61st STSC – UNCOPUOS, 2024

Long Term Sustainability Efforts by India in 2023

Dr. A. K. Anil Kumar

Associate Director, ISTRAC, ISRO

Vice President, IAF (Relations with International Organizations)

Unveiling of Indian Space Policy 2023

Key points

- IN-SPACe: dual role of Promoter and Authorizer of space activities.
- **Compliance with Space debris mitigation guidelines assessed before authorization**

Establish a framework for safe and sustainable space operations, in compliance with relevant international space debris mitigation guidelines.

Formulate guidelines for meeting safety and sustainability requirements of space objects

Undertake R&D for long-term sustainability of space activities

Develop SSA capabilities

Issue authorisation for planned re-entry

Share observation data with relevant stakeholders

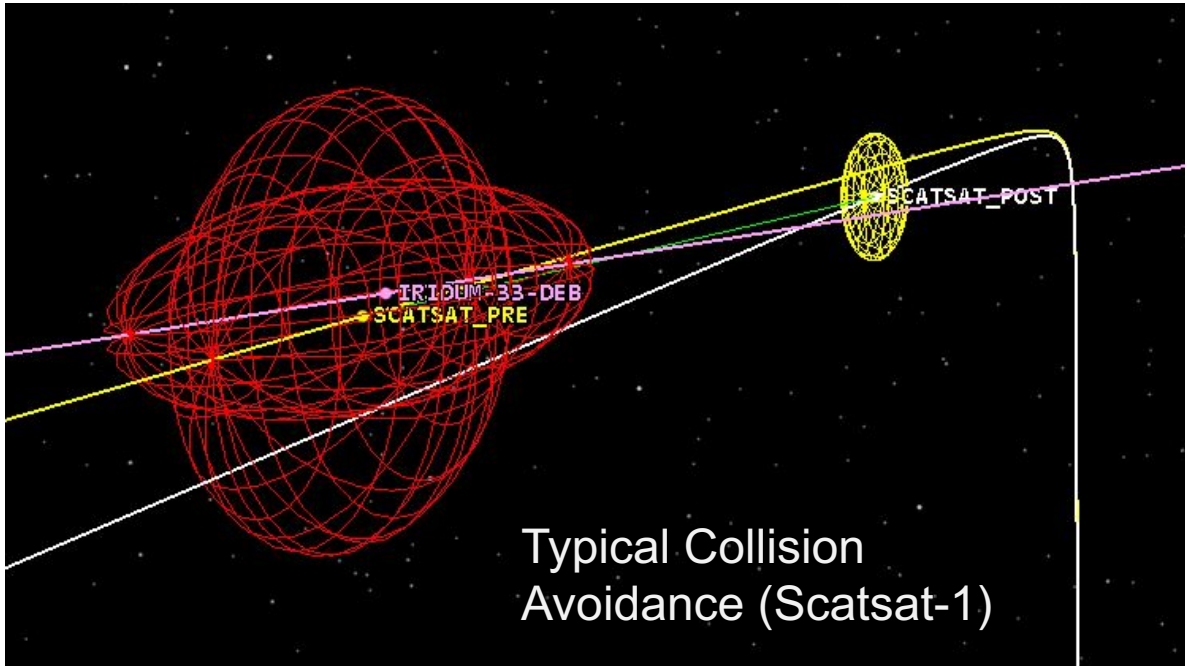
Close Approach Analyses for Spacecraft

- Space Object Proximity Analysis for all LEO and GEO satellites
- Collision avoidance maneuvers (CAM) recommendations based on detailed analysis of close conjunctions and alerts from USSPACECOM.
- Screening of any planned Orbit Maneuver (OM) including CAM
- Coordination with external agencies for orbital data and information exchange to improve accuracy of analysis

Collision Avoidance Manoeuvres in 2023

LEO Satellites	GEO Satellites
18	5

Conjunction analyses for Deep-space missions (Chandrayaan-2, Chandrayaan-3, Aditya-L1) also carried out regularly

