INTERAGENCY OPERATIONS ADVISORY GROUP

IOAG-17 Meeting

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IOAG-17 Meeting Minutes
Rutherford Appleton Laboratory (RAL), UK
13 May 2013 (Day 1)

In Attendance
Chair: Jean-Marc Soula
Secretariat: Stephanie Wan

Members:
ASI: Giovanni Valentini
CNES: Jean-Marc Soula
DLR: Martin Pilgram, Rolf Kozlowski
ESA: Michael Schmidt, Klaus Juergen Schulz, Nestor Peccia, Josep Rosello, Ricard Abello, Enrico Vassallo
JAXA: Takanori Iwata, Tsutomu Shigeta, Yuta Kimura
NASA: Phil Liebrecht, Mike Kearney, John Rush

Observers:
UKSA: Peter Allan

On Teleconference
ESA: Gian-Paolo Calzolari
ICG: JJ Miller, AJ Oria
KARI: Sang-Il Ahn (observer)
NASA: Wallace Tai, Les Deutsch, Betsy Edwards
Secretariat: Barbara Adde

1) Welcome and Opening Remarks:
The Chair opened the IOAG-17 meeting and UKSA host, Peter Allan, welcomed all the delegates to the United Kingdom, providing a quick introduction of the RAL campus.

2) Introduction of Delegates:
The IOAG delegates (ASI, CNES, DLR, ESA, KARI, JAXA NASA) went around the meeting room and introduced themselves. Mr. Gian-Paolo Calzolari noted that many of the ESA delegates were missing due to travel delays.

3) Agenda Review:
The Chair reviewed the agenda, which was approved by the members. Then he assigned himself, Mr. Michael Schmidt, Mr. Phil Liebrecht, and Ms. Stephanie Wan to the drafting committee.

4) Chairman's Report:

The Chair noted that not a lot has happened since IOAG-16 in December other than publishing the 2012 Annual Report and the 2013 Work Plan, which was prepared in January and published in March and could be approved faster in the future. He also commented that he continued to use the same format as in the previous years. There could be changes to the Work Plan after IOP-3, when there may be new high level objectives that require revisiting of the IOAG procedures; The next Chairman will decide if a revised Work Plan is needed.

He highlighted that all liaison activities are in good shape before the IOP; however, the IOAG text still needs to be approved for inclusion in the Global Exploration Roadmap (GER). The study group activities are in good shape to meet the core tasks; OLSG completed its activities and will be reported to IOP for the first time. The LEO26SG will also be reporting for the first time, and has made great progress considering it has worked less than eight months. The MOSCG will also be reporting to IOP for the first time, which would require further discussion for guidance on its future activities and endorsement of the report.

The IOAG and IOP websites have been updated, but there have been no new e-polls since IOAG-16.

For IOP-3 attendance, RFSA, CSA, and ISRO are still tentative, though invitations have been sent. CNSA indicated it will not attend either meeting, although it remains interested in our activities. Discussion amongst the delegates noted that CNSA may not be the right Chinese agency to be participating and perhaps the IOAG should consider other departments more focused on space communications operations.

5) IOAG Reference Tables:

The Chair noted that all updates to the IOAG reference tables should be submitted to the Secretariat for inclusion in the aggregate tables to be published on the IOAG public website before IOP-3. Furthermore, the infusion plans are useful to populate the IOAG-CCSDS Product Agreement (ICPA) database; while the first updates are still in work, changes made do not significantly alter IOAG inputs to CCSDS. Some of the need dates and standards have been delayed, and may require changes from time to time. The ICPA has been populated with IOAG inputs; however, there are a few discrepancies on the need date status (mainly related to Service Catalog 1 [SC #1] and Cross Support Transfer Services) and actions for certain items as it has been reviewed by CCSDS in its last meeting and will be presented during the CCSDS presentation. The Chair recommended putting the ICPA on future agendas to revisit from time to time to ensure full agreement to provide better input to CCSDS.

DLR noted that all DLR tables have been provided and the current presentation needs to be updated to reflect that information. NASA asked about the high rate and error correction coding on the forward link, and the Chair noted they were already aggregated into the ICPA.

AI 17-01: IOAG delegates to revisit after IOP-3 their priorities and expected dates in the development of new CCSDS standards, as per the service catalogs (for ICPA update). To also make proposals for an update of the IOAG top priorities in the upcoming years. Due date: August 30, 2013.

Also refer to the section with SFCG report on changes required by ESA on the IOAG tables.

AI 17-02: Secretariat (A. Oria) to modify template (available for each meeting) to reflect changes proposed by ESA, and also the aggregate table that has been produced after the IOAG-17 meeting. Further provide a footnote on the G/T at 90degree for the Deep space antennas. Due date: May 31, 2013.

