

India

Agenda Item – 8

Space Debris

Madam Chairperson and Distinguished delegates,

The Indian delegation would like to update on the developments and activities carried out by India in the area of Space Debris and in particular in Space Situational Awareness and management Activities.

It is of great concern for all space operators, the growing threats of Space Debris and its collision potential to operational spacecraft. Proper assessment of collision threats, mitigation requirements and executing remedial measures are of very importance for sustainable utilisation of the space for the benefit of mankind. With the growing presence of mega constellations in Low Earth Orbits, it is imperative to take extra measures technically and managerially to contain the threats caused by Manmade Orbital Debris.

Indian Delegation appreciates the efforts taken by Space Debris Working Group of this Sub-Committee and the Inter-Agency Space Debris Coordination Committee (IADC) for their technical support and well thought mitigation guidelines. India has been progressing well in its efforts to safeguard space assets through well planned studies and initiatives to set up observational facilities. Indian delegates attended the 37th IADC meeting held at ROME hosted by ASI during 7-10 May 2019. Technical presentations covering ISRO's activities on space debris studies and mitigation were presented in that meeting. ISRO delegation attended First International Orbital Debris Conference (IOC 2019) held at Sugarland, Houston and held discussions with NASA ODPO team.

A brief of activities carried out by Indian Space Research Organisation (ISRO) in Space Debris Mitigation and Management during 2019 is presented herewith.

Madam Chairperson,

ISRO delegation would like to bring to the notice of this august group that the recently formed Directorate of Space Situational Awareness and management has initiated many activities with an objective of coordinating all the efforts related to Space Debris studies, mitigation and space situational awareness. This Directorate will strengthen all the activities and initiate new activities to make ISRO self-sufficient in space object observations, data processing, cataloguing and analysis. A multi object tracking radar (MOTR) was established at Sriharikota range of ISRO and the space objects tracking expected to commence by March 2020. ISRO has installed SSN with two optical telescopes and initiated processes of further augmenting it with a high end RADAR for LEO object tracking and an optical telescope dedicated for GEO objects imaging. These observational facilities will help ISRO to have accurate orbital

information of space objects for better management of space debris and threat mitigation.

In 2019, there were five PSLV and one GSLV Mk3 missions and all missions successfully placed the satellites in their intended orbits. India has placed 7 Indian payloads during the period, including GSAT-31. In all these launch vehicle missions, the excess fuel in the propellant tanks of spent last stage was vented out and the stage was passivated successfully to avoid any possible explosion at a later time. The satellite separation sequences for PSLV C45, PSLV-C47 and PSLV-C48 were designed ensuring collision free separation and collision free relative orbital motion between multiple satellites and spent rocket body.

For all ISRO launches, COLLision Avoidance (COLA) assessments are carried out to find the safe liftoff times within the designated launch windows, by assessing the potential close conjunctions with space objects during its ascent phase and initial orbital phase. For all launches nominal lift-off time was cleared based on COLA studies.

Madam Chairperson,

ISRO has been regularly carrying out Space Object Proximity Analysis (SOPA) to identify potential threats from catalogued space objects to Indian operational LEO satellites and has been regularly analysing and resolving the alerts raised by CSpOC. In 2019, eight times Collision Avoidance Manoeuvres were carried out to avoid potential critical collisions of Indian LEO spacecraft with space debris objects. The regular Orbit Manoeuvres of Indian LEO satellites totalling of 129 numbers are cleared after SOPA analysis. ISRO thanks CSpOC for providing regular close conjunction alerts for Indian satellites.

Madam Chairperson,

ISRO participated in the Re-entry Test Campaign (2019) of the Inter Agency Space Debris Coordination Committee (IADC) for the test object Electron second stage (identified via COSPAR ID 2018-010D or #43166), the object re-entered Earth's atmosphere 3rd March 2019. ISRO's various models for the prediction of re-entry time and location provided consistent and good results. Considering the predictions during the entire campaign in the exercise and during the final phases of re-entry, ISRO prediction was one among the best.

ISRO like to place on record its commitment to Post Mission Disposal at the End-of- Life to restrict the long term presence of space objects at the high valued orbits. Cartosat-2 and Resourcesat-1 (IRS-P6) were deorbited to lower orbits at the end of operational life so that the orbital lifetime expected is less than 25 years. INSAT-4A was disposed to Super Synchronous Graveyard Orbit with perfect execution of post mission disposal plans. All the power sources were switched off in this spacecraft.

In 2019, eight rocket bodies of ISRO launch vehicles re-entered Earth's atmosphere, PSLV-C40 R/B on 17th January, PSLV-C39 R/B on 2nd March, GSLV-F11 R/B on 5th April, GSLV-F05 R/B on 29th April, GSLV Mk3 –D2 R/B on 12th May, GSLV-Mk3 –M1 R/B on 16th October, GSLV-F08 R/B on 4th December and PSLV-C15 DLA on 17 November 2019. All these rocket bodies have impacted in Ocean.

Madam Chairperson,

ISRO has been studying various aspects of debris environment and its evolution, the effects of Mega constellations, indigenous software codes for orbital propagation methodologies, re-entry prediction models, collision avoidance models, collision probability models and active debris techniques. The Directorate of Space Situational Awareness and Management coordinates with various space agencies in international collaborations on data sharing, analysis and threat mitigations.

ISRO launched a project called NETRA - NEtwork for space object TRacking and Analysis, primarily meant for Space Situational Awareness and Management (SSAM). The prime goal of the project is to establish a network of observational facilities and a control centre, to identify, track and catalogue space objects that threaten the safety of Indian space assets. As mentioned earlier, under this project SSN will be augmented with an optical telescope in northern part of India and a tracking radar in north eastern part of India. The control centre will process the tracking information from the observational network and provide accurate & timely proximity alerts to mission operations centres.

Madam Chairperson,

Very Large Constellations proposed by various private players have become a serious concern for useful and meaningful space operations in Low Earth Orbit. Starlink already with 120 objects in orbits at 550 km, has given large number of potential collision threats to an Indian spacecraft and to mitigate the continuing threat, ISRO raised the orbit of the spacecraft by 20km, as a onetime measure. This august body need to consider the threats from mega constellations very seriously.

Madam Chairperson,

ISRO dedicates all its efforts in technical co-operation and data sharing voluntarily with space faring nations for an effective and efficient monitoring of Space Debris objects and for the implementation of mitigation measures to contain the threats posed by Space Debris. Indian delegation fully supports the implementation of mitigation measures on a voluntary basis through their respective national mechanisms to mitigate threats from space debris.

Thank you Madam Chairperson.