



# **INTERAGENCY OPERATIONS ADVISORY GROUP**

## **Work Plan 2014**

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## IOAG Work Plan 2014

### **1 Introduction**

The overall scope of the Interagency Operations Advisory Group (IOAG) is to undertake activities to establish a multi-agency coordination related to space cross support and space communications. A specific IOAG goal is the achievement of full Inter-Operability among member space agencies.

To achieve these goals, some permanent objectives are defined in the IOAG Terms of Reference. The Inter-Operability Plenary (IOP) has also assigned specific objectives, as described in Section 2.

The Work Plan details the IOAG work objectives for 2014 and defines an associated implementation plan. The higher-level objectives for the next several years are also identified to highlight the need for continuity in some tasks or new activities that need to be initiated. It is anticipated that the IOAG Work Plan will be updated on an annual basis to remain more current and provide more details on the medium-term objectives and implementation schedules.

The IOAG Work Plan 2014 responds to three overarching strategic objectives:

- Establish or enhance all elements of the IOAG organization required to achieve its role as the premier international focal point for matters related to cross support in the space communication and navigation domain.
- Continue effective and value added use of the IOAG in 2014 with achievements that foster the goals of IOAG and are of mutual benefit to the participating Agencies and interfacing organizations.
- Increase the visibility of IOAG by communicating its existence and purpose to relevant international groups and organizations.

### **2 Objectives**

The objectives of IOAG are defined in its Terms of Reference (TOR) and are also driven by the IOP-2 and IOP-3 communiqués. Annex-1 includes a detailed description of the IOAG objectives.

The IOAG work for 2014 has been classified into four activity lines: (i) core tasks (section 3); (ii) tasks performed in collaborations with other existing international groups/organizations (section 4); (iii) improvement of IOAG internal processes (section 5); and (iv) reporting activities (section 6).

Annex-2 includes detailed definitions of the following: task; activity identification; implementation approach; expected outcomes for tasks for the year 2013; and, as applicable, continuation as follow-up tasks.

Annex-3 includes an overview of the participation by the IOAG agencies to the activities herein.

### **3 Overview of Activities in 2014**

This section provides an overview of the main activities / actions relevant to 2014.

#### **3.1 Interface to International Space Exploration Coordination Group (ISECG)**

- ✓ A regular contact between the chairmen of IOAG and of the ISECG Architecture WG is to be established leading to an exchange of up-to-date information. A presentation by IOAG is to be performed if considered useful to inform ISECG about the proposed configuration.
- ✓ A formal liaison will be established once the ISECG evolution has reached a status that requires a closer interaction.
- ✓ The IOAG secretariat is to keep track of the interactions.

#### **3.2 Interface to Consultative Committee for Space Data Systems (CCSDS)**

- ✓ The CCSDS Liaison is to regularly participate in the IOAG teleconferences and meetings.



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- ✓ The communication mechanism between the two organisations is the ICPA, which is to be populated/ prioritized by the IOAG delegates and be maintained by G.P. Calzolari and the counterpart from CCSDS.
- ✓ In addition the IOAG chairman / secretariat are to send IOAG progress reports to CCSDS as required.
- ✓ The priorities defined by IOAG (Top 10 and ICPA priorities) are to be updated as required.

### **3.3 Interface to Space Frequency Coordination Group (SFCG)**

- ✓ The IOAG agency delegates are to encourage their frequency managers to continue early missions coordination via SFCG and to participate to the ITU meetings in support of the SFCG objectives.
- ✓ The IOAG requests that the SFCG liaison is to regularly participate in the IOAG teleconferences and meetings.
- ✓ The IOAG mission model and asset database is to be made available to SFCG and to adapt the model structure and content to the needs.

### **3.4 Interface to the International Committee on GNSS (ICG)**

- ✓ The IOAG agency delegates are to collect relevant information (space user performance needs for their GNSS constellations).
- ✓ The IOAG agency delegates are to contact their national bodies' representatives in the ICG.
- ✓ The IOAG chairman is to maintain the contact with the ICG, either by directly participating in the relevant meetings or by coordinating the activities via the liaison (J.J. Miller).

### **3.5 LEO 26 GHz WG**

- ✓ The IOAG agency delegates are to promote the utilization of the 26 GHz band for LEO missions in their agencies that require very high data rates or that have concerns about congested bands.
- ✓ The IOAG 26 GHz report should be sent to the relevant mission representatives.
- ✓ The IOAG delegates should report back to the IOAG on the progress and findings of their implementations.
- ✓ The IOAG is to distribute the 26 GHz report and the associated information to the member agencies.
- ✓ The IOAG delegates are to collect relevant information on the propagation effects and to report back to the IOAG.
- ✓ The IOAG is to request an update of the ICPA and to establish the priorities and due dates for the development of standards by the CCSDS.