6) Secretariat's Report:

The latest version of IOAG 16a minutes has been uploaded on the website, with edits and comments from all delegations incorporated. The delegates formally approved the minutes. The Secretariat confirmed that there have been no new e-votes since IOAG-16. Furthermore, the IOAG and IOP websites have been updated; she encouraged members to register for IOP-3.

The Secretariat reviewed the open actions and presented on **Action Item (AI) 16-08**, on the feasibility of creating an automated comparison of IOAG and SFCG mission models. It was concluded that further discussion on requirement needs would be necessary before moving forward; the action item was closed.

Mr. Tai then presented NASA's response to **AI 16-11**: Plan for Cross Support Service Management (CSSM) by NASA, recommending that agencies work towards Blue Book Version 2 to have a common cross support service management standard. NASA is expects the Version 2 be available by 2015 ready for support to the MPCV missions in 2017 and beyond. NASA also asked other agencies to augment their support to the CCSDS CSSM working group.

DLR asked whether there are time-related requirements to be kept updated considering the fact that CSSM work plan is undergoing major revisions since the Bordeaux meeting. NASA noted that deficiencies in Blue Book version 1 are already known; also known are what capabilities are needed for Blue Book version 2. DLR asked NASA if they were aware of how they want the missions to go, and NASA responded that a project has been set up to have a unified network around 2015, or the schedule will need to be adjusted. Everyone will be kept engaged in the process. The Chair closed the action item.

NASA then presented the response to **AI 16-10**, a proposal on what can be done to exploit SFCG mission model to make the IOAG mission model process more efficient. NASA noted that the CCSDS agencies mission model identify projects using CCSDS products. Currently with each agency report, there is a list of missions based on the CCSDS mission model. The Chair commented that on the infusion of standards, IOAG is related to the schedules, frequency bands, and provide the same list of missions. DLR suggested adding in the information of what CCSDS

has. However, discussions led to the fact that the IOAG models are currently fitted to meet their needs, and this led to comments on whether it could be a drawback on users of the mission models. While this option can be considered, it could provide complexities and make it much harder than originally planned, as it requires more energy to ensure all the mission models are synced up. The Secretariat commented that the current action item (16-08) only evaluated the feasibility but not the requirements, and would require cooperation within IOAG to ensure there was one voice on the models. Comments arose about the possibility of less configuration control, where further discussion was needed between the liaisons to ensure the decision reflected what is best for each organization. Action 16-10 was left open and will be discussed at IOAG-17b.

On the Documentation status, Mr. Calzolari requested approval to the updates in Service Catalogue #1 and #2, noting three small editorial changes to the structure in DDOR, and in the coding and modulation schemes. NASA noted that while they will not reject these changes, there is an internal NASA configuration control board meeting that will happen at the end of May, and until the internal review is processed, they cannot approve. NASA also commented that with the RF and Modulation book that is referenced in the Service Catalog, there are many options that need to eventually be narrowed down for the minimum set for interagency cross support to work. Mr. Calzolari agreed and that it is a subject for infusion tables where agencies should be reporting for coding and modulations the options that they are supporting, and what are the exceptions that are not supported.

The Chair commented that a number of modulations have already been reduced in CCSDS, and since it is a long list of options, IOAG needs to make sure the reference is the same for all members and what is useful for cross support. Mr. Calzolari suggested that this should be done offline between IOAG-17 and -18. The Chair agreed, suggesting an action to identify which standards are used for cross support. Furthermore, it was necessary to identify all schemes of coding and modulations; there may not be just one coding for all types of missions or sorts of coding, which may require building mission profiles. The discussion led to the fact that the action may result in diverse responses for all agencies in the beginning. Moreover, UK-SA expressed concern whether it was a desire for what an agency is using versus what one's agency can support. NASA agreed, as some agencies have already built and are using certain standards that make it impossible to adapt immediately. Therefore, further strategic discussions are necessary.

The Chair highlighted that the communication assets table currently show what agencies can do today, and it addresses standards but not utilization profile. There may be a need to establish utilization profiles and metrics with options possible. NASA recommended the development of a set of preferred standards, because depending on how or where an agency operates, it may not be so simple.

The IOAG members agreed to develop a set of preferred standards, and then possibly further reduce these, if necessary. The members will look into which modulations and coding are appropriate for IOAG. Mr. Calzolari suggested that CCSDS documents should not be ruled out in the discussion, and that an action be put on IOAG agencies on whether they are able to provide support. NASA believed that domains need to first be defined, then agencies can respond

on the domains of the preferred choices. Furthermore, not all agencies are working in deep space or environment around Mars and there are no simple choices for coding or modulation.

The Chair suggested that the next steps include identifying a list of domains that can be discussed at the next meeting, then establishing metrics for agencies to discuss plans or preferences in the future usage. Afterwards, IOAG can identify what may be used in the future. NASA and DLR volunteered to define the domains and make sure the subdivision of domains are for users than for operations.

AI 17-03: Secretariat to organize an e-poll (to start at the end of May till mid-June) for approval of Service Catalog revisions that are available in the IOAG-17 web-listed documentation. Due date: 31 May 2013.

AI 17-04: Concerning the clarification of which RF, Modulation and Coding standards are used by the IOAG members in the context of the cross support catalogs, NASA (W. Tai) and DLR (M. Pilgram) to support in identifying list and providing definitions on what the use domains and available standards are. Due date: 2 July 2013.

AI 17-05: All Agencies to respond on their preferred choices of standards in the proposed domains. Due date: 30 August 2013.

7) Overall IOP Preparation:

The Chair commented that the IOP-3 agenda has been updated to take into account the comments provided during IOAG-16. He further noted that Monday, 24 June can be used as an IOAG final preparation session.

Mr. Schmidt asked when the next IOAG meeting should be held, as it can be a long time between IOP and the next meeting, and IOAG may need to get started on some action items. The Chair suggested having a teleconference after IOP to go over any actions, as well as a teleconference prior to IOP, and can confirm the dates later.

8) IOP-Logistics:

The Chair noted that the venue for IOP-3 will be Cite de l'Espace. The coffee breaks and lunches will be provided by CNES. Further hotel logistics and details will be made available on the web site, and a bus to the venue is still to be confirmed.

CNES will also host the social event at the Hotel d'Assezat - Foundation Bemberg in the city center.

ESA raised the fact the NASA Webex works differently from their own, offering a dial-out capability within WebEx rather than a separate teleconference number. They would look into the possibility of hosting Webex for IOP-3.

AI 17-06: ESA (M. Schmidt) to look into the possibility of hosting WebEx capabilities for IOP-3. Due date: 28 May 2013.

9) Status of IOP Website:

The Secretariat provided a brief overview of the IOP-3 website, highlighting that the IOP-2 presentations are still available and that the website is now open for registration.

AI 17-07: Secretariat to add affiliation options for liaisons and subcommittees to upload IOP-3 presentations. Due date: 18 May 2013.

10) IOAG Membership:

The Chair discussed the current memberships of CNSA, ISRO, RFSA, and the current difficulties of establishing a quorum. He recommended that if they do not confirm their attendance, their participant level should be downgraded to observer status. Their lack of participation in the past IOAG meetings by de facto makes them observers.

With regards to RFSA, the Chair noted that they do not participate or report, and IOAG is currently waiting for a reply from both RFSA and ISRO on their IOP-3 attendance.

DLR suggested removing the non-active members off the membership list if they cannot provide feedback to the IOP, and they can request membership at a later date.

Following this discussion, the IOAG resolved that RFSA and ISRO are now considered de facto observers due to lack of IOAG meeting attendance.

As for CSA observer membership status, a decision can be made at or after IOP.

AI 17-08: All IOAG delegates to look into other organizations in China that may be a better fit for participating in IOAG and IOP activities. Due date: 4 June 2013.

11) IOAG Presentation to the IOP:

The Chair provided a review of the slides, highlighting the history of the IOAG, its updated organization chart (and its relationships with liaisons), and the resolutions from IOP-2.
CCSDS noted their lack of resources, but if the group was given a requirement, they could easily provide a standard. However, the question was raised regarding whether IOP was the right forum to address this issue, and that IOP would not be able to solve this problem either. NASA asked whether there were statistics on CCSDS resources to share with IOP.

The IOAG report will be updated for IOAG-17a to reflect the discussions at IOAG-17.

12) ISECG Report:

The Chair presented the ISECG report, highlighting the history, the current status of their work, and their relationship with IOAG. In relation to the IOP-2 resolutions, the IOAG relationship objectives have been achieved, and there has been IOAG cooperative text within the ISECG

GER. However, the previous IOAG text within the ISECG document has been changed and the new text does not reflect IOAG properly and may require restructuring. The IOAG delegates commented that perhaps the group should provide resources for requirements, as ISECG has not started on communications and IOAG would not want them to start on their own, but there are also no resources available. This would pose a problem if there is excessive work coming up and resources are not available. The delegates agreed that IOAG should support the space communications architecture of ISECG rather than duplicate efforts.

The ISECG report will be updated for IOAG-17a to reflect the discussions at IOAG-17.

13) ICG Report:

The ICG liaison, Mr. Miller presented an overview of ICG and the relevant Space Service Volume (SSV) proposal, and the importance of continuing the relationship between the two organizations. NASA recommended an action to put together an IOAG mission model to be presented at the top level. The Chair commented that an action item has already been open on this, although only 3 agencies have provided inputs so far. The IOAG delegates agreed that this action should be revived, and that more agencies would provide information on current and future missions using GNSS capabilities. Mr. Schmidt and Mr. Rosello commented that many are using GPS signals, and there is the SSV orbital altitude issue, which is something ESA can further discuss on how to update the tables. JAXA noted that Japanese attendance to the ICG is at the governmental level, and the space agency does not want to appear as though it is requesting a requirement from ICG without having advance coordination with participants. Similar to JAXA, CNES has no representation and DLR has limited ability to obtain nomination for ICG attendance, thus further coordination with agencies is needed.

