PRAGUE MEETING – SEPT 2010 MINUTES

Meeting Date(s) : September 26th, 2010
Venue : Suite I, Rhine, CORINTHIA HOTEL, PRAGUE

Participants:

1. JOHN C MANKINS  AIMS   Chairman
2. GIUSEPPE REIBALDI  ESA   Vice Chairman
3. S. RAMAKRISHNAN  ISRO   Secretary
4. SHOIDIRO MIHARA  USEF
5. ALEX IGNATIEV
6. SERGE FLAMENGAR
7. MARIA ANTONETTA PERINO  THALESALENIASPACE
8. WENDELL MENDELL  NASA
9. GIANCARLO GENTA  POLITO
10. CHRISTOPHE BONNAL  CNES
11. ROMAN KEZERASHVILI  NYC TECH
12. RAO V. KOTESWARA  ISRO
13. KLAUS SCHILLING
14. MAX CALABRO  IA FRANCE
15. HIROBUMI SAITO  JAXA
16. KOICHI IJICHI  USEF
17. GREG MATLOFF  NYC TECH USA
18. JIM GRADY JIM  GEI
19. JUNICHIRO KAWAGUCHI  JAXA
20. SUN MOBILIA  GEI
21. YASUSHI HORIKAWA  JAXA
22. JEAN MUYLACET
23. ANDREAS RITTWEGER  ASTRIUM EADS
24. HORST RAUCK  GMK
25. WILLIAM SIEGFRIED  BOEING
26. CHRISTIAN SALLABERGER  MDA CORPN
27. C.P. STAURINIDIS  ESA
28. MICHAEL MENKING  ASTRIUM EADS
29. E.D. ASHFORD
30. JUNJIRO ONODA  JAXA
31. KUNINORI UESUGI  JAPAN
32. SEISHIRO KIBE  JAXA
33. CLAUDIO BRUNO  UNIROMA
34. PETER BAINUM  HOWARD
I.A.A. Commission III

PRAGUE MEETING – SEPT 2010 MINUTES

Meeting Date(s) : September 26th, 2010
Venue : Suite I, Rhine, CORINTHIA HOTEL, PRAGUE

35. ROBERT A LAINE  ORANGE
36. HAROLKI TAKEGAHARA
37. HIROKI MATSUO
I.A.A. Commission III

PRAGUE MEETING – SEPT 2010 MINUTES

Meeting Date(s) : September 26th, 2010
Venue : Suite I, Rhine, CORINTHIA HOTEL, PRAGUE

Objective : Progress Review preparatory to SAC Presentation on Academy Day at IAC, Prague.

AGENDA

1. Introduction & Commission III composition
2. Review of Actions from Paris meeting held in March 2010
3. Status of Study Group reports progress & way forward:
   # SG 3.1  Advanced Propulsion Perspective – Max Calabro
   # SG 3.9  Private Human Access to Space – Christophe Bonnal
   # SG 3.10 Interstellar Precursor Missions – Claudio Bruno
   # SG 3.11 Solar Energy from Space – John Mankins
   # SG 3.12 Global Human Exploration of Space – Wendell Mendell
   # SG 3.13 Space Elevators Concept & Technologies – Peter Swan
4. New SG proposals:
   • Piggy Backing to Planets – Jacques Blamont
5. Symposia status:
   • IAC 2010
   • IAC 2011
6. Report to SAC
7. Any other Business
Minutes:

<table>
<thead>
<tr>
<th>Subject/Description</th>
<th>Action</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Chairman, Commission III welcomed the Members and other participants to the Commission meeting and briefed on the agenda proposed.</td>
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<tr>
<td>1. Commission III composition was displayed (Annexure-I) and confirmed.</td>
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<tr>
<td>2. Review of Actions from March 2010 meeting: Action items status was presented (Annexure-I)</td>
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<tr>
<td>3. Status of study Group reports:</td>
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<tr>
<td>#SG 3.1 Advanced Propulsion Perspective</td>
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<tr>
<td>Comments on draft document received from M/s.Bonnal, Onoda, Claudio Bruno, Hans Hoffmann &amp; Roger Lenard were presented and reviewed (Annexure-I)</td>
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</tbody>
</table>
It was noted that the scope of the study document is revised and limited to ‘Chemical Propulsion from Earth to Orbit’

The commission concluded that this study report may not qualify as a cosmic study document since it is more in the nature of a survey report on the state of art. Hence, it may be redefined as a technical paper/monograph to be published under ACTA Astronautica Journal of IAA.

