

IAA Study Group Status Report

Responsible Commission: 3

**Study Number and Title: SG3.16 - Global Human Mars System Missions
Exploration – Goals, Requirements and Technologies**

Short Study Description (repeat from Study Group Proposal):

Human Missions to Mars have been studied individually by several Space Agencies over the past decades. However, a cooperative Human Mars mission framework – including, but not limited to requirements and technologies, is missing.

ISECG is not dealing with the above subject since it is limiting the coordination of the activities to the Mars Sample Return Mission.

Overall Goal:

Identify, assess and synthesize a global set of goals with its related criteria requirements for future human exploration of the Mars system and establish technology opportunities and roadmaps in the context of promising cooperative exploration scenarios. The Study should aim to identify means to minimize the risks at global level

Intermediate Goals:

The study will consider, but not limited to, the following aspects:

- 1) Mission rationale definition goals with its related criteria: – Political, Scientific, Economical, Cultural
- 2) Questions to be answered with the relevant time lining
- 3) Global set of requirements
- 4) Enabling Technologies required with the required time lining
- 5) Human Factors aspects
- 6) Mission Architecture Options
- 7) Sustainability
- 8) Outreach aspects
- 9) Cooperative Framework
- 10) Decision Roadmap
- 11) Recommendations
- 12) Conclusions

Progress in past six months:

The second meeting was held at the IAA Headquarters in Paris in March 2013 and the third was held at the 8th IAA symposium on space exploration: towards the stars in Torino, in July 2013.

In the two meetings the detailed list of contents was updated and the responsible for the various chapters were not yet appointed were chosen.

The updated table of contents resulting from the meeting is the following:

I. Mission rationale (Responsible: Richard Heidmann)

- a) Definition of goals with related criteria: Political, Scientific, Economical, Cultural
- b) Relevant options
- c) Heritage of past space experience

**II. Lessons learned from the past projects for Human Mars Exploration
(Responsible: Andrew Aldrin)**

- III. International cooperation (Responsible: TBD)**
 - IV. The environment (Responsible: Giancarlo Genta)**
 - a) Space environment beyond LEO
 - b) Mars environment
 - c) The environment on Mars Satellites
 - d) Forward contamination
 - e) Backward contamination
 - V. The human issues (Responsible: Nick Kanas)**
 - a) Radiation
 - b) Physiological health
 - c) Psychological and interpersonal issues
 - d) Cultural issues
 - e) Physical and mental efficiency
 - VI. The space transportation system (Responsible: Andreas Rittweger)**
 - a) General mission architecture
 - b) The launch vehicle
 - c) The interplanetary vehicle
 - d) The Mars lander
 - e) The Earth return vehicle
 - VII. The planetary infrastructure and vehicles (Responsible: Maria Antonietta Perino)**
 - a) Habitats
 - b) Power systems
 - c) ISRU
 - d) Rovers
 - VIII. The ground sector (Responsible: Christophe Bonnal)**
 - IX. Roadmap for the implementation of the mission (Responsible: Alain Dupas)**
 - a) Questions to be answered with the relevant time frame
 - b) Global set of requirements
 - c) Enabling Technologies required with the required time frame
 - d) Sustainability
 - e) Outreach aspects
 - f) Cooperative Framework
 - g) Decision Roadmap
 - h) Recommendations
 - X. Conclusions (Giancarlo Genta and Alain Dupas)**
- Appendices and bibliography**

The study deliverables were defined as two different documents:

- A. The main report
- B. The 25-page special synthesis document

The 25-page synthesis document is scheduled to be available for the next Heads of Space Agencies Summit to be held in Washington D.C. in January 2014.

Website Study Information up to date? (Study Group Membership, Study Plan and Schedule): The composition of the group, as reported on the IAA website, is

Chair: Giancarlo Genta

Co-Chairs: Alain Dupas
Hideto Yamazaki

Secretary: Jean-Marc Salotti

Study group **Membership** (in alphabetic order):

Mauro Augelli (CNES, France)
Andrew Aldrin (ULA, USA)
Nicolas Bérend (ONERA, France)
Giovanni Bignami (COSPAR)
Christophe Bonnal (CNES, France)
Claudio Bruno (University of Rome, Italy)
John B. Charles (NASA, USA)
Lin Chen (Lockheed Martin, USA)
Elisa Cliquet Moreno (CNES, France)
Gabriel G. De la Torre (Univ. of Cadiz, Spain)
Nadeem Ghafoor (MDA, Canada)
Richard. Heidmann (Planet Mars Ass., France)
Bernhard Hufenbach (ESA, Europe)
Les Johnson (NASA, USA)
Nick Kanas (U. of California, S. Francisco, USA)
David Kendall (Canadian Space Agency, Canada)
Julien-Alexandre Lamamy (Orb. Sc. Corp. USA)
John Logsdon (George Washington Univ., USA)
Chris McKay (NASA, USA)
Susan McKenna-Lawlor (Ireland Nat. U., Ireland)
Ernst Messerschmid (Stuttgart U., Germany)
Gian Gabriele Ori (Univ. G. d'Annunzio, Italy)
Maria Antonietta Perino (TASI, Italy)
Yury Razoumny (Russia)
Pascal Renten (University of Stuttgart, Germany)
Stephen C. Ringler (SGAC, USA)
Andreas Rittweger (Astrium, France)
Christian Sallaberger (MDA, Canada)
Klaus Schilling (Univ. of Würzburg, Germany)
Carol R. Stoker (NASA, USA)
Lin Wei (China)
Alan Wilhite (Georgia Tech, USA)
Cao Xiaohui (China)

New members have been added, see list below.

- Study plan: see previous section
- Schedule:
 1. A paper will be presented at the 64th IAC, Beijing, 23-27 Sept. 2013
 2. A draft will be presented at the meeting in Beijing during the 64th IAC
 3. A final draft of the 25 pages report will be prepared for the Heads of Space Agencies Summit in Washington, January 2014
 4. The Study will be completed for the 65th IAC in Sept. 2015
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Issues requiring resolution? (recommend approach):

None

Product Deliveries on Schedule? (If modified explain rationale):

Yes

Study Team Member Changes? (List any Study Team Members that you wish to discontinue, and provide names plus contact coordinates of any Members you wish to add on the second page of this Study Update form.) Note: Complete contact information including email, tel. and fax must be provided for all additions. Only Members with complete contact information will be listed and receive formal appointment letters from the IAA Secretariat.)

Name of person providing Study Group Status (Study Group Chair or Co-Chair):

Giancarlo Genta
Study Group Chair

Status Report Date:

3 Aug.. 2013

Study Team Membership Changes

Effectivity Date: 3 Aug. 2013

Discontinue:

None

Add:

Name Alexey Grushevski

Mailing address Keldish Institute of Applied Mathematics,
Russian Academy of sciences

Name Anatoly Koroteev

Mailing address Keldish Research Center

Name Andrey A. Kuricyn (Russia)

Name Kohtaro Matsumoto

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