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### **Minutes of Meeting**

### **IAA Commission IV**

Space Systems Operations and Utilization

October 11, 2009

Location: Daejeon, Republic of Korea

## **1. Welcome and Introduction**

Amnon Ginatti is new chair, congratulations! Leon Alkalai (Vice Chair) is absent due to LCROSS activities, Larry Paxton supporting for Daejeon. Secretarial position is still open.

New participants in Commission IV are encouraged. Voting members are limited to 10, but all chairs, co-chairs, and officers of study groups are required to attend Commission meeting

Attendees: See Attachment 1.

## **2. Study Group Activities**

Commission 4 has four ongoing Study Groups: Knowledge Management, Hitch-hiking to the Moon, Quality Considerations for Space Programmes, and Integrated Applications. A new Study Group was proposed in Paris 2009 for International Aerospace System for Monitoring of Global Geophysical Phenomena. A new Study Group was proposed here for Distributed Systems for Space Missions.

### **SG 4.1 - Knowledge Management (J. Holm)**

Draft of study group paper is being distributed at sessions this week and final expected to be published in February 2010.

See Attachment 2 for a full report.

#### **SG 4.5 - Hitch-hiking to the Moon (L. Alkalai)**

Jacques Blamont (ESA) has joined the team's efforts and submitted two technical reports on the topic of Hitchhiking to the Moon, based on work he has done years before, on utilizing commercial launches to GTO to deploy assets as secondary missions to the Moon. These reports are extremely useful and valuable to the study.

JPL has engaged in a study to utilize the International Space Station (ISS) as a platform to launch small payloads to the Moon. The primary means that was studied was using electric propulsion technology that has already been proven including Hall thrusters technology. A transfer stage would be delivered to the ISS using one of the launch vehicles existing, to the ISS, including the HTV-4 or so from JAXA, which would deliver the transfer stage to the ISS external docking station. With one or two launches, one can assemble a complete transfer system with a standard interface for external payloads such as micro-satellites, etc. These satellites could be from 50 to say 100 kg. The payloads could be attached robotically or using astronauts on the ISS. Once integrated, the transfer stage is spring deployed, and then, it would go on a low-energy trajectory to the Moon, where it could enter lunar orbit (much like SMART-1 did) and then deploy the payloads into lunar orbit. This study of a flight system for the ISS has been completed, and is going through internal reviews for external publications.

The next milestone to anticipate is a review of the study, via a presentation that Leon will make at the IAA/IAF meeting in Paris, March 2010. The completion of the study is expected to be presented at the IAC 2010 in Prague.

#### **SG 4.8 Space Systems Cross Compatibility**

J. Esper was not attending to present the status **TBD (Attachment 4)**

#### **SG 4.X. Dormant: Integrated Applications (A. Ginati and M. Grimard)**

Study Group is dormant and will reconvene in Prague 2010 when more participation is expected. The plan is to link to small satellites group within the Commission. Focus of current ESA activities was discussed, including:

- Space for Safety
- Space for Health ([www.esa.int/health](http://www.esa.int/health))
- Space for Knowledge/Development
- Space for Energy

#### **SG 4.X: International Aerospace System for Monitoring of Global Phenomena for Natural and Manmade Disasters (Prof V. Menshikov)**

Issues raised in Paris 2009 were addressed in that there is a broader membership in the Study group (20 members from 11 countries, South America pending). However, the concern was noted that Study Group products should be position papers, identification of users and challenges, and not endorsements of a specific

project at an organization. This is still evidence in the paper today. In addition, existing missions (such as NASA's GRACE) should be reviewed to see what is already being done.

In Paris, the SAC approved the Study Group without the prior approval of Commission IV. A. Ginati will meet with SAC to resolve that the procedures have been followed to formally validate the Study Group.

Two reports have been prepared: \_\_\_\_\_ and *About the International Aerospace System for Monitoring of Global Geophysical Phenomena and Forecasting of Natural and Man-Caused Disasters*.

Resolution to UN has been prepared and signed by members and address of IAA to UN to promote project within UN and programs on disaster management, such as UN SPIDER.

Will broaden next year to include studies from Japan, \_\_\_\_\_, and USA; what onboard equipment will be needed to monitor global disasters

Symposium planned for November 2-4, 2009 in Cyprus. Presentation planned for UN-OOSO next year, as well as other conference venues.