Mr. Miller responded that the current signal availability lacks pinpoint positioning in using other signals and requires specialized software. There is a need to model and continue processing the information in order to institutionalize a performance metric that allows for a whole new class of missions. Mr. Rush further highlighted that there are missions using the data now, but a second group would use and explore these possibilities if it was available.

The Chair noted the need to work on a more specific template, as IOAG cannot provide both mission models and secondary users. Mr. Liebrecht noted that the agency had many missions, not even all in higher orbits, and it would be valuable to prevent degrading performance. Mr. Rosello highlighted that there are two cases to have interoperability that make Global Navigation Satellite Systems (GNSS) very important: one in low earth orbit, where there are fewer signals and it is valuable to have many signals to get better accuracy, and secondly, for scientific purposes such as radio occultation.

The ICG report will be updated for IOAG-17a to reflect the discussions at IOAG-17.

A new due date was assigned to the following action item:
AI 15c-05: Send mission model for Global Navigation Satellite Systems Space Service Volume to NASA and Secretariat. Due Date: 31 May 2013.

14) SFCG Report:

NASA responded to AI 16-10, on what can be done to exploit SFCG mission model to make IOAG mission model process more efficient. In terms of the current tables on the website, there are currently some models not exposed to IOAG and further understanding of which IOAG tables are useful to SFCG, and vice versa, is needed. Moreover, SFCG has a more focused coordination (e.g., using the ITU file name in its databases), and the Spectrum Manager is not the IOAG representative. The IOAG delegates agreed to leave the action item open, as clarification on who is responsible for each of the different fields is needed. NASA will coordinate with SFCG on the initial brainstorming.

The SFCG liaison, Mr. Vassallo, then provided SFCG's IOP-3 presentation. NASA commented that at SpaceOps 2012 it appeared that commercial industries fought against each other for spectrum, whereas agencies had a better coordination. The IOAG delegates agreed that the SFCG slides should be highlighted towards a high level audience, and to move many of the detailed slides into the backup.
The SFCG report will be updated for IOAG-17a to reflect the discussions at IOAG-17.

Mr. Vassallo then provided a proposal to update the terminology of the communication assets table, to provide exact frequencies instead of ambiguously designated bands, and to provide complementary terminology for "Uplink/Downlink" with "Forward/Return."

AI 17-02 was confirmed.

The meeting adjourned for the day.

14 May 2013 (Day 2)

15) Summary of Day 1 discussions and actions:

The Chair provided a summary from the previous day, highlighting that there were many good comments for recommendations and resolutions to pass to the IOP in the different domains. The objective right after IOAG-17 is to develop the draft communiqué with resolutions. While currently there is not a template for the IOP communiqué, it will align to the IOP resolutions.

Mr. Schulz asked about the purpose of the liaison reports. The Chairman responded that these presentations are intended for setting the stage but also to have the IOP endorse the progress made in the relationship of IOAG with each organization. The delegates commented that it would be high level requirements addressed to other communities that would give a starting point for discussion.

16) CCSDS Report:

The CCSDS liaison, Mr. Peccia, presented the CCSDS report. The CCSDS report to IOP-3 noted that currently the group tries to provide an international consensus for future technology drivers and had an over-subscription of resources. The IOAG delegates were concerned about CCSDS's message highlighting their limited resources, as it was best not to address such issues to the senior level officials when everyone had funding issues at the moment.

ESA asked why the slide commenting on robotics (slide 3) included human space flight when there are currently no joint human space flight programs. NASA responded that we are currently in a unique time to build human exploration and there are opportunities on both the human and robotics side.

CCSDS continued to discuss that they worked from the top down and bottom up approach, as the IOAG is not the only source of requirements for the group. The IOAG delegates were concerned the image showed competing directions, and it was recommended that while the group recognized having both top and bottom approach is healthy, it was best not to emphasize the bottom up as much, because it may appear that the group was not considering the bigger strategic plan and could cause budget cuts. Mr. Peccia argued that only 50 percent of the standards would have occurred if it was only requested from the top down. The Chair suggested that it was best to reflect how the two groups worked to provide the necessary drivers, whereas the message currently showed multiple international organizations in space agencies to just coordinate amongst each other.

Mr. Peccia noted that they needed ten years to establish the basic framework, and if they were waiting for inputs from IOAG, the necessary standards would be not available. NASA commented that their long range strategic architecture was done internally by the same people in their agency. However on the mission side, people are most interested in human space flight and

not as much science. Mr. Peccia pointed out that the Johnson Space Center currently supports the organization with mission operation standards.

NASA noted that the CCSDS membership is larger than IOAG and it would be useful to show the organizational inter-relationships. Mr. Pilgram suggested highlighting that CCSDS inputs are therefore not just coming from IOAG. Mr. Kozlowski noted that perhaps IOP is interested in providing recommendations in helping both the IOAG and CCSDS communities; currently the presentation has good information but does not provide recommendation on how IOP can help.

The IOAG delegates continued to emphasize that the message should remain positive to the IOP. On the slide regarding the CCSDS response to IOAG, the delegates noted that many of the IOAG dates had a later need date than CCSDS. The Chair asked if the resource issues needed to be presented, highlighting the implications to ongoing work. Mr. Peccia commented that the group was delaying possible schedules in order to cope with resources and that additional resources will have to be deployed by member agencies. Mr. Calzolari commented that the last slide with radiometric services appears like it is currently not funded.

The CCSDS report will be updated for IOAG-17a to reflect the discussions at IOAG-17.

Considering the many comments and discussions, Mr. Peccia asked when the IOAG consolidated comments to CCSDS would be available. The Chair noted the group will consolidate the comments this week.

AI 17-09: Chair to provide an IOAG consolidated list of comments for CCSDS IOP-3 report. Due date: 22 May 22 2013.

17) MOSCG Report:

Mr. Kearney presented the MOSCG report. Mr. Schulz commented that NASA is probably the only group spearheading the activities that will also be part of the next generation of ISS. The Chair noted there are ways to qualify user inputs, and IOAG receives the consolidated input as it is the voice of a group of agencies with commitments to use and deploy.

NASA asked whether there was a business case assessment, and Mr. Kearney replied that the business case was provided only in terms of the cost/benefit discussion in the presentation. The MOSCG recommended preparing a SISG-type report, noting that it is modeled after SISG work, which included some additional business case type of material.

The Chair suggested that the MOSSG should provide priorities on what needs to be produced, similar to ICPA.

Mr. Schmidt noted that there are currently no resources available and ESA disagrees with the recommendation as written. While ESA agreed to create MOSSG, they could not agree to the approach to the effort when considering the lack of resources. NASA noted they also have

resource issues. ESA also commented that there are no ESA user missions, nor any immediate need on board the ESA spacecraft side. The Chair requested responses from the other IOAG delegations.

JAXA responded that the agency understands the benefits in large missions, but there are no immediate benefits for science and earth observation missions; unless there is a target mission (such as human exploration) it is difficult to set a target date. Mr. Valentini agreed, saying that currently their agency's future mission is the second generation comet mission and for earth observation; therefore, he did not know if there is any need or possibility for implementation. DLR also agreed, as there are no projects telling them what services need to be implemented. UKSA commented that there is no immediate need but can see it be taken up; similar to ASI, it can be used on international missions UKSA is currently involved in and therefore can become a driver. CNES noted that they could agree with the creation of the MOSSG group but the 18-month time period is short.

It was agreed to resume the discussions on the next day.

18) LEO 26SG Report:

Mr. Abello presented the LEO26SG Report, highlighting the progress the group has made over the past several months in analyzing the benefits of Ka-band.

Mr. Schulz noted that they've been trying to use weather prediction to enhance deep space Ka-band. If you can predict, then you can optimize, he said. NASA noted that the deep space experience has shown that using weather at 90 percent confidence level results in four times as much performance than on the X-band. Therefore, there is a lot more data in a lot less time.

The IOAG delegates asked if the situation was aggravated becuasae of the need to adapt to unpredicted weather. This appeared to complicate mission operations and would require further discussions. The delegates asked whether the time correlation and mission centers would be affected if the mission were only downlinking (e.g., no uplink). This would not be an issue if it were science data and it took longer. However, some information would be needed quickly, requiring these weather mitigation techniques.

Mr. Schulz noted that the propagation models can help predict the effects of the weather in advance; Adaptive Coding and Modulation (ACM) may then be used to automatically optimize the channel – making ACM the next logical improvement. Mr. Abello verified that the loop can be closed. NASA commented that you can go through the control center or get missions to send information up to spacecraft and make adjustments. Mr. Rosello commented that the intent is to start like that.

NASA inquired about GEO spacecraft and how the industry works with the operators. Mr. Rosello responded that there are transmitters on the ground that get cranked up and done locally. Mr. Schulz mentioned that if you drive it to maximum, then it will be 7 instead of 2.4, with a

maximum of 10Gb/s. Therefore an optical system would have to compete with this level of performance.

Mr. Shigeta noted that the slides should offer the reason why space agencies are moving to 26GHz band. The reason is because high data rates are not satisfied in the X-band and not because of only avoiding congestion, otherwise it would look like commercial satellites are happy with less congested conditions in the X-band. Ms. Edwards responded that while 26 GHz is beneficial for high data rate, high data rate users will also want to avoid the congestion in the lower bands in the future. Mr. Rosello suggested adding this to the report as well as other considerations. NASA noted that when there is a cost per pass, misisons can use a smaller amount of passes resulting in more data. CNES commented that this is true as long as the data rate requirement is low and under the link capacity.

The Chair commented that the report is a good approach for projects to evaluate going towards Ka-band, and suggested putting this on the IOP-3 agenda. The delegates discussed the use of fixed data rate scenarios and how wide band poses a threat to high band receivers as Earth science satellites are causing interference. Mr. Vassallo noted that this still needs to be resolved.

ESA commented that they would like to expand their propagation models and there are two types of cross support models. The Chair noted that the propagation model is the same issue as the optical link. It would be adapted in real time in the bio-control with the spacecraft. NASA questioned whether there is a reasonable set of standards that can be used rather than reinventing the wheel. This would show what technologies are available, and finalize the work to make recommendations. Mr. Vassallo agreed, noting that a lot of the work has already been done by CCSDS, and IOAG should capitalize on it.

The LEO26SG report will be updated for IOAG-17a to reflect the discussions at IOAG-17 and be shortened for a higher level presentation.

19) SISG Report:

Mr. Schulz and Mr. Rush presented the SISG report, noting the background on the development of the group and Action Items assigned during IOP-2. The Chair noted they needed to convey a message to CCSDS (who is in charge of the green book)that it is important to provide an update to the green book as soon as possible, and see if an updated document could be endorsed before the IOP. As it is currently in the final review for CCSDS approval, the Chair recommended that they try to shorten their approval cycle. Mr. Kearney said he would informally ask CCSDS to try and make it happen.

The SISG co-chair noted that in stage one, the BP and LTP would be in two Blue Books by late 2013. However, it was noted that already demos are being conducted on ISS.

The Chair recommended that the IOAG continue coordination with CCSDS and endorse the continued development of DTN Standards. Mr. Schulz noted that SISG did not find an urgency to develop the standards beyond BP and LTP since they are sufficient for stage 1 implementation and stage 2 is yet a ways off.. NASA suggested taking another look at the CCSDS DTN standards development priorities in order to harmonize the development schedule with the stage 2 and 3 implementation

ESA commented that with future Mars missions coming in 2016 or 2018, it would be too late to use this round of DTN standards. It was suggested to add “In particular next generation Mars missions” to the SISG resolution. The meeting adjourned for the day.

15 May 2013 (Day 3)

21) Summary of Day 2 Discussions:
The Chair opened up the meeting to suggest changes to the agenda, considering many items were not yet discussed due to the overflow of discussions on the previous day. He further noted that he received news that ISRO will be attending the IOP.

Furthermore, KARI would be providing their agency report earlier in the day in order to accommodate for the time difference.

KARI Agency Report:
Dr. Ahn highlighted the number of KARI's missions and that the SLE interface is not yet implemented. The Chair asked whether KARI intends on participating at IOP-3. Dr. Ahn noted that he will be attending as KARI's IOP delegate.

20b) OLSG Report:
Mr. Schulz presented the background on the group's objective, the schedule of Agency Optical Communications demonstrations, their final report, and their presentation to the IOP-3. Mr. Soula commented that there seem to be commonalities between weather issues related to 26 GHz and optical communications. It was agreed that in the process of developing standards for exchange of weather data for optical communication ground stations, there should also be consideration of whether the data might serve a dual purpose for both optical communications and 26 GHz use.

The chairman noted that one of the keys to success for the standardization process will be that a number of participants in OLSG also participate in the CCSDS working group.One of the first tasks of the CCSDS should be to develop a common set of terminology for optical communication. Mr. Schulz noted that the OLSG recommends that a Green Book be developed that captures the common terminology as well as a system level description for cross support in optical communications that depicts the concept of operations, link budget calculation process, handover techniques, and atmospheric models..

The Chair and Mr. Schulz discussed the need to minimize the complexity; if we limit optical links then the chance to receive data for weather predictions with the multiple site coordination approach will result in loss of data. It was necessary to receive the completeness of the data. In discussing the concept of operations, Mr. Schulz wanted to use today's speculation concept and be part of the optical link. ACM is for data return and DTN is for the management of disruption. ESA commented whether this would use the on-board buffer or DTN, and then offline process afterwards, and later re-link the downlink. The response was that this depended on the needs and whether it needs to be real time. The schemes need to be experimented to see what works best, and Mr. Rush suggested that DTN can be relied on alone. Mr. Schulz noted that the combination

of all the different links for optimum communication can avoid having all capabilities together to make optical communications.

Mr. Schulz noted that the goal is for CCSDS to develop the Green Book and three Blue Books. One Blue Book would be for low photon flux applications, such as NASA's LLCD, and could be worked on first. Another Blue Book would be fir high photon flux applications and would take a little longer. A third Blue Book would cover handovers that are unique to optical communication and involve a new level of information flow due to weather considerations. There needs to be clarification in regard to handover procedures and these should be worked out by CCSDS in the standardization process. JAXA pointed out that the wavelength was not specified by OLSG and asked if it was intentional. The OLSG co-Chairs responded that there are currently two wavelengths being used by the agencies and that both have been demonstrated to be eye safe to a degree and the detailed information is in the report. It was noted that the eye safety question for aviation is governed by ICAO guidelines and standards which are currently being revised

The IOAG delegates asked whether it is possible to have interoperability with two wavelengths in the optical system. The co-chairs replied that technology is still evolving and the question could be further explored by CCSDS. The OLSG report recommended that only the two wavelengths be considered for cross support..

RAL Tour

MOSCG Conclusions Discussion:

The Chair revisited the Mission Operations Services proposed resolutions, providing questions (considering the previous day's discussions) to the IOAG delegates to answer on the IOAG endorsement of the group. On the IOAG endorsement of MOSCG proposal, ESA commented that they would be interested to move forward with MOSSG; however, not with the full development with a specific mission in mind.

Agency	1. Recognize Benefits on ground	2. Recognize Benefits on board	3. Anticipate utilization of MO function on board	4. When to anticipate usage	5. Agree w/ proposed re-chartered role and creation of MOSSG	6. Produce a Report for CS strategy of MO	7. Produce SC#3	8. Prioritize CCSDS dev. Via extended ICPA	9. Orchestrate simulation w/CCSDS on benefits	10. Report on progress made in prep for next IOP
ESA	Yes	No	No	No	Yes	Yes	Yes	Yes	Good Idea but not needed immediately	yes
NASA	Yes	Yes	Yes	maybe	Yes	Yes	Yes	Yes	Yes	Yes
JAXA	Yes	Yes	Yes	Hard to tell	Yes	Yes	Yes	Don't know	Yes	yes
ASI	Yes	yes	Cannot explore	Interested	Yes	Yes	Yes and no	Don't know	-	yes
DLR	Yes	No	No	No	Yes	Yes	Yes	Yes	yes	yes
CNES	Yes	Reservations	Reservations	TBC	Yes	Yes	Yes	Yes	Yes	Yes
UKSA	Yes	Yes	Yes	Not immediate	Yes	Yes	Yes	Yes	Yes	Yes

There were questions raised about whether this technology should be considered for the space segment. Mr. Kearney noted that the MOSCG did not discriminate between on board and on

ground, and it was considered that the conclusions could apply to either onboard or ground (separately) or both.

Dr. Allan noted that the UK Space Agency is concerned about the fraction of its budget needed for operations and is seeking ways to reduce this through more efficient tools and processes. He highlighted that they are building towards the on-board aspect and did not object to MOSSG. He highlighted that the UKSA is building towards the on-board aspect and did not object to the MOSSG proposal.

JAXA commented that without changing or standardizing MO on board, they believe that just standardizing the ground may make ground systems more complex and that could offset the maximization of benefits. There is potential but JAXA does not see any upcoming missions which will require these approaches. While it may take a while to have a complex new mission with such requirements, they could see the benefit of implementing this approach to space science missions in the future. Mission Models need to be prepared for this evolution to be included in IOAG and on extended opportunities for international missions and in this domain.

NASA noted they supported the MOSSG activities. CNES agreed with creating a charter, and of course, resources must be discussed.

ISECG Roadmap:
The Chair presented the revised counterproposal for the ISECG GER text. Some of the text proposed was beyond the roadmap and therefore required further identification of the relationship and discussion in the architecture group. When discussing these issues with ISECG (K. Laurini), the group has not reached that point and they have no counterpart other than CCSDS activity or IOAG. Furthermore, text focused on the "International Docking Station" singles out CCSDS. Therefore the Chair will incorporate the inputs and re-distribute to the IOAG.

22a) Agency Reports:
Due to time constraints, the IOAG delegates quickly reviewed each agency report.

ASI noted the organization changes in the Director General, and Roberto Ibba (former head of ASI Ground Segment department) has been replaced by Fabrizio Toscone and Barbara Negri. ASI has also moved headquarters in Rome. Since the failure of the MLD-2 antenna, ASI has been using the MLD-1 antenna, reducing the agency's activities since late December 2012.

CNES highlighted a new CNES president, Jean-Yves Le Gall. There have not been changes to the Board of Directors under him at this stage. Over the last six months, CNES launched Pleiades 1B and SARAL (cooperation with ISRO).

DLR highlighted a new office that opened in February, strengthening their cooperation on the asteroid-lander MASCOT.

JAXA noted that Naoki Okumura became the new JAXA president (Naoki Okumura) in April. There are organizational changes to the Satellite Applications 1 & 2, Human Space Flight, and Institute of Aeronautical Technology directorates, and the Engineering Digital Innovation Center. Within the Consolidated Space Tracking and Data Acquisition Department, Shizuo Yamamoto is the Executive Director.

NASA introduced the addition of the Space Technology Mission Directorate to the organization. Some key highlights include the Asteroid Retrieval Initiative and the TDRS-K launch on 30 January. NASA noted the benefits of multi-agency missions, such as the Human Exploration Missions and cross support. The agency emphasized the need to prioritize the development of standards and new capabilities within systems due the current budget environment.

The UK-SA noted the new Chief Executive, David Parker, and that the staffing increased to 50. The agency also opened the Satellite Applications Catapult Center, incorporating the work of the International Space Innovation Center.

The Chair noted that the agency reports will only be uploaded to the IOP website for reference this time, rather than be presented as had been done in IOP-2. He suggested adding the infusion status and agency plans to the report, but leaving the flexibility for the formatting to the respective agencies. The Chair suggested adding an agency perspective on the achievements in cross support.

26) Planning for the Next Meetings:
The IOAG delegates agreed the next teleconference to prepare for the IOP-3 would be on 4 June. The Chair suggested the Monday before IOP-3 would be available for another final preparation meeting. Due to the potential actions following IOP-3, the IOAG delegates should hold another teleconference following, such as Tuesday, 9 July.

27) Drafting Committee Report: Review of the Draft Communique:
The IOAG delegates started the review of the draft resolutions and recommendations of the OLSG, SISG, LEO26GHz, MOSCG subgroups, providing real-time revisions.

The meeting adjourned for the day.

16 May 2013 (Day 4)

Continued: Drafting Committee Report:
The IOAG delegates continued the real-time revision of the subcommittee's resolutions.

After the IOAG delegates completed the subgroup resolutions, they focused on the real-time revision of the ICG, SFCG, CCSDS, and ISECG resolutions.

The IOAG delegates then focused on providing real-time comments to CCSDS's IOP-3 slides.

The Chair re-highlighted the fact that each subgroup and liaison group would need to also provide a one page executive summary, to better prepare the IOP-3 delegates. This would be shared prior to the IOAG-17a teleconference.

The Chair commented that all executive summaries (noting the findings, decisions, achievements, and progress) and resolutions need to be assembled before early June and that this is prepared before the next teleconference. The resolutions will have iterations to be reviewed, and have a draft communiqué ready.

A plan of actions was discussed and the following actions were assigned:

AI 17-10: Chair to return to the presenters at IOAG-17 revised draft resolutions (in Power Point format) to be included in their presentations and to give an advance briefing on the schedule of their next deliveries in preparation of the IOP3. Due date: 21 May 2013.

AI 17-11: Current IOAG Chair to update the IOP-3 draft agenda, based on discussions at IOAG-17 and to circulate to IOAG delegates. Due date: 21 May 2013.

AI 17-12: All IOAG members to review and comment on the IOP-3 agenda. Due date: 24 May 2013.

AI 17-13: Secretariat to produce a clean version of the IOP-3 agenda (called final draft) and to send it to the IOP HoD's and to the registered participants at the IOP-3, together with briefings and details on the logistics and the schedule of when more information will follow. Due date: 28 May 2013.

AI 17-14: Secretariat to elaborate a draft communiqué based on the agreed text of the draft resolutions, for distribution to the IOAG delegates. Due date: 10 June 2013.

AI 17-15: Secretariat to distribute the draft communiqué to the IOAG delegates (who will introduce it to their IOP delegates), after final verification by the IOAG chairs. Due date: 14 June 2013.

AI 17-16: All IOAG presenters at the IOP to provide finalized presentations at or shortly after the IOAG-17; should be made available to IOAG. Due date: latest 24 May 24 2013.

AI 17-17: All IOAG members to review and bring comments before or at IOAG-17a on each revised presentation. Due date: 4 June 2013.

AI 17-18: IOAG Chair will return final consolidated comments to presenters at IOAG-17a. Due date: 4 June 2013.

AI 17-19: All IOAG presenters to finalize presentations and to return them to the IOAG Secretariat on IOAG-17a web site. Due date: 6 June 2013.

AI 17-20: Secretariat to upload presentations and the supporting material (study reports) on the IOP web site. Due date: 10 June 2013.

AI 17-21: MOSCG, SISG, OLSG, LEO26SG to each provide a one page Executive Summary including a summary of their presentation and the proposed draft resolutions, as compliant with the conclusions of IOAG-17. Due date: 30 May 2013.

AI 17-22: Liaisons, CCSDS, SFCG, ICG to each provide an Executive Summary based on the same format and content. Due date: 30 May 2013.

AI 17-23: All IOAG members to review before and bring comments at IOAG-17a on each Executive Summary. Due date: 4 June 2013.

AI 17-24: Secretariat to assemble the Executive Summaries, for validation by the IOAG co-chairs and before distribution to the IOP delegates. Due date: 10 June 2013.

AI 17-25: Secretariat to distribute the "Executive Summary for IOP-3" to the IOP HoD's. Due date: 14 June 2013.

AI 17-26: IOAG delegates to submit their agency report in power point or pdf format. Due date: June 14, 2013.

The Chair thanks all the delegates for their participation and adjourned the meeting.