The document to be revised/updated taking into account the comments from Members and the above recommendation of Commission-III

The Commission Agreed that study is completed and hence SG 3.1 is declared as closed.

**#SG 3.9 Private Human Access to Space:**

Study Status reviewed; Part-I covering the sub-orbital flights in
advanced state of readiness. Part-II addressing the orbital flights initiated.

2\textsuperscript{nd} International IAA conference on Private Human Access to Space scheduled for 30\textsuperscript{th} May – 1\textsuperscript{st} June at Arcachon, France.

The symposium announcement has to be posted in IAA website.

**#3.10 Inter Stellar Precursor Missions**

Comments on draft report received from M/s. Bonnal, Hans Hoffman, G. Reibaldi and Roger Lenard presented to the Commission (Annexure-I)

It was observed that this study report is in good shape. However, the report to be revised with respect to the consistency of technical depth and harmonization of different topics/chapters dealt with. The main body of the report to be more concise and the technical
details/mathematical formulations can be shifted to Appendix.

Additional feed back from other Commission-III Members to be communicated to Prof. Bruno.

Revised Study Report to be ready for review by Commission–III Members.

# SG 3.11 Solar Energy from Space

The Study Report is complete and ready for review by Commission Members. The draft report will be mailed to Commission-III Members for feedback. Due on 30th November 2010.

Initiation of Peer IAA Review process.

Completion of Peer IAA Review process.
# SG 3.12 Global Human Exploration of Space

Study Group meeting held in March 2010

The objective of study, target audience, scope of the report with respect to already completed studies have been discussed.

Study Group report outline under review and writing assignments will be identified.

The IAA 50th Anniversary Study Group report on this topic will form part of inputs from this study.

# SG 3.13 Space Elevators concepts & Technologies

Study Group proposal (Annexure-II) formally approved by the Academy and work has commenced. Progress to be reported in next Commission Meeting.
# I.A.A. Commission III

## PRAGUE MEETING – SEPT 2010 MINUTES

Meeting Date(s) : September 26th, 2010

Venue : Suite I, Rhine, CORINTHIA HOTEL, PRAGUE

<table>
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<tr>
<th>4. New SG Proposal</th>
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<tr>
<td>The Commission considered the Proposal (Annexure-III) for a new Study Group on the topic ‘Piggybacking to Planets’ originated by Mr. Jacques Blamont.</td>
</tr>
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</table>

The Commission concluded that the proposal is too narrow in scope, more in line of a project execution task than a cosmic study.

The Commission recommended the proposal may be revised to address a wider subject, viz. ‘Low Cost Planetary Missions using Mini Satellites’.

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<tr>
<th>5. Symposia Status:</th>
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<tr>
<td>IAC-2010 and IAC-2011 sessions related to Commission-III are generally good.</td>
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</table>

There is a need to review the sessions planned in IAC-2012 to link them with the current Study Groups under Commission-III.
6. Report to SAC:

The final report presented to SAC on 26<sup>th</sup> September is given in Annexure-IV.

7. Any other Business:

Reviewed the actions from IAA Commissions plenary meeting held that morning.

Regarding presentations from IAA in UN COPOUS meet, suggested following possibilities:

- Present IAA 50<sup>th</sup> Anniversary Study Reports (4 topics)


Regarding special events at IAC-2011 in Cape Town, SA on the theme ‘Space for Africa/Africa in Space’ it was proposed that symposia
key note talks can be arranged relevant to the theme, for example, IAA SG 3.11 presentation on Space Solar Power can be the keynote for session C 3.1.

# With reference to Global Space Technology Forum meet at Abu Dhabi, IAA should get involved.

# Topics for possible stand-alone conferences to be identified.

# Special sessions/symposia on Anniversaries of early space endeavor events to be identified and proposed.

<table>
<thead>
<tr>
<th>Members, Commission-III</th>
<th>15th Dec. 2010</th>
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<td>IAA Secretariat</td>
<td>15th Dec. 2010</td>
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</table>
IAA COMMISSION-III MEETING
PRAGUE, CZECH REPUBLIC
Sunday, 26th September 2010

AGENDA

1. Introduction & Commission III composition
2. Review of Actions from Paris meeting held in March 2010
3. Status of Study Group reports progress & way forward:
   # SG 3.1 Advanced Propulsion Perspective – Max Calbro
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   # SG 3.11 Solar Energy from Space – John Mankins
   # SG 3.12 Global Human Exploration of Space – Wendell Mendell
   # SG 3.13 Space Elevators Concept & Technologies – Peter Swan
4. New SG proposals:
   Piggy Backing to Planets – Jacques Blamont
5. Symposia status:
   IAC 2011
   IAC 2012
6. Report to SAC
7. AoB
Commission III Composition

- John C. Mankins (USA), Chairman
- Giuseppe Reibaldi (It), Deputy Chairman
- S. Ramakrishnan (In), Secretary
- Christophe Bonnal (F), Member
- Hans E. W. Hoffmann (D), Member
- Wendell Mendell (USA), Member
- Claudio Bruno (It), Member
- Junjiro Onoda (J), Member
- Roger Lenard (USA), Member
- Christian Sallabarger (Ca), Member
- Tetsuo Yasaka (J), Past Chair
Review of Actions from March 2010 meeting

- **SG 3.1 DRAFT DOCUMENT ON ‘CHEMICAL PROPULSION FROM EARTH TO ORBIT’ (MAX CALABRO)**
  - To be sent to COMN.III members and feedback sought

- **SG 3.10 DRAFT REPORT ON ‘INTERSTELLAR PRECURSOR MISSIONS’ (CALUDIO BRUNO)**
  - To be sent to COMN III members & feedback sought

- **COMMENTS RECEIVED FROM:**
  - C. BONNAL (CNES)
  - ONODA (JAXA)
  - CLAUDIO BRUNO
  - HANS HOFFMANN
  - ROGER LENARD

- **COMMENTS RECEIVED FROM:**
  - C. BONNAL
  - HANS HOFFMANN
  - ROGER LENARD
  - G. REIBALDI
- SG. 3.9 DRAFT REPORT ON ‘PRIVATE HUMAN ACCESS TO SPACE’ (C. BONNAL) PART-I TO BE PRESENTED & PROPOSAL FOR PART-II (ORBITAL FLIGHTS) STUDY PLAN

- SG. 3.11 FINAL DRAFT REPORT ON ‘SOLAR ENERGY FROM SPACE’ (J. MANKINS) TO BE READY FOR REVIEW/DECISION ON PEER REVIEW

- TO BE PRESENTED

- TO BE PRESENTED
3. STUDY GROUP PROGRESS

SG-3.1 ADVANCED PROPULSION PERSPECTIVE

COMMENTS FROM BONNAL C.

- COVERS CORRECTLY ALL CHEMICAL PROPULSION DOMAIN
- RECOMMENDATIONS CHAPTER TO BE STRENGTHENED
- GENERAL ROAD MAP AS EXECUTIVE SUMMARY IS TO BE REVIEWED IN COMMISSION
- IT IS STILL A DRAFT – CAN BE IMPROVED
ONODA (JAXA)

- GENERAL REMARK ON HYBRID PROPULSION CHARACTERISTICS & TECHNICAL CHALLENGES TO BE ADDED
- JAPANESE DEVELOPMENTS IN HYBRID ROCKET TO BE INCLUDED
- SOME UPDATES ON H-II VEHICLE PROPULSION PARAMETERS
SG-3.1 ADVANCED PROPULSION PERSPECTIVE -

CLAUDIO BRUNO

- REFERENCES FOR ALL TABLES & FIGURES
- USE Isp INSTEAD Isv
- NO MENTION OF LRE USING H$_2$O$_2$
- MIX OF DIFFERENT TOPICS – IMPROVE FOCUS
- STATEMENTS ON FUTURE IMPROVEMENTS – NOT CLEAR
- DOCUMENT SKEWED TOWARDS SP/SRM
- LOOKS AT THE EXISTING SCENARIO - TSTO USING AB MISSING
SG-3.1 ADVANCED PROPULSION PERSPECTIVE -

HANS HOFFMANN
- REPORT INCOMPLETE WITHOUT MENTION OF FALCON LAUNCHER /MERLIN ENGINE ETC.
- SHOULD INCLUDE CONTRIBUTIONS FROM AMERICAN /CHINESE /RUSSIAN AGENCIES

ROGER LENARD
- REVIEW INTRODUCTION/FIRST CHAPTER
- REWRITE THE SECTION ON AUTOMOTIVE & AIRCRAFT TURBOJETS
- FUTURE OF HYBRID PROPULSION MISSING
- GOOD REVIEW OVERALL
STUDY GROUP PROGRESS

- 3.10 INTERSTELLAR PRECURSOR MISSIONS – CLAUDIO BRUNO
  C. BONNAL
  - TOPIC IS ORIGINAL & INTERESTING
  - TABLE OF CONTENTS GOOD & LOGICAL
  - MANY CHAPTERS YET TO BE FILLED
  - CHAPTERS TO BE HOMOGENISED/HARMONISED IN TERMS OF TECHNICAL DEPTH
  - CHAPTER 2.1.1 ALREADY PUBLISHED MATTER (ACTA ASTRONAUTICA)
  - IDENTIFY TWO MEMBERS TO HARMONISE THE DOCUMENT WITH EQUAL DEPTH IN ALL CHAPTERS
HANS HOFFMANN
- REPORT IS GOOD WORK & GOOD CONTRIBUTION TO ACADEMY
- WE CAN PUBLISH IT

ROGER LENARD
- WELL WRITTEN/NOTHING OUT-OF-PLACE
- SECTION BY BRUNO & SIMONE TO BE EXPANDED TO INCORPORATE CONCEPTS THAT CAN BE BUILT WITH CURRENT TECHNOLOGIES
- AREA OF SOLAR SAILS/SOLAR ELECTRIC PROPULSION – LOT OF REPETITION
- REQUIRES HARMONISATION
GIUSEPPE REIBALDI

- THE STUDY IS FRAGMENTED, A SYSTEM APPROACH IS MISSING

- THE EMPHASIS IS MAINLY IN THE PROPULSION WHILE THERE ARE OTHER TECHNOLOGIES REQUIRED FOR SUCH MISSIONS. A CLEAR SET OF CONCLUSIONS IS MISSING WITH SPECIFIC PROPOSAL INCLUDING OVERLAP WITH EXISTING/PLANNED INTERPLANETARY MISSIONS.

- SESSIONS AND THE STUDY GROUP NEEDS TO BE INTERLINKED SO THAT THE SESSION PROVIDE USEFUL INPUTS FOR THE STUDY AND IT IS ALSO THE FORUM TO DISCUSS THE STATUS OF THE STUDY WITH EMPHASIS ON CONTROVERSIAL AREA.
Proposal for Forming an IAA Study Group

SG 3.13

<table>
<thead>
<tr>
<th>Title of Study:</th>
<th>Assessment of the Technological Feasibility and Challenges of the Space Elevator Concept</th>
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<tbody>
<tr>
<td>Proposer(s):</td>
<td>Peter Swan, Ph.D. &amp; David Raitt, Ph.D.</td>
</tr>
<tr>
<td>Primary IAA Commission Preference:</td>
<td>Commission III</td>
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</table>

Members of Study Team

- **Chairs:** Peter Swan & David Raitt
- **Secretary:** Cathy Swan

- (accepted) Robert Penny, Lubos Perek, Tetsuo Yasaka, Radu Rugescu, Richard J. Tremayne-Smith, Ted Semon, Bryan Laubscher, Michael Laine, Ben Shelef
- (Invited) Wiley Larson
- (invited) other members of Commission III

Short Description of Scope of Study

- **Overall Goal:**
  1. Assessment of the Technologies
     - Ribbon Material
     - Dynamics of Ribbon
     - Base Station Infrastructure
     - Ribbon Rider Motor / Wheels
     - Power to Ribbon Rider (Lasers vs. sun)
     - Ribbon Rider Platform
  2. Systems Design Issues
     - Space Debris
     - Deployment
     - Environmental Elements
  3. Description of Space Elevator Implementation – Dynamics and Control of Long Ribbon, Build-up of 1-meter wide Ribbon, Power Approach, Payload Carrying Capacity, Anchor Design
Intermediate Goals: (1) Conduct sessions at IAC’s (South Africa, Naples) with purpose of presenting technological aspects of the Space Elevator. [direct questions from study group]
(2) Conduct a min-symposium co-sponsored by the Academy and the International Space Elevator Consortium presenting the results of this study. [could be session at IAF at Naples]

Methodology: The initial step is to sponsor sessions inside the IAA D.4.4 Symposium (Symposium on the Far Future: Space Elevators & Tethers). A parallel step is to create a study group, establish goals, objectives and timelines for a Space Elevator cosmic study. Conduct a min-symposium to present the results of the study. The last step would be to produce a report for the Academy that discussed the feasibility of a Space Elevator and identify the potential benefits to humanity.

Time Line: 1st Meeting Oct 10 in Prague – to establish study group and schedule [of course much will be started thru email and telephone calls starting when the study is approved.]
March 11 in Paris – to discuss progress, identify action items, finalize South Africa and Naples papers to support study group
3rd Meeting: Oct 11 in South Africa – to discuss presentation during IAF and finalize some portions of the report.
4th Meeting: Mar 12 in Paris – summarize conclusions and recommendations in the report and draft final aspects of Academy product.
5th Meeting: Oct 12 in Naples – produce the Academy report for commission review and have a session focused on the report in co-sponsorship of the International Space Elevator Consortium
6th Meeting: Paris 2013– produce the Academy report- for peer review

Final Product:

Academy Publication entitled: Assessment of the Technological Feasibility and Challenges of the Space Elevator Concept

Target Community and Expected Effects: Those organizations wishing to have inexpensive access to space: Mars/Moon program, Life in space believers, geosynchronous satellite owners (communications, solar power satellites, etc.), planetary defense organizations, commercial satellite builders, space tourism companies, and governments.
Support Needed: Minimal at the present time: Title a session in Prague, South Africa and Naples: Vision of the Far Future – Space Elevators and Space Tethers – the last two structured to support study group.

Potential Sponsors: space agencies, Mars/Moon programs, planetary defense organizations, commercial space organizations, future human habitats and world governments.

To be returned to the IAA Secretary General Paris by fax: 33 1 47 23 82 16 or by email: sgeneral@iaamail.org

Date: 22 March 2010 Signature: signed Peter Swan

No Signature required if document authenticated.
**Initial Phase**

Application received: Created study group – March 2010
Chairing Session in Prague on Space Elevators and Space Tethers
focused toward the cosmic step.

Commission Approved:

SAC Approved:

Web Site Section opened:

Members Appointed:

**Final Phase**

Peer Review by Commission Completed:

Recommended by the Commission:

Final Report Received:

SAC Approved:

BOT Accepted:

Publisher Selected:

Study Published:
Proposal for Forming an IAA Study Group

**Title of Study:** PIGGY BACKING TO PLANETS

**Proposer(s):** Jacques BLAMONT  
(Must be member(s) of the Academy M or CM)

**Primary IAA Commission Preference:**  
(From Commission 1 to Commission 6)  
Commissions: 1 Space Physical Sciences, 2 Space Life Sciences, 3 Space Technology & Systems Development, 4 Space Systems Operations & Utilization, 5 Space Policy, Law & Economics, 6 Space and Society: Culture and Education

**Secondary IAA Commission Interests:**  
(From Commission 1 to Commission 6)

**Members of Study Team**

**Chair(s):** Jacques BLAMONT  
(Must be member(s) of the Academy, M or CM)  
TBD (INDIA)

**Secretary:**

**Other Members:**  
(Open to members and non-members of the Academy)

DEGTYAREV Alexander (UKRAIN), LOPOTA (RUSSIA), TBD (KELDYSH INST.,RUSSIA), TBD (JAPAN°), J.Y. LEGALL (FRANCE), D. MC CLEESE (USA, JPL), G. VANE (USA, JPL), S.ATREYA (USA, Univ. MICHIGAN), TBD (GERMANY)

**Short Description of Scope of Study**

**Overall Goal:** ESTABLISH LIMITS CONSTRAINTS AND ADVANTAGES OF THE USE OF COMMERCIAL LAUNCHES TO GTO FOR PLANETARY MISSIONS  
(Expected scientific or practical benefit of the study group’s efforts)

**Intermediate Goals:** UPDATE PRELIMINARY STUDIES (1996…) OF TRAJECTORIES AND MASSES FOR CONDITIONS IN THE 2010’S.
Methodology:
(Email works, workshops, stand alone conferences, interim publications, etc.)

NEW SESSION AT THE 9TH IAA LPCM-LOWCOST PLANETARY MISSIONS
ARTICLE IN ACTA ASTRONAUTICA

Time Line: ONE YEAR
(Cannot exceed three years)

Final Product (Report, Publication, etc.):
SEE ABOVE

Target Community:
PLANETOLOGY AND SPACE OPERATIONS COMMUNITY AND LAUNCH INDUSTRY

Support Needed:

Potential Sponsors:
SPACE AGENCIES, SPACECRAFT AND LAUNCHERS INDUSTRY

To be returned to the IAA Secretary General Paris by fax: 33 1 47 23 82 16 or by email: sgeneral@iaamail.org

Date: JULY 31TH 2010
(No Signature required if document authenticated).
**Follow-up Section for IAA use only**

<table>
<thead>
<tr>
<th><strong>Initial Phase</strong></th>
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<tbody>
<tr>
<td><strong>Application received:</strong></td>
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<td><strong>Commission Approved:</strong></td>
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<td><strong>Members Formally Appointed by IAA:</strong></td>
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<th><strong>Final Phase</strong></th>
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