### **3.6 Mission Operations Systems Strategy Group (MOSSG)**

- ✓ The Chairman and the Secretariat are to produce a revised charter for the IOAG, which is to be approved by the IOAG delegates. The Charter shall include cognizance over Mission Operations, primarily focusing on Mission Operations Systems.
- ✓ The IOAG should consider addressing both Systems and Practices aspects of Emergency Support Services (at link or network levels). The IOAG is to discuss whether a separate WG is to be created to address emergency communication and tracking services.
- ✓ The IOAG is to establish a MOSSG.
- ✓ The IOAG delegates are to nominate participants to the MOSSG.
- ✓ The chair and co-chair of the MOSSG are to define the ToR of the MOSSG.
- ✓ The MOSSG is to produce the outputs as defined in the MOSSG ToR, which should comprise i) a study report, "Recommendations on a Strategy for Cross-Support of Mission Operations" and ii) a draft of a Service Catalogue addressing Mission Operations cross-support.



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- ✓ The MOSSG is to check with the CCSDS which results are already available regarding the assessment of the benefits of Mission Operations Services and to assess whether a simulation is needed.
- ✓ The IOAG is to promote the Mission Operations Services Strategy Groups by inviting non IOAG agencies to participate.
- ✓ The IOAG is to keep track of the evolution of the Mission Operations Services and to compile a report, which should be presented to the next IOP.

### 3.7 Optical Links Study Group (OLSG)

- ✓ The IOAG delegates are to verify within their agencies when optical link communications will be relevant and for which mission profiles.
- ✓ The IOAG is to assess the needs for standardization in the context of optical link communications and to provide appropriate guidance to CCSDS. The establishment and organisation of relevant WGs is under the responsibility of the CCSDS.
- ✓ The IOAG is to request an update of the ICPA and to establish the priorities and due dates for the development of standards by the CCSDS.
- ✓ The IOAG is to establish a liaison with the International Civil Aviation Organization (ICAO) via OLSG to coordinate aviation eye safety concerns with respect to the future international implementation of optical communication ground stations, some of which may have high power uplink lasers.
- ✓ The IOAG delegates are to record lessons learned from the cooperation between the member agencies regarding the demonstrators, the studies on propagation effects and in general, the development of optical link communications.
- ✓ The IOAG is to keep track of the evolution of the optical link communications and to report back to the next IOP.

### 3.8 Space Internetworking Study Group (SISG)

- ✓ The IOAG delegates are to promote the Space Internetworking concept within their agencies.
- ✓ The IOAG delegates are to record lessons learned from the cooperation between the member agencies regarding the demonstrators and the development of space internetworking communications.
- ✓ The IOAG is to keep track of the evolution of the space internetworking and to report back to the next IOP.

### 3.9 Spacecraft Emergency Cross Support Working Group (SECSWG)

- ✓ The IOAG delegates are to identify the specific problem(s), weakness/deficiency, and/or areas for improvement in the inter-agency emergency cross support, past and present.
- ✓ The IOAG delegates are to define the operational process executed by both the service provider and service users in time of the spacecraft emergency. Focus on the standardization, enhancements, and preparedness of the communications and navigation operational activities.
- ✓ The IOAG delegates are to define the common policy that governs emergency cross support agreements among the IOAG member agencies. The policy statements shall cover at least support priorities, constraints (e.g. uplink RF licenses), and programmatic accountability.
- ✓ The IOAG delegates are to identify the key characteristics of the relevant CCSDS cross support services, needed for interoperability, that are unique to spacecraft emergency cross support. Assess these characteristics to determine potential new requirements and/or interfaces for the service providers and service users to comply.



#### **4 Core Tasks**

IOAG tasks are classified as core tasks if their implementation is primarily performed by IOAG (instead of working groups not related to the IOAG) and if they lead to clearly identified and concrete outcomes in 2014.

Five core tasks have been identified for 2014:

- Core 14.1 = Improvement of completeness, accuracy and visibility of the IOAG Mission Model, Cross Support Mission Model, Communication Assets and Standards Infusion Status.
- Core 14.2 = Follow-on of the definition of a Solar System Internetworking Infrastructure.
- Core 14.3 = Follow-on of the evolution of Optical Communications.
- Core 14.4 = Follow of the evolution of Ka-band (26 GHz) in the domain of LEO satellites.
- Core 14.5 = Follow-on of the study on the Mission Operations Services.
- Core 14.6 = Elaborate Emergency Cross Support.

The Core Task 14.1 requires contributions and updates from all Members of IOAG. Several agencies have been deficient in the last years to provide such inputs. Considering the positive feedback received during the IOP-3 some improvements are expected for 2014.

Though some of the WGs have in principle completed the allocated tasks it has been agreed to keep them alive or to reactivate them as necessary in order to have a forum to exchange information and to follow the corresponding evolution.

The IOAG TOR and Procedures Manual were revisited. While the TOR can remain as is the Procedures Manual requires some minor adjustments.

#### **5 Tasks in Collaboration with Other Organizations**

The interface of IOAG with existing groups, as directed by the IOP-3, will be primarily to coordinate space communications and navigation aspects, and to ensure the consistency of the tasks conducted by the multiple communities.

Four strategic tasks have been identified for 2014:

- Liaison 14.1 = Continuation and improvement of the relationship with the International Space Exploration Coordination Group (ISECG) to collect their requirements in the domain of Space Communications and Navigation.
- Liaison 14.2 = Continuation and improvement of the existing liaison with the CCSDS to convey the requirements from the IOAG and the users' communities in a timely manner relative to the domain of the standards for Space Communications and Navigation, and to clarify interfaces between IOAG and CCSDS.
- Liaison 14.3 = Continuation and improvement of the existing liaison with the Space Frequency Coordination Group (SFCG) to convey the requirements from the IOAG and the users' communities in a timely manner relative to the domain of the frequencies and spectrum for Space Communications and Navigation.
- Liaison 14.4 = Definition and implementation of a liaison with the International Committee on Global Navigation Satellite Systems (ICG) to exchange on both parties requirements and information in the domain of Space Communications and Navigation.

#### **6 Initiatives for Improvement of IOAG Processes**

In many areas of IOAG activities, the flow of information within the IOAG with external organizations of interest and with the agencies or their partners is critical with respect to the overall outreach and efficiency of the organization. The special tasks assigned to the Secretariat for improvement of the tools and methods used in the various procedures of the IOAG and for better outreach on the IOAG achievements and recommendations are identified as "Process 14.1" in Annex-2.



## **7 Reporting Activities**

The year 2014 will focus on the implementation of the IOP-3 resolutions. It is expected that the IOAG chairman and the heads of delegation will report back to the corresponding IOP-delegates regarding the implementation of the IOP resolutions. The chairmen of the various WGs are to report back their progress to the IOAG.

The Chairman will develop, with support from the Secretariat, an Annual Report that will summarize the activities and achievements. The Annual Report will include inputs from all participating Agencies and a progress report on the implementation of activities in the 2014 Work Plan.

The Annual Report will be posted on the public IOAG website (<https://www.ioag.org>) no later than January 2015.

## **ANNEX-1: OBJECTIVES**

- ToR (a) According to the TOR, areas for consideration for the IOAG objectives and activities include:
- ToR (b) Identifying the space and ground mission operation systems and services needed by potential cooperative programs and projects to achieve their scientific objectives, and maintaining a corresponding cross support mission model.
- ToR (c) Maintaining a catalog of recommended cross supported services and associated interoperable ground and space facilities deployed and operated by the space agencies.
- ToR (d) Promoting the use of internationally recognized standards (for communications, navigation, and mission operation standards) in the design and implementation of cooperative flight programs including spacecraft, ground and space based communication assets.
- ToR (e) Monitoring the work of relevant standards organizations and assisting in the agreement, adoption and implementation of new standards by space agencies.
- ToR (f) Based on identified future cross support scenarios, or based on practical experience and feedback from actually performed cross support, IOAG shall ascertain inconsistencies in cross support services and standards, and inform relevant standards organizations (such as the CCSDS or SFCG), using methods described in the *IOAG Procedures Manuals*, inviting them to update existing standards or to develop new international standards.
- ToR (g) Establishing recommendations for priorities for the implementation of cross supported services and associated interoperable ground and space facilities needed to achieve full interoperability and enunciating policies furthering interoperability. Such IOAG priorities and policies should be passed for consideration to relevant organizations and to the IOP Delegates, using methods described in the *IOAG Procedures Manual*.
- ToR (h) Assessing the resources needed to implement these requirements and inviting IOP Delegates to make these resources available within their agencies
- ToR (i) Working with other bodies (such as CCSDS) to establish technical or reference architectures that will enable operations interoperability and cross support across the member space agencies.
- ToR (j) Encouraging the sharing and distribution of operational techniques to accelerate the deployment of interoperable solutions.

At the 3<sup>rd</sup> Inter-Operability Plenary meeting (IOP-3), held in Toulouse in June 2013 several resolutions were adopted, which can be summarized as follows:



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- The IOP endorses the role of the IOAG as a focal point regarding the communications related cross-support of the participating space agencies.
- The IOP requests the IOAG to maintain the close interaction with the various international coordination groups (CCSDS, SFCG, ISECQ and ICG).
- The IOP acknowledges the good work of the various IOAG working groups and endorses the recommendations of the various working groups regarding the evolution of the proposed communication techniques.
- The IOP encouraged the IOAG to establish contact with other space agencies and to foster the achievements.