Study Group still awaits formal approval and a plan for the future and broadening the reach and scope, including the formal completion of the study group. IAA Study Groups are only for general recommendations and not to endorse a specific project.

### **Proposed New Study Group: Distributed Missions for Space Systems**

Upcoming space systems will make use of coordinating platforms instead of monolithic systems in order to achieve new capabilities.

Members: Co-Chairs: Michael D'Errico and James Wertz. They are developing a two-year plan. This needs to be taken forward to the Scientific Activity Committee (SAC) meeting.

## **3. Program Committee Activities**

### **B.5 Symposium on Integrated Applications (Reported by C. Mathieu)**

B5.1. Integrated Applications End-to-End Solutions (14/10/2009 10:00)  
Both chairpersons and rapporteur present (10 papers submitted initially)  
7 papers presented and 1 no show.

### B5.2. Tools and Technology in Support of Integrated Applications (15/10/2009 10:00)

Neither the chairpersons nor the rapporteur were present  
5 papers presented and 3 no shows (19 papers submitted initially)

Audience for the two sessions varied between 5 and 25 people.

#### Comments on the symposium

First edition of this symposium with some interesting papers/presentations addressing integrated applications in various fields and some interest from audience

But it is noticeable that there were different avenues in this symposium (for instance, one would be “examples of integrated applications”, another would be “integrated knowledge management”) and the two sessions this year were quite similar in their content => The number of papers rejected because of a lack of understanding on the scope of the symposium confirms the need to re-focus and better characterize the symposium and each session (wording already modified for IAC 2010 Call for papers)

Problem with sessions on similar topics addressing the same communities held simultaneously (such as B4.4. Small Satellites Potential for Future Integrated Applications and Services held at the same time as B5.1. Integrated Applications End-to-End Solutions)

### **D.5 Safety & Quality (J. Holm)**

For Daejeon IAC 2009 we have 25 papers accepted for 3 sessions, with good international representation but with a fair number of people who have cancelled their attendance or withdrawn their papers in one of the tracks:

- D5.1 - From Parts to Systems: Contribution of Tests on Performance Prediction and Assessment: 5 papers uploaded (6 withdrawn)
- D5.2 - Quality and Knowledge Management in Aerospace: 11 papers uploaded (1 withdrawn)
- D5.3 - Preventing Spacecraft Failure From Space Environment Effects: 9 papers uploaded (0 withdrawn)

No large changes expected for Prague or Cape Town based on current experience. We have drafted a call for papers for Prague.

### **B.4 Small Satellite Missions (R. Hornstein)**

Small Satellite Committee formed in response to the issue that IAA and IAF are not always coordinated on the symposium that exists in absence of a study group.  
(Rainer Sandau)

- Permanent Committee is now formed and was approved for IAA for “Small Satellite Missions” for all aspects of small satellites. This is an exception in the IAA. Chairs: Freddie Laufer, Rainer Sandau, **Error! Reference source not found.**; Secretary: Gill. This Committee will help to preserve and ensure the integrity of the Small Satellites Symposium under IAA. Members are all Commission members and Study Group Chairs.
- Recommend: Leave the Symposium as it is. Rhoda Hornstein to continue to organize logistics. Make permanent Committee active when all parties are together. The dedicated discussion will be postponed until Prague (2010).
- Members present at this meeting agreed to the activity and plan.

Small Satellite Symposium was held this year successfully

- May 4-8, 2009 in Berlin (next is planned for April 2011)
- Regulatory aspects of small satellites and hitchhiking to the Moon were new sessions
- Plenary discussion dedicated to commercial aspects of small satellites
- 15 sessions and poster session
- 250 attendees from 25 countries, student pricing and participation is excellent

For Daejeon IAC 2009 we have 93 papers accepted for 9 sessions, with good international representation. There is a concern about the low number of papers uploaded for some sessions:

- B4.1, Tues AM; 6 of 11 accepted papers uploaded with presentation material; 5 papers not yet uploaded, included Sias; and status of walk on Rhazaksat paper unknown.
- B4.2, Monday PM; 3 of 11 accepted papers uploaded with presentation material; 4 papers uploaded without presentation material; 2 papers not uploaded; 2 papers withdrawn
- B4.3, Tues PM; 8 of 11 accepted papers uploaded with presentation material; 1 paper uploaded without presentation material; 1 paper not uploaded; need to note that paper 1 is in coordination with paper 2
- B4.4, Wed AM; 7 of 13 accepted papers uploaded with presentation material; 2 papers uploaded without presentation material; 3 papers not uploaded; 1 paper withdrawn
- B4.5/D2.7, Wed PM; 4 of 11 accepted papers uploaded with presentation material; 4 papers uploaded without presentation material; 3 papers withdrawn
- B4.6A, Thurs AM; 5 of 9 accepted papers uploaded with presentation material; 3 papers uploaded without presentation material; 1 paper not uploaded
- B4.6B, Wed AM; 4 of 10 accepted papers uploaded with presentation material; 4 papers uploaded without presentation material; 2 papers withdrawn

- B4.7, Thurs PM; 4 of 9 accepted papers uploaded with presentation material; 2 papers uploaded without presentation material; 3 papers withdrawn
- B4.8, Fri AM; 3 of 8 accepted papers uploaded with presentation material; 1 paper uploaded without presentation material; 1 paper not uploaded; 3 papers withdrawn

#### **4. Organizational Issues**

Call for papers for Prague is now complete and released

If new sessions should be added or changed for Cape Town 2011, deadline is November 30 for any recommendations to **Error! Reference source not found.**

Recommendation from **Error! Reference source not found.** that a presentation on Academy Day should be prepared for the Prague Congress for small satellites and invite Commission or representatives to be present on the past and future of small satellites. KM could contribute to lessons learned and knowledge made available from previous missions. Should this be a plenary within the Congress?

#### **5. Report to the Scientific Activities Committee**

A. Ginati and L. Paxton will report the Commission 4 activities to the Scientific Activities Committee, on the basis of these Minutes.

#### **6. Next Meeting and Action Items**

The next meeting of Commission 4 will be held in Paris in March 2010.

### Attachment 1: Participants List

<b>Name</b>	<b>Organization</b>	<b>Email</b>
Amnon Ginati	ESA (Netherlands)	amnon.ginati@esa.int
Larry Paxton	APL (USA)	larry.paxton@jhuapl.edu
Rainer Sandau	DLR (Germany)	rainer.sandau@dlr.de
Jeanne Holm	NASA JPL (USA)	jholm@jpl.nasa.gov
Sergey Lysy		sergeylsy@gmail.com
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## Attachment 2: Knowledge Management Study Group Report

### IAA Study Group Status Report

#### Responsible Commission:

- **IAA Commission 4: Space Systems Operations and Utilization**

#### Study Number and Title:

- **S.4.1. Knowledge Management of Space Systems**

#### Short Study Description

- Define the organizational and inter-organizational issues that support or inhibit knowledge sharing amongst aerospace organizations (including capturing knowledge of our key experts and aging workforce)
- Identify and recommend standards for knowledge management activities and initiatives to promote interoperability of key systems (such as lessons learned or publications)
- Create, through consensus, a position on the recommended approaches for an aerospace organization to investigate to excel at knowledge management

#### Website Study Information up to date?

- No, will work with Fabrice Dennemont to upload past meeting notes, draft paper, and link to new web site

#### Issues requiring resolution?

- None

#### Progress and Product Deliveries on Schedule?

- **Plan:** Support a better understanding among member and aerospace organizations of the ways in which they can share knowledge
  - **Action (ongoing):** Planning underway for third *International Conference on Knowledge Management for Aerospace*, likely date is May/June 2010 hosted by ESA. Will build on previous two conferences that focused on case studies and best practices from across the globe. This conference will additionally have a workshop related to augmentation and validation of the taxonomy and ontology that is the recommendation of the group's white paper. This year's conference was cancelled due to the economic downturn and difficulty in attendees obtaining travel funds.
  - **Action (ongoing):** Continue to co-lead a consortium of US aerospace industry, academia, and government space organization meetings on knowledge management. Team meets face-to-face 4-6 times a year.



Participants include Northrop Grumman, The Aerospace Corporation, Boeing, Pratt Whitney Rocketdyne, Lockheed Martin, Raytheon, Computer Sciences Corporation, University of California at Irvine, Pepperdine University, California State University at Northridge, and NASA.

