National Network in the development and testing of radiation science content focused deliverables, thus also ensuring direct content with radiation science personnel and research and the usability and relevance of the deliverables to what teachers need to properly present the science of space radiation and human space flight.
- *Develop and implement student focus simulations of radiation science ground-based and/or flight investigations.*  
Directly engaging Exploration Systems Mission Directorate (ESMD), MSFC, and other NASA-funded researchers in our product development and review including information on their current research projects in our hands-on activities will ensure their scientific and technological authenticity as student focused analogs of this research.
- *Develop interactive classroom activities to supplement high school level advanced placement courses.*  
In collaboration with our partners, each hands-on activity will be mapped to the national science education standards as well as specific state standards in each of the 4 Corners states and the 13 different national locations for the project ASTRO sites, thus ensuring their value as supplements to middle and high school curricula, including advanced placement courses.
- *Develop collaborations that complement existing NASA Office of Education and/or other Directorate education programs with ESMD-content components.*  
The Space Science Institute is the western U.S. NASA Broker/Facilitator for the Science Mission Directorate (SMD). This role directly created the Colorado Project ASTRO-GEO and the 4-Corners Alliance for Science. This project bridges the efforts of ESMD with SMD. Additionally, the activities and videos will be submitted for publishing to the NASA Portal, [www.nasa.gov](http://www.nasa.gov).

## **PROGRAM ACCOMPLISHMENTS**

- Teacher workshops were provided at the Detroit, Denver, and Birmingham National Science Teachers Association (NSTA) regional's in 2007. Approximately 20 teachers participated in the workshops. Approximately 1000 children may be reached through these teachers.
- A regional workshop with 4 corners teachers has been held to field test the activity guides. Changes were implemented immediately following the workshop.
- The videos have been completed and are being finalized for 508 compliance and DVD mastering. Each video is approximately 30 minutes long and will also contain DVD ROM features that will host the educator guides.
- One middle school guide containing one module and one high school guide consisting of four different modules of study have been created and finalized.
- All products, including a teacher training .pdf will be placed on the portal.

## **STUDENT ACCOMPLISHMENTS**

No student accomplishments at this time.