

## International Meetings for Space Agencies

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### 1. Preamble

In the world, there are many space agencies and each agency promote their space programs and they work under the frame work where they cooperate each other for common programs. e.g., as one of schemes, the space networks which consist of earth and relay stations located on the ground or in space are for the tracking and control of satellites for space exploration and earth observations.

To operate satellite systems effectively in these space networks, it is required to coordinate spectrums and data interface in advance. In this review, activities in space agencies are to be introduced and the next review “Discussion on optical communications started in CCSDS” will be continued in the next April / May issue of Space Japan Review.

### 2. Interoperability Plenary

According to Ref [1], it is introduced that there are constraints of budget and working force in space agencies and it has been required to realize additional economies by sharing their large cost investment. e.g., It is an approach to increase cooperative programs where more than 2 agencies would do design, manufacture, launch and operation. Following this trend of international cooperation, Inter-Agency Consultative Group (IACG) which became Interagency Operations Advisory Group (IOAG)<sup>[2]</sup> was formed with SFCG<sup>[3]</sup> and CCSDS<sup>[4]</sup> to be later introduced and they have conducted their cooperative programs and standardizations for reduction of operation cost among space agencies.

However, the interoperability has not yet been achieved and they convened the InterOperability Plenary (IOP)<sup>[5]</sup> in 1999 to promote the cross support operations among space agencies. In this first IOP, they resolved to form the Interagency Operations Advisory Group (IOAG) and the second IOP was held in 2008, though this plenary will not so often be held.

### 3. Interagency Operations Advisory Group

In IOAG formed by IOP introduced above, methods for effective interoperability are discussed to achieve their missions by representatives of space agencies and their real operations are conducted.

In this meeting, IOAG members define contents of their services and operation scenarios required for their operations and request the following organizations to work on their spectrum managements and standardization of data interfaces.

These specialized organizations have responsibilities for spectrum management and standardization of data interfaces, so the former organization is “Space Frequency Coordination Group (SFCG)” and the latter one is “Consultative Committee for Space Data Systems (CCSDS)”. The relations among these organizations are shown in Figure 1.

### 4. Space Frequency Coordination Group

Definitions and applications of spectrums used in space are dealt with in a sector under the specialized

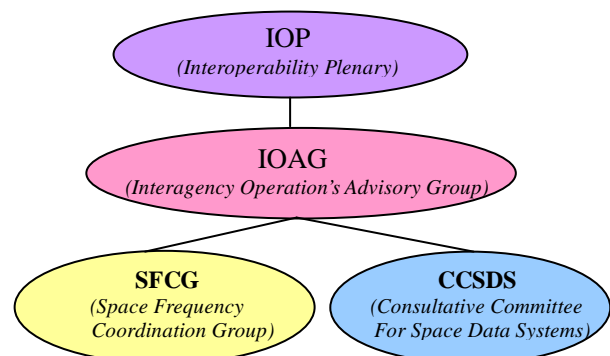


Figure 1: Structure of Organizations

organization (ITU)<sup>[6]</sup> of United Nations which is called “ITU-R” and review of radio regulation and assignment of new spectrum are coordinated in the world conference held once every few years. The ITU structure is briefly shown in Figure 2.

Responsible administrations and operators in each country attend the world conference and there exist study groups in the ITU-R for each service and they are categorized into services. Such as, Fixe Service (FS), Mobile Service (MS), Fixed Satellite Service (FSS), Mobile Satellite Service (MSS), Aeronautical Mobile Service (AMS), Space Research Service (SRS) and other services.

Space agencies mainly belong to Space Research Service (SRS) and conduct the maintenance and improvement of operational environment and acquiring new spectrums. On the other hand, the agencies hold a SFCG meeting for spectrum coordination once a year in order to consolidate the opinion and comments for the international conference.

In this meeting, methods for several issues in ITU are mainly discussed and spectrum coordination for avoidance of frequency conflict in their operations is also discussed. In this way, the maintenance and improvement of operational environment in Space Research Service (SRS) are realized by SFCG working with ITU.

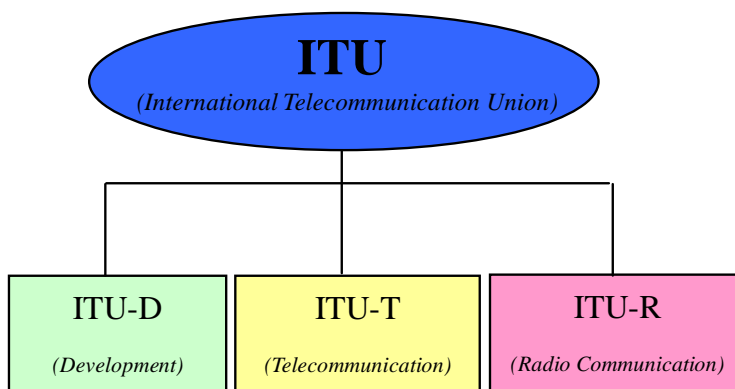


Figure 2: ITU Structure

## 5. Consultative Committee for Space Data Systems

The interoperability among space agencies can not be realized only by acquiring spectrums in transmission path, because the compatibility of data formats and protocols between communication nodes are also required. The organization which work on this technical definition is called “CCSDS”. This organization consists of representative engineers from each space agency and there exist working groups according to each layer defined in OSI reference model and it realizes common data interface among space agencies by making technical documents.

