IAA Study Group Status Report

Responsible Commission: III and also I

Study Number and Title: 3.19

Feasibility study of astronaut standardized career dose limits in LEO and the outlook for BLEO; biological response of humans to the impingement of high energy particle radiation.

Short Study Description (repeat from Study Group Proposal):

Differences between the values of career dose limits adopted for their astronauts by individual space agencies need to be investigated. Also, the biological response of humans to the impingement of high energy particle radiation needs specifically to be studied under microgravity conditions.

Progress in past six months:

A paper "Recommendations arising from a feasibility study of (a) astronaut standardized career dose limits in LEO and the outlook for BLEO (b) the biological response of humans to energetic radiation under microgravity conditions" was published by Acta Astronautica in September, 2014.

A further paper "Strategies to mitigate again human health risks incurred due to energetic particle irradiation Beyond Low Earth Orbit/BLEO" which was presented at an IAA Symposium on ***Space Flight Safety*** in St. Petersburg (July, 2014) is invited to be submitted for refereeing by Acta Astronautica.

Website Study Information up to date?

No. Many of the study group members who have worked with me since February 2013 and who's contributions were mentioned in several oral reports (Torino, Beijing, Washington) and in the Acta Astronautica paper (2014) are not listed on the website. I have recently asked Fabrice to look into this but, as of today, this is not resolved: *Study group members have to send their acceptance to the IAA Office.*

Study Group Membership (2013)

Chair: **S. M. P. McKenna-Lawlor**

Members:

A. Bhardwaj, Space Centre, ISRO, India
F. Ferrari, Institute of Physics, Poland
N. Kuznetsov, SINP MSU, Russia

A. K. Lal,, Sci/Eng ESMG, India
Y. Li, Astronaut Research and Training Centre of China .
A. Nagamatsu, JAXA, Japan
R. Nymmik, SINP MSU, Russia
M. Panasyuk,, SINP MSU, Russia
V. Petrov, Vladislav, Russian Academy of Sciences, Moscow, Russia*
G. Reitz, DLR, Germany
L. Pinsky, University of Houston, USA
Sheikh M. Shukor, Universiti Kebangsaan, Malaysia
A. K. Singhvi, A.K, Physical Research Laboratory, India
U. Straube, ESA, Cologne, Germany
L. Tomi, Canadian Space Agency, Canada
L.. Townsend, Univ. of Tennessee, USA

***in memoriam**

Study Plan

Activity for Phase 2 of the Study

- Inter-comparison of the energetic particle radiation levels estimated to be incurred during: a 31 day human mission to trans-lunar space (EM-L2); a 160 day mission to asteroid 2010UE51 and a 400day (return) cruise phase to Mars combined with a 30day surface stay.
- Coordination, for the particular cases of the Moon and Mars, of an inter-comparison between the results of the various international, interplanetary radiation models now available, complemented by validation of these several models using data measured in situ.
- Co-ordination of further research into the biological effects of space radiation in microgravity.
- Fostering of improved approaches to predicting the occurrence of those Solar Energetic Particle (SEP) events characterized by the delivery of high Effective doses.

Develop a preliminary concept for the development of a ***Human Space Awareness System*** (HSAS) that will:

- provide for crewed missions the means of prompt onboard detection of the ambient arrival of hazardous particles;

- provide a strategy (risk management) for the implementation of onboard responses to hazardous radiation levels;
- support modeling that can reliably predict the arrival of hazardous radiation at a spacecraft in BLEO;
- guarantee the timely transmission of particle alerts to a crewed vehicle in BLEO at an emergency frequency using suitably located support spacecraft.

Schedule

The study is expected by the Academy to be completed in mid 2015.

Issues requiring resolution? (recommend approach):

When the problem with the absence of existing members from the website is sorted out 5 additional new members need to be added (details on hold) to the total. After the Heads of Space Agencies summit meeting in Washington (2014) two were suggested as candidate members by the Czech Space Agency and a further two by the Swedish Space Agency. An American astronaut who is ready to join the group will also be added. Team membership will then be deemed to be complete.

A 30 page paper which was submitted to the HSFCG on 25 October, 2013 has not been published and some of my team members are anxiously asking about this. The material is good and a shorter version could be prepared for (say) JGR which would give welcome (and timely) exposure to the work of the group.

Product Deliveries on Schedule?

Yes for every deadline.

Study Team Member Changes?

Due to the untimely death of our distinguished colleague Professor V. Petrov, his name should now be removed from among the team members.

Name of person providing Study Group Status (Study Group Chair)

Acad. Susan McKenna-Lawlor:

Status Report Date:

8 September, 2014