### ANNEX-2: TASK DEFINITIONS

WP-Core-14.1: Improvement of completeness, accuracy and visibility of the IOAG Mission Model, Cross Support Mission Model, Communication Assets and Standards Infusion Status .

Definition:	<p>The IOAG Mission Model, the IOAG Cross Support Mission Models and the Communication Assets list need to be maintained up to date in 2014.</p> <p>A table with Communication Assets belonging to non-IOAG members was established in 2012 and need to be extended to more partners and to be maintained up to date in 2014.</p> <p>There is a need to clearly point out the services and supporting standards agreed upon by the IOAG Member Agencies. Such services and standards must be known and their infusion status must be provided by all Member Agencies: This refers to the 2010 Service Catalog #1 and the 2011 Service Catalog #2; those references serve for the evaluation of the agencies infusion plans.</p>
Related Objectives:	TOR – (a), (b), (c)
Activities :	<ol style="list-style-type: none"><li>1. Continue to collect the inputs from the IOAG Members to fill the IOAG tables with information pertaining to assets and missions of their Agencies.</li><li>2. Continue to collect the inputs to fill the IOAG tables with information pertaining to assets and missions of commercial providers.</li><li>3. Synthesize the inputs from the IOAG Members in the table showing the infusion status and plans of the recommended standards, and derive the information required to populate the IOAG-CCSDS Product Agreement (ICPA).</li><li>4. Keep the above elements up to date on the website.</li></ol>
Implementation:	<p>The IOAG Secretariat is responsible for collecting the inputs from the Agencies. The Secretariat is also in charge of managing these elements and their subsequent updates on the website. This will be coordinated via email with the objective to have all information available on the website at IOAG-18 (February 2014).</p> <p>The Heads of Delegations will ensure that the information required to fill these tables is provided in due time by their Agency. They will provide updates as required so that the information on the web pages is always current.</p>



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NASA will conduct the action to simplify and improve the process to collect the inputs from the IOAG members and the SFCG.

- Expected Outcomes:
1. Current and complete IOAG tables and graphics available on the public website.
  2. A Communication assets table with inputs from commercial providers available on the private web site.
  3. A report on infusion status and plans that may be used to populate the IPCA in interface with CCSDS.
  4. A simplified process to collect input data for the IOAG reference tables.

Next steps: The cross support services are mainly those required by the current point-to-point and simple multipoint internetworking cross support scenarios, which will later be enhanced with the elaboration of the SSI Operations Concept and Architecture.

To keep the tables up to date is a collective permanent action of the IOAG delegates, under coordination by the secretariat. It will be a pre-requisite for the new members to provide the information related to their agency before they are formally admitted to IOAG and for the members to maintain their membership status.

**WP-Core-14.2: Follow-on of the definition of a Solar System Internetworking Infrastructure**

Definition	During the IOP-3 the results of the SISG were presented. The main outcomes were an Operations Concept and a draft consolidated architecture. In 2014, the CCSDS will refine this architecture.
	It is agreed to keep the group formally alive in order to have a forum to exchange information and to follow the evolution of the SSI.
Related Objectives	TOR (e), (f), (h).
Activities	The SISG will not regularly meet in 2014 but to exchange information on the progress of the evolution of the SSI and to verify that the IOAG recommendations are considered by the implementing organizations.
Implementation	The activities are mainly performed by the implementing agencies. The IOAG / SISG only has a monitoring role.
Expected Outcomes	Regular reports to IOAG.
Next steps	The concerned agencies will implement the SSI considering the various standards. The IOAG is to follow the evolution and to check that the agreed IOAG recommendations are considered.



WP-Core-14.3: Follow-on of the evolution of Optical Communications.

Definition	<p>The Optical Links Study Group (OLSG) was formed with the objectives first to collect information from the member agencies on their plans and views, and later to assess the need for cross support in various mission scenarios and the required coordination to identify the technical aspects to be agreed upon to enable the Inter-Operability of optical assets.</p> <p>An addendum to the 2011 report was provided at IOAG-16, in December 2012, including the prioritized efforts for standardization.</p> <p>The results of the OLSG were presented to the IOP-3. The main remaining task of the OLSG is to follow the various experiments and to monitor the evolution of the implementation of the optical link communications.</p>
Related Objectives	<p>TOR (e), (f), (h).</p>
Activities	<ol style="list-style-type: none"><li>1. At the IOP-3, it was decided that OLSG would be dormant, but called upon by IOAG on occasions:”to exchange information on the progress of the evolution of optical links;</li><li>2. to follow the optical link experiments and their outcome;</li><li>3. to follow the implementation of relevant standards in the CCSDS;</li><li>4. to report back to the IOAG.</li></ol>
Implementation	<p>The optical link experiments will be conducted in the upcoming years. The OLSG will report on its progress at IOAG -18 meeting and the subsequent telecons.</p>
Expected Outcomes	<p>Apart from regular reports to IOAG no specific output has been defined.</p>
Next steps	<p>The OLSG is to follow the evolution of the OL experiments and relevant standards and is to check whether a corresponding Service Catalogue is to be established. This comprises among others:</p> <ol style="list-style-type: none"><li>1. Iteration with CCSDS on the best practices and on the definition of the elements to be standardized in the domain of optical links, to enable cross supports.</li><li>2. Iteration with SFCG on the recommended practices for utilization of optical links, as required.</li></ol> <p>It is anticipated that the IOAG may need to adapt its service catalogues and its reference tables to better address the optical assets and their associated services.</p>

**WP-Core-14.4: Follow of the evolution of Ka-band (26 GHz) in the domain of LEO satellites.**

Definition	<p>At IOAG-15b it has been decided to create the LEO26SG to facilitate the utilization of 26 GHz Ka-Band (i.e. (25.5-27.0 GHz) direct space to Earth data downlink for future LEO missions, in the context of cross-supports.</p> <p>The results of the 26 GHz WG were presented to the IOP-3. The main remaining task of the 26 GHz is to follow the various experiments and to monitor the evolution of the implementation of the K-band links.</p>
Related Objectives	TOR (a), (c), (f), (i).
Activities	<p>The LEO26SG will :</p> <p>At the IOP-3 it was decided to keep the 26 GHz WG alive:</p> <ol style="list-style-type: none"> <li>1. to exchange information on the progress of the evolution of the K-band links;</li> <li>2. to follow the K-band link experiments and their outcome;</li> <li>3. to follow the implementation of relevant standards in the CCSDS;</li> <li>4. to report back to the IOAG.</li> </ol>
Implementation	<p>The K-band link experiments will be conducted in the upcoming years.</p> <p>The 26 GHz group will report on its progress at IOAG -18 meeting and the subsequent telecons.</p>
Expected Outcomes	Apart from regular reports to IOAG no specific output has been defined.
Next steps	<p>The 26 GHz WG is to follow the evolution of the K-band link experiments and relevant standards and is to check whether a corresponding Service Catalogue is to be established. This comprises among others:</p> <ul style="list-style-type: none"> <li>• Iteration with CCSDS on the best practices and on the definition of the elements to be standardized in the domain of optical links, to enable cross supports.</li> <li>• Iteration with SFCG on the recommended practices for utilization of optical links, as required.</li> </ul> <p>It is anticipated that the IOAG may need to adapt its service catalogues and its reference tables to better address the optical assets and their associated services.</p>

WP-Core-14.5: Future plans concerning the Mission Operations domain

Definition	The Mission Operations Services Coordination Group (MOSCG) has provided a report of the potential benefits of Mission Operations Services to IOP and the IOP has agreed to establish the Mission Operations Services Strategy Group (MOSSG).
Related Objectives	TOR (a), (c), (d), (f), (i).
Activities	<p>The MOSSG has been created at IOP-3 and has started its work end of 2013. The main activities are to:</p> <ol style="list-style-type: none"> <li>1. refine the TOR of the MOSSG;</li> <li>2. To consolidate the membership;</li> <li>3. To follow the tasks as defined in the TOR;</li> <li>4. To follow and guide the work in CCSDS on Mission Operations Services;</li> <li>5. To report back to IOAG.</li> </ol>
Implementation	<p>The MOSSG is to interact regularly in the course of the year. The interaction should comprise regular telecons and potentially one face-to-face meeting if considered relevant.</p> <p>The MOSSG is to report back to the IOAG at the IOAG-18 meeting and at the telecons if progress is to be reported.</p>
Expected Outcomes	The initiative is to conclude with a progress report at IOAG-19 and a final one to be approved at IOAG-20.
Next steps	The MOSSG is to work on a report of the findings. It should follow the activities performed in the CCSDS to be sure that the CCSDS WG is on the right track.



WP-Core-14.6: Elaborate Emergency Cross-Support	
Definition	The Spacecraft Emergency Cross Support Working Group (SECS WG) is to establish a common, standard process, agreed upon by the IOAG member agencies, for providing spacecraft emergency cross support.
Related Objectives Activities	<p>TOR (a), (b), (f), (g), (h).</p> <p>The SECS WG has been created at IOAG-18 and will start its work in the course of 2014. The main activities are to:</p> <ol style="list-style-type: none"><li>1. Identify the specific problem(s), weakness/deficiency, and/or areas for improvement in the inter-agency emergency cross support, past and present.</li><li>2. Define the <u>operational process</u> executed by both the service provider and service users in time of the spacecraft emergency. Focus on the standardization, enhancements, and preparedness of the communications and navigation <u>operational activities</u>.</li><li>3. Define the <u>common policy</u> that governs emergency cross support agreements among the IOAG member agencies. The policy statements shall cover at least support priorities, constraints (e.g. uplink RF licenses), and programmatic accountability.</li><li>4. Identify the key characteristics of the relevant CCSDS cross support services, needed for interoperability, that are unique to spacecraft emergency cross support. Assess these characteristics to determine potential new requirements and/or interfaces for the service providers and service users to comply.</li></ol>
Implementation	<p>The SECSWG is to interact regularly in the course of the year. The interaction should comprise regular telecons.</p> <p>The SECSWG is to report back to the IOAG at the IOAG-19 meeting and at the telecons for progress updates.</p>
Expected Outcomes	The initiative is to conclude with a progress report at IOAG-19 and a final one to be approved at IOAG-20.
Next steps	The SECSWG shall identify the needs of the various agencies and identify an efficient way to implement the relevant tools and procedures.



**WP-Liaison-14.1: Continuation and improvement of the relationship with the International Space Exploration Coordination Group (ISECG)**

Definition	<p>The IOP-2 has identified the International Space Exploration Coordination Group (ISECG) as a crucial organization to interface with the IOAG and to represent the user community of the Space Exploration missions.</p> <p>The IOP-3 has confirmed its interest to maintain the interface between IOAG and ISECG.</p> <p>In 2011, the ISECG published a first version of a roadmap that identifies two scenarios for the precursor exploration missions (Moon and Asteroid). The roadmap provides first architecture elements that need be defined. ISECG published a second version of the roadmap that highlights fundamental benefits which are expected to flow from continued investment in the missions and activities.</p> <p>The IOAG made the ISECG aware of its works in the domain of Space Communications and Navigation, to make sure the IOAG recommendations are taken into account in the ISECG roadmap.</p>
Related Objectives	TOR (a), (b).
Activities	<ol style="list-style-type: none"> <li>1. Make sure that the ISECG is aware and kept updated on the IOAG recommendations and that ISECG do not duplicate activities unnecessarily.</li> <li>2. Bring to the attention of the ISECG the evolution of CCSDS recommendations in the domains of Mission Operations and On board Interfaces, to evaluate if they could be relevant in the context of the Global Exploration Roadmap.</li> </ol>
Implementation	For the activities (1) and (2), ISECG and IOAG will contribute to each other's activities with liaison interface, documents, and presentations in meetings, as appropriate and according to opportunities.
Expected Outcomes	<p>No duplication of activities on communications and navigation within the ISECG.</p> <p>A written report is not expected for this activity.</p>
Next steps	<p>Adaptations of the service catalogs or the SSI documentation should be revisited, as needed, to reflect the high level Exploration Mission requirements.</p> <p>The interface with ISECG being potentially permanent, the activity (1) is expected to be iterated and the exchanges will be as frequent as required to reflect the improvements in the definition of the exploration architecture to be reflected in subsequent versions of the roadmap.</p> <p>The reporting to either organization will be made, as felt appropriate, on the occasion of an ISECG or an IOAG meeting (or videoconference).</p>



**WP-Liaison-14.2: Continuation and improvement of the liaison with the Consultative Committee for Space Data Systems (CCSDS)**

Definition	<p>The IOAG has established since 2004 a permanent liaison with the CCSDS. From early 2006, the CCSDS Engineering Steering Group (CESG) co-chairs serve as liaison agents between the two organizations. In turn or depending on opportunities, they attend the IOAG meetings and report on the statements that they collect on the CCSDS side, during the CCSDS Management Council meetings. Also, they convey the IOAG messages back to CCSDS Committees. This interaction was confirmed by the IOP-3.</p>
Related Objectives	<p>TOR (c), (d), (e), (f), (g).</p>
Activities	<ol style="list-style-type: none"> <li>1. Continue to use the existing liaison as the main support for the exchanges between the two organizations. Nestor Peccia (ESA) acts as liaison officers between IOAG and CCSDS.</li> <li>2. Update the “IOAG– CCSDS Product Agreement” tool (ICPA) initiated in 2012, for the two organizations to formulate priorities on the development of standards (IOAG) and to report on the progress made to take such requests are taken into account (CCSDS) so as to identify any issue in this process and to concentrate on their resolution.  J.M. Soula and G.P. Calzolari have been tasked to main the ICPA on the IOAG side and to interact with the CCSDS accordingly.</li> <li>3. Hold intermediate meetings between IOAG annual plenary meetings, via tele/video conference, scheduled in a way that will allow to efficiently convey requests and report messages between the two organizations, via the liaison officers.</li> </ol>
Implementation	<p>The activities (1) and (2) are under the responsibility of the nominated liaison officers.</p> <p>Activity (3) will be coordinated by the IOAG Secretariat together with the liaison officers.</p> <p>The liaison activities are expected to be summarized at the IOAG-18 in order to consolidate a way forward on the related subjects.</p>
Expected Outcomes	<p>Improved coordination on the development of the standards needed by the projects.</p> <p>ICPA effective between the two organizations and used to analyze the deviations between developments and needs.</p> <p>Regular reports are to be provided to the IOAG.</p>
Next steps	<p>The need and the opportunity of joint meetings at a regular pace is not identified in the short term but an IOAG slot on the agenda of the CMC meetings will be planned. This will be used to have focused discussions on the subjects of common critical interest.</p> <p>The liaison with CCSDS being permanent, the activities are expected to be continuous and the exchanges will be as frequent as required and the reporting to either organization will be made, at the minimum once a year, on the occasion of CCSDS or IOAG meetings (or videoconferences).</p>



**WP-Liaison-14.3: Continuation and improvement of the liaison with the Space Frequency Coordination Group (SFCG)**

Definition	<p>The IOAG has established since 2005 a permanent liaison with the Space Frequency Coordination Group (SFCG). From then, a member of SFCG serves as liaison officer between IOAG and SFCG. The liaison officer attends the IOAG or SFCG meetings and reports on the statements that they collect on the other side.</p> <p>The coordination is established to reach agreement on how to address the spectrum and frequency issues that may arise on the SFCG or ITU sides.</p> <p>This interaction was confirmed by the IOP-3.</p>
Related Objectives	TOR (c), (d), (e), (f), (g).
Activities	<ol style="list-style-type: none"> <li>1. Enrico Vassallo (ESA) acts as liaison officer between IOAG and SFCG and the main support for the exchanges between the two organizations. In the short term, this activity will concentrate on the preparation of the relevant ITU WRC conferences and the positions of the IOAG agencies.</li> <li>2. SFCG liaison participates to check completeness or discrepancies, to correctly interpret inputs and to provide comments to the IOAG mission model.</li> <li>3. Collect the suggestions of the SFCG for future improvements of the interface, in particular on the expectations of the SFCG on inputs to their works.</li> <li>4. Contribute to each other's activities with liaison statements, documents, and presentations in meetings, as appropriate.</li> </ol>
Implementation	<p>The activities (1, 2, 3 and 4) are under the responsibility of the nominated liaison officer: Enrico Vassallo (ESA).</p> <p>The activities (3) and (4) will be conducted with the support of the IOAG Secretariat.</p> <p>The liaison activities are expected to be summarized at the IOAG-18 in order to consolidate a way forward on the related subjects.</p>
Expected Outcomes	<p>Coordination made on the items on the agenda of the relevant ITU WRC conferences.</p> <p>Improved IOAG Mission Model that better reflects the mission profiles of SFCG interest.</p> <p>Improved processes and relationship between SFCG and IOAG.</p>
Next steps	<p>The liaison with SFCG being permanent, the activity (4) is expected to be continuous and the exchanges will be as frequent as required and the reporting to either organization will be made, at least once a year, on the occasion of a SFCG or an IOAG meeting (or videoconference).</p>

**WP-Liaison-14.4: Definition and implementation of a liaison with the International Committee on Global Navigation Satellite Systems (ICG)**

Definition	<p>At IOAG-14 the idea of a new liaison with the International Committee on Global Navigation Satellite Systems (ICG) to exchange information on the user requirements and possible services in the domain of Positioning, Navigation and Timing (PNT), in particular for the GNSS Space Service volume, was approved.</p> <p>In 2011, the IOAG was given a position of Observer with the ICG. Exchanges of views were initiated up to IOAG-16 and actions were identified then to prepare for a reporting to the ICG, on the Navigation Mission Model.</p> <p>In 2013 the IOP-3 requested the IOAG to maintain the interaction with the ICG. The IOAG chairman participated in the ICG-8 meeting and clarified the relationships,</p>
Related Objectives	TOR (c), (d), (e), (f), (g).
Activities	<ol style="list-style-type: none"> <li>1. The IOAG chairman, M. Schmidt, will interact with the ICG with the support of James Miller (NASA) as liaison officer. The participation to ICG meetings will be decided on a case by case basis. In the short term, this activity will concentrate on the Navigation Mission Model and the requirements for the GNSS Space Service Volume. A list of the issues to be addressed in the short, medium or long term, under this liaison, should be established and updated to support the reporting on both sides.</li> <li>2. Establish processes and organization within IOAG that enables the reception and processing of special requests from the ICG.</li> <li>3. Contribute to each other's activities with liaison statements, documents, and presentations in meetings, as appropriate.</li> </ol>
Implementation	<p>The activity (1) is under the responsibility of the IOAG chairman and the nominated liaison officer.</p> <p>The activities (2) and (3) will be conducted with the support of the IOAG Secretariat.</p> <p>The interface activities are expected to be summarized at the IOAG-18 in order to consolidate a way forward on the related subjects.</p>
Expected Outcomes	<p>Navigation Mission Model submitted by the IOAG Agencies to the ICG.</p> <p>A further presentation about the IOAG status to ICG is currently not envisaged.</p>
Next steps	<p>The relationship with ICG being potentially permanent, the activities are expected to be continuous and the exchanges will be as frequent as required and the reporting to either organization will be made, at least once a year, on the occasion of an ICG or an IOAG meeting (or videoconference).</p>



**WP-Processes-14.1: Improvement of the IOAG internal processes**

Definition	<p>The IOAG Secretariat supports the organization in many of its areas of activities and plays a central role in the flow of information within the IOAG, with external organizations of interest and with the agencies or their partners.</p> <p>The tools utilized by IOAG and managed by the Secretariat need be kept as efficient as possible so as to facilitate the activities of all.</p>
Related Objectives	<p>This is a continuous activity within IOAG.</p>
Activities	<ol style="list-style-type: none"> <li>1. Continue to improve the IOAG website on the public side, to reflect the role, activities and achievements of the IOAG. The final outcomes of the IOAG core tasks in the present Work Plan should be displayed on the public website of IOAG.</li> <li>2. Continue to improve the IOAG website, on the secure side, to provide tools for the members to access the documentation related to each meeting. Special areas of interest are the action items (lists, elements of progress or closure), the resolutions submitted for discussion, the documents submitted for review and comments, the announcements of events in the IOAG domain of interest, the schedules for next IOAG videoconferences or meetings.</li> <li>3. Identify opportunities and propose ways to support the promotion of the services selected by the IOAG to support the cross support scenarios, through presentations at workshops or conferences.</li> <li>4. Identify how to efficiently exchange information with the organizations having liaisons with IOAG: initially, ISECG, CCSDS, SFCG and ICG. Also, the schedules of the meetings of such organizations could be integrated into a global IOAG schedule (2 year horizon).</li> </ol>
Implementation	<p>The Secretariat is in charge of the improvement of all processes. The schedule of implementation of the different tasks is made by the Agency funding the Secretariat. The implementations may need an acceptance by the IOAG Chairman only or by the members, depending upon the case.</p>
Expected Outcomes	<p>Up-to-date website.</p> <p>Reliable tools and processes.</p> <p>Better knowledge of IOAG activities, achievements and recommendations, inside and outside the IOAG community.</p> <p>Support for presentation of IOAG's role, achievements and plans at the Space Ops 2014 conference.</p>
Next steps	<p>New objectives will be established every year so as to improve the outreach of IOAG and its internal efficiency.</p>

**ANNEX-3: PARTICIPATION OF AGENCIES**

<b>X:</b> <b>x:</b>	<b>Lead Function Participant</b>	<b>Secretariat</b>	<b>Chairman</b>	<b>ASI</b>	<b>CNES</b>	<b>DLR</b>	<b>ESA</b>	<b>ISRO</b>	<b>JAXA</b>	<b>NASA</b>	<b>RFSA</b>	<b>UKSA</b>	<b>KARI</b>	<b>CSA</b>
	<b>CORE TASKS</b>													
	<b>Mission models, Communication Assets and Standards Infusion</b>	X		x	x	x	x	x	x	x	x	x	x	x
	<b>Solar System Internetwork (SISG)</b>				x	x	X		x	X		x		
	<b>Optical Links Study Group (OLSG)</b>				x	x	X		x	X				
	<b>Mission Operations Services Strategy Group (MOSSG)</b>			x	x	x	X		x	X				x
	<b>LEO 26 GHz Study Group (LEO 26SG)</b>				x	x	X		x	X				
	<b>Emergency Spacecraft Cross Support Group</b>				x	x	X		x	X				x
	<b>COLLABORATIONS WITH OTHER ORGANIZATIONS</b>													
	<b>Interface with ISECG</b>	x	X							x				
	<b>Liaison with CCSDS</b>	x	x				X							
	<b>Liaison with SFCG</b>	x	x				X							
	<b>Interface with ICG</b>	x	X							x				
	<b>IMPROVEMENT OF IOAG TOOLS AND METHODS</b>													
	<b>Improvement of tools and methods</b>	X	x							x				



**ANNEX - 4: Organizational Relationship**

