

## Particle Radiation Hazards en route to, and in orbit about, Mars

### Proposer(s):

Susan M. P. McKenna-Lawlor

Primary IAA Commission Preference:  
Commission 1, Space Physical Sciences

Secondary IAA Commission Interests:  
Commission 3: Space Technology and System Development  
Commission 4: Space System Operation and Utilization

### Short Description of Scope of Study

**Overall Goal:** To provide an up-to-date assessment, based on modeling and on in-situ measurements, of the particle radiation hazard en route to, and at, Mars, against the background of global aspirations to send various unmanned, and ultimately manned, missions to the planet.

### Intermediate Goals:

To bring together an interdisciplinary team (scientists, engineers, spacecraft manufacturers, component manufacturers, radiation modelers and medical personnel) who can provide expertise necessary to underpinning a manned mission to Mars.

To collect all relevant documentation/reports in one place as a resource for the mission planners.

To provide an assessment of the particle radiation to be expected while on route to Mars/in orbit about Mars at different phases of the sunspot cycle.

To provide an estimate of the particle radiation to be expected at the surface of the planet based on modeling and on existing measured data.

To determine consequences for spacecraft design/component selection.

To determine dosage and medical hazards pertaining to astronauts/ cosmonauts

To develop strategies for particle prediction at Mars (Martian weather)

To determine strategies for hazard mitigation.

**Methodology:** This study assumes that the major space agencies will actively promote technological and medical studies necessary to mount a manned mission to Mars (recall the proposal by US President George W. Bush in January 2004 that America would develop evolutionary architectures necessary to achieve the goal of manned flight to Mars. Also, long running programs in Russia to achieve this goal and initiatives in Japan and China to institute exploration at Mars).

It is envisaged that the study will not only provide a unique compilation of available inter-disciplinary information but will also address, where practical, the derivation of new results.

The work would be coordinated by S. McKenna-Lawlor who has a track record of acting as PI for instrumentation (energetic particle detectors) flown on Phobos 1 and Phobos 2; was involved in the preparation of four scientific experiments for Mars 96 and who is presently a Co-I for the ASPERA experiment flown on Mars Express.

It is expected that most of the work would be coordinated by e-mail but special sessions of the Study Group would be organized to take place during IAA and other meetings in the course of the study to review progress.

Time Line:

Autumn 2007 Presentation of a Package of Preliminary Findings to the IAA.

Autumn 2008 Presentation of an Interim Report to the IAA

Autumn 2009 Submission of a Final Report to the IAA

Progress reports submitted to the IAA over the three year lifetime of the project could be, as requested by the IAA, also presented at selected Academy/ other scientific meetings.

Final Product (Report, Publication, etc.):

Final Report to IAA.

Publication in Acta Astronautica following formal IAA evaluation/inputs concerning the results.

Target Community:

International Space Organizations (IAA, ESA, NASA, JAXA etc.)

Those planning unmanned and manned missions to Mars as well as those involved in preparing astronauts for flight could act on/react to the report.

Support Needed:

Financial support is not needed from the Academy

Potential Sponsors:

Space Technology Ireland, National University of Ireland, Maynooth (travel for S. McKenna-Lawlor)

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