The representative of Japan for CCSDS is Japan Aerospace Exploration Agency (JAXA) and as a member agency for CCSDS, JAXA joins CCSDS Management Council (CMC) which manages the operations in CCSDS. In addition, there are organizations as observers in CCSDS and National Institute of Information and Communications Technology (NICT) technically support JAXA.

The technical documents mentioned above are to be used not only for systems for space agencies, but also to be officially issued as ISO<sup>[7]</sup> standards. The ISO structure is simply shown in Figure 3.

In ISO, there are several groups in the technical committee 20 (TC20) related to aircraft and space vehicles. One is called “SC14” for Space systems and operations and the other is called “SC13” for Space data and information transfer systems. The international standards are created according to each purpose. In this way, the CCSDS activity working with ISO realizes mutual data exchange among communication nodes in space and the society of Japanese Aerospace Companies (SJAC)<sup>[8]</sup> has a role as a Japan’s secretariat for SC13 and SC14 in ISO/TC20.

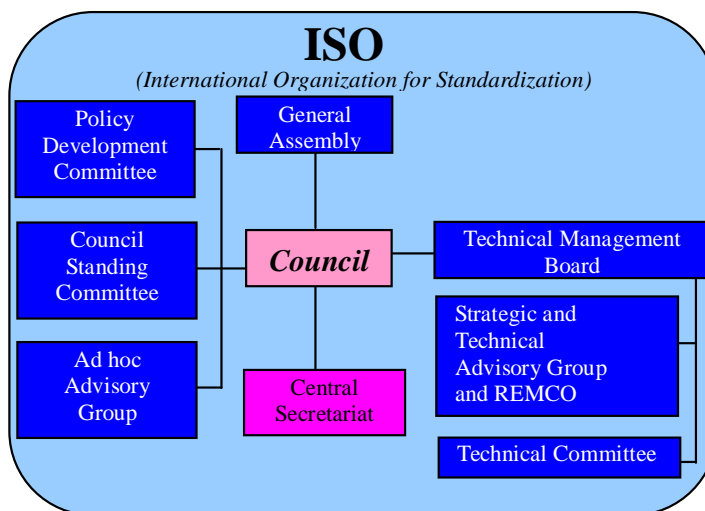


Figure 3: ISO Structure

## 6. CCSDS secretariat in JAXA

The CCSDS secretariat in JAXA is for relevant issues to CCSDS in Japan and is located in the consolidated

space tracking and data acquisition department of JAXA. e.g., it is required to acquire and use spacecraft identification (SCID) to be assigned for satellites which use data transmission and structures compatible for CCSDS standards. The application of acquiring and disposing of this spacecraft identification is dealt with by CCSDS secretariat in JAXA and it needs to be confirmed by the secretariat (e-mail: JAXA.CCSDS@jaxa.jp) in advance.

## 7. Conclusions

Space Agencies has ever realized their interoperability with discussion on space network structure mainly for near earth and deep space missions. It is expected the scope of discussions among space agencies will be changed for more diversified programs and their cooperation for their purposes through meetings will contribute to realizing their programs.

## 8. References

- [1] CCSDS A02.1-Y-2.1b ORGANIZATION AND PROCESSES FOR THE CONSULTATIVE COMMITTEE FOR SPACE DATA SYSTEMS
- [2] Interagency Operations Advisory Group: <https://www.ioag.org>
- [3] Space Frequency Coordination Group: <https://www.sfcgonline.org>
- [4] Consultative Committee for Space Data Systems: <http://public.ccsds.org/>
- [5] InterOperability Plenary: <https://www.interoperability-plenary.org/home.aspx>
- [6] International Telecommunication Union: <http://www.itu.int/>
- [7] International Standardization Organization: <http://www.iso.org/>
- [8] Society of Japanese Aerospace Companies: <http://www.sjac.or.jp/>

### Authors

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In 1998 he started working in former NASDA and has been engaged in developments of experimental ground systems of OICETS satellite and systems of Wideband Inter-Networking Demonstration Satellite (WINDS). After these programs, he has been engaged in spectrum management, development of OICETS experimental ground system and spectrum coordination for Data Relay Test Satellite (DRTS). In addition, since around the year of 2003, he has worked for ITU and SFCG and for IOAG and CCSDS since 2007.

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In 2005, he started working in Space Engineering Development Co.Ltd and has been engaged in mission data analysis of optical communication experiments for OICETS. Recently, he works for a CCSDS office placed in JAXA for technology standardizations.