- **Plan:** Ensure that after this Study Group concludes, there is an ongoing entity to coordinate the KM track.
  - **Action:** IAF application for partner KM for Space Organizations Technical Committee was approved.
  
- **Plan:** Ensure that there is a set of related papers from workshop participants at the 2009 IAC that exemplifies excellent knowledge management practices at aerospace organizations.
  - **Action:** Continue to have combined Knowledge Management and Quality Management tracks.
  - **Action:** 13 papers were submitted for the KM track for Daejeon and 12 were accepted, 11 papers have been confirmed for presentation at the session this week, and one was withdrawn.

### **Confirmed**

1. *Status of the IAA Knowledge Management Working Group*
  - Jeanne Holm, NASA/Jet Propulsion Laboratory
  - Roberta Mugellesi-Dow, European Space Operations Centre
2. *Apollo: Learning From the Past, For the Future*
  - Michael Grabois, United Space Alliance, LLC
3. *Capturing Tacit Knowledge for Spacecraft Operations in ESOC*
  - Roberta Mugellesi-Dow, European Space Operations Centre
4. *Multi-Generational Knowledge Sharing for NASA Engineers*
  - Daria Topousis, Jet Propulsion Laboratory
5. *Taxonomy for Space: Knowledge Sharing Amongst Countries*
  - Jeanne Holm, NASA/Jet Propulsion Laboratory
6. *Knowledge Management Architecture for Japan Aerospace Exploration Agency*
  - Hiroaki Tateshita, JAXA
7. *Understanding and Implementing Knowledge Management Applied to the ESA Rosetta Mission*
  - V. Dhiri, G. Schwehm, and J. Brinkmann, ESA-ESAC, Spain
8. *Importance of Knowledge Management Within Space Data Systems*
  - Gert Villemos, Logica
9. *SWIFTER - Space Weather Informatics, Forecasting, and Technology through Enabling Research and Virtual Organizations*
  - Larry Paxton, Applied Physics Laboratory
  - Jeanne Holm, NASA/Jet Propulsion Laboratory

*10. Learning from Space Operations: Lessons Learned as Drivers for Improvement*

- Stefano Scaglioni, European Space Agency (ESA)

*11. The Implementation of Risk Management into the Concurrent Engineering Process*

- Andre Weiss, German Aerospace Center (DLR)

**Withdrawn**

*12. Development and evaluation of a prototype cross-search system for aerospace technical data management*

- Yoshikazu Miyano, Japan Aerospace Exploration Agency (JAXA)

- **Plan:** Ensure that there is a set of related papers from workshop participants at the 2010 IAC that exemplifies excellent knowledge management practices at aerospace organizations.
  - **Action:** Continue to combine Quality and Knowledge Management Track for track to be submitted for Daejeon.
- **Plan:** Information is posted on a web site for each of communication and status reference.
  - **Action:** Group has an online collaboration workspace and discussion forums, which we are in the process of moving this year to have as a more generally available capability.
  - **Action:** Expanded online community to ~140 members.
- **Plan:** Coordination with other key working groups to understand issues and share lessons learned.
  - **Action:** Coordination continues with a variety of government and industry standards bodies as documented in previous notes.
  - **Action:** Seeking to find joint effort with the IAA Integrated Applications Working Group, perhaps in the area of utilizing space-related assets and knowledge for health. One-day workshop may be planned for this winter, either in Washington DC or Amsterdam.
- **Plan:** A position paper on the recommended approaches for an aerospace organization to follow in knowledge management that would promote knowledge sharing and interoperability with other organizations
  - **Action:** A draft paper will be distributed on Wednesday at the working group meeting for comment and review. Based on recommendations from the Commission in March, the paper was expanded to include recommendations for development of the

international taxonomy and ontology for space, perhaps under an IAF Technical Group.

**Study Team Member Changes?**

- New members
  - Dr. Panagiotis Bamidis (Greece)
  - Dr. Roger Launius (US)
  - Dr. Sorosh Sorooshian, (US)
  - Mr. Stephan Ulamec (Germany)
- Online community to supplement working group—~135 members.

**Name of Persons Providing Study Group Status**

- Jeanne Holm, Chief Knowledge Architect, NASA, Jet Propulsion Laboratory
- Roberta Mugellesi-Dow, ESOC

**Status Report Date**

- 11 October 2009