

IAA Study Group Status Report

Responsible Commission:

Study Number and Title:

Short Study Description (repeat from Study Group Proposal):

Long term on-orbit storage of propellant is a key technology for future deep space exploration, this involves numerous technology requirements such as cryogenic propellant management, boil-off control, propellant supply and transfer on-orbit, etc. The study will promote and advance the future application of high energy propulsion in various space transportation systems, so that the objectives of future missions may be enhanced with a cost reduction.

Overall Goal:

Identify requirements, concepts and opportunities for future high energy propellant space depots, identify required key technologies and define the road map for this new capability.

Intermediate Goals:

Offer opportunities for cooperation among nations on international deep space exploration and utilization, motivate innovation, and foster deep space exploration activities. Identify, evaluate and characterize requirements and concepts for future long term space propellant depots in the 2020-2050 time frame. Both technical and economic aspects will be considered, and alternate scenarios established and discussed. High level findings and recommendations for the consideration of the global space community will be formulated.

Progress in past six months:

The first meeting has been convened at the IAC Congress in Naples on Sep.30, 2012, with the following agenda:

- 1) Welcome / Approval of the Agenda
- 2) Study Introduction
- 3) Introduction of each member and discussion on possible additional members.
- 4) Appointment of Vice-chairs
- 5) First round tables on ideas for the study
- 6) Preliminary discussion on study content outline
- 7) Proposed way forward
- 8) Next meeting
- 9) A.O.B

The 2nd meeting has been convened at the IAA Spring Meeting in Paris on Mar.21, 2013, with the following agenda:

- 1) Welcome / Introduction of participants / Approval of the Agenda
- 2) Update on IAA plans for the current Study Groups (*G.Reibaldi*)

- 3) Review of Study Team Composition and discussion on possible additional members.
- 4) Discussion on study content outline: finalisation
- 5) Allocation of responsibilities for study content
- 6) Proposed way forward: schedule and actions
- 7) Next meeting
- 8) A.O.B

After the 2nd meeting, the proposed content has been finalized. Allocation of responsibilities for study content is also completed. Schedule and actions in future are also made sure as following.

IAA has decided to present the preliminary findings of current Studies at the occasion of the Head of Space Agency Summit dedicated to Robotics and Human Space Exploration planned on the 9th of January 2014 in Washington.

Our SG should try to contribute at its best towards this goal.

In view of that, the following **deadlines** have been identified **for 2013**:

• **June 2013:**

- Completion of the preliminary Draft report for discussion within SG. This report has to be prepared has collection of inputs for each chapter/paragraph, coordinated by each identified Book Captain. The Book Captains shall interact with the Chairmen and Secretary to assemble the draft within the deadline.

• **July 2013:**

- Discussion of the Preliminary Draft to be held within a dedicated SG meeting or virtual forum.
- 3-5 July, IAA “The Future of Space Exploration” Conference in Turin, possibility to held another SG meeting and present the status of the SG to the Conference audience to get feedback and possible increased participation to the SG team.

• **September 2013**

- Consolidation of the complete Draft report within the SG
- 23-27 September IAC 2013 in Beijing, Presentation of the status of the SG at the Commission 3 meeting
- New Meeting of the SG.

• **October 2013**

- 25th October, Finalization of the Draft Report including all deliverables
- Send the Report to IAA

• **November 2013**

- IAA will synthesise the main part/recommendation of the report for inclusion in the HoA report
- IAA discuss HoA report with Space Agencies

The 3rd meeting has been convened at the 8th IAA Symposium on the Future of Space Exploration Meeting in Turin on July 4th, 2013 with a teleconference form. In this teleconference, we reviewed the status of activities of our study and discussed next step actions.

Before the 3rd meeting, a preliminary draft report was prepared.

After the 3rd meeting, some new inputs have been added. And we are organizing a face-to-face meeting in Beijing Sep.22th, and consolidating a complete draft report to discuss in Beijing.

We also create an online copy, so everyone can work on the current copy and we don't have multiple versions floating around. Multiple people can edit the document at the same time.

Taking into account the feedback from the event in Washington, the Study Report will then be finalized in 2014-15.

The study team composition is listed as follows(listed in alphabetic order):

Chairs:

Giorgio Saccoccia

European Space Agency – The Netherlands

Lu Yu

China Academy of Launch Vehicle Technologies (CALT) – China

Secretary:

Xiaowei Wang

CALT – China

Members:

Sebastien Bianchi

Air Liquide - France

Dallas Bienhoff

USA

Christophe Bonhomme

CNES - France

Davina Di Cara

European Space Agency – The Netherlands

James Free

NASA (Glenn Research Center) – USA

Dettlef Hueser

OHB Space Systems – Germany

Hans E.W.Hoffmann

Germany

Ivan Ilin

Ballistic centre of Keldysh Institute of Applied Mathematics, Russian Academy of Sciences – Russia

Jim Keravala

Shackleton Energy – USA

Guenter Langel

EADS/ASTRIUM – Germany

Jerrold W. Littles Jr

Kevin Miller

Ball Aerospace – USA

Robert Mueller

NASA (Kennedy Space Center) – USA

S. Ramakrishnan

Vikram Sarabhai Space Centre (ISRO) - India

Bill Smith

Aerojet Corp. – USA

Jeroen Van den Eynde

University of Southampton - United Kingdom

Alan Wilhite

Georgia Institute of Technology – USA

Young Professional Members:

Andrea Boyd

Fatoumata Kebe

Sandra Gonzalez Diaz

Website Study Information up to date? (Study Group Membership, Study Plan and Schedule):

The Group membership is on the website, but needs to be updated

The study plan will be inserted after the meeting in Paris

Issues requiring resolution? (recommend approach):

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

A draft is scheduled to be available for October 2013, or for the next Heads of Space Agencies Summit.

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.)

Some Changed.

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

Status Report Date: Aug. 22 2013

Study Team Membership Changes

Effectivity Date: 2013-08-22

Discontinue:

Liu Wei

Add:

Sebastien Bianchi

Dettlef Hueser

Hans E.W.Hoffmann

S. Ramakrishnan

Jeroen Van den Eynde

Andrea Boyd

Fatoumata Kebe

Sandra Gonzalez Diaz