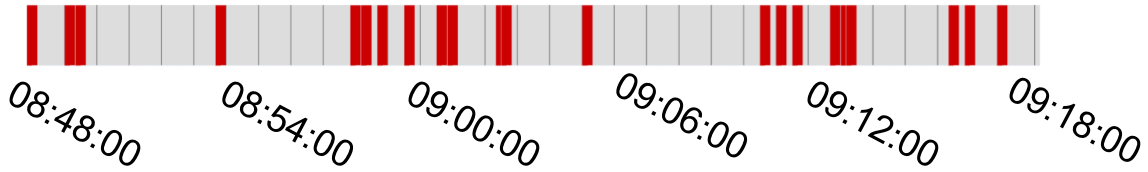


Typical Collision Avoidance (Scatsat-1)

COLlision Avoidance (COLA) Analysis for Launch Vehicles

- COLA performed for all launches to select collision free liftoff timings
- Analysis for ascent (and descent, in case of upper stage re-start) phase of orbital stages of LV and initial orbital phase of injected payloads
- Notification to USSPACECOM and coordination with other S/C operators

Example: PSLV-C55/TeLEOS-2 launch **delayed by 1 minute** to avert close conjunction with Polar Scout Yokon S/C



All timings in UTC

22 Apr 2023

Nominal lift-off 08:49 UTC → Actual lift-off 08:50 UTC

Liftoff time changes based on COLA (2023)

Mission	Nominal liftoff time (UTC)	Delayed by	Actual liftoff time (UTC)
PSLV-C55/ TeLEOS-2	22 Apr 2023, 08:49:00	1 min	22 Apr 2023, 08:50:00
LVM3-M4/ Chandrayaan-3	14 Jul 2023, 09:05:13	4 sec	14 Jul 2023, 09:05:17
PSLV-C56/ DS-SAR	30 Jul 2023, 01:00:00	1 min	30 Jul 2023, 01:01:00

Post Mission Disposal

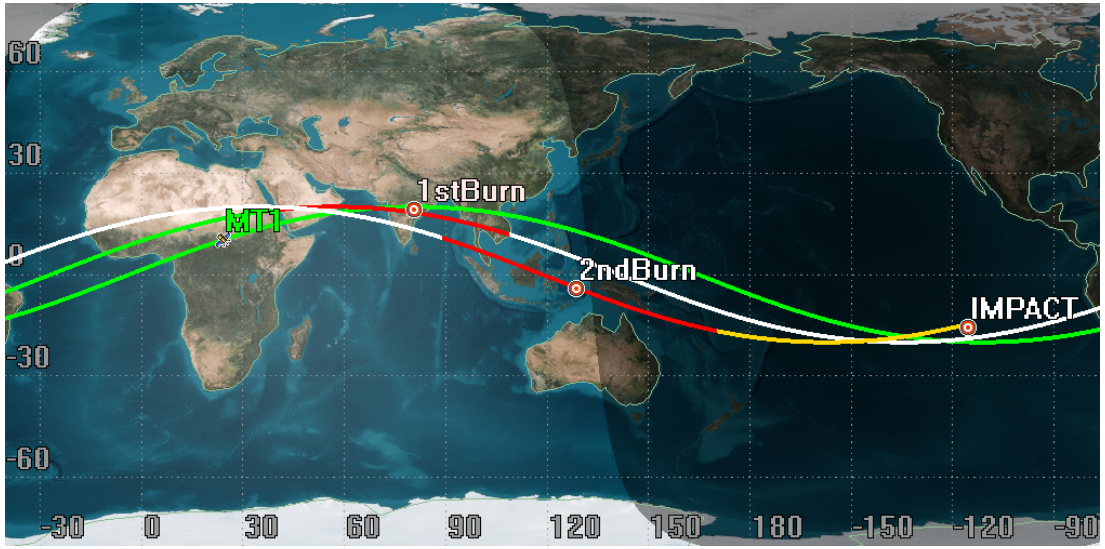
Controlled Re-entry Experiment of Meghatropiques-1

Launch date: 12 Oct 2011

Operational orbit: 867 km, 20 deg inclination

Risks

- Post mission orbital life time > 100 years
- 125 kg excess fuel



- Total 20 perigee de-boost maneuvers
- Extremely challenging exercise due to multiple on-board constraints
- Final impact over South Pacific ocean on 7 March 2023

Perfect compliance with IADC guidelines

De-orbiting of PSLV-C56 Upper stage

- After injection of payloads at 536 km altitude, PS4 deorbited to 300 km by two manoeuvres and passivated
- Atmospheric re-entry within 1 month

Disposal of GSAT-12 to Super-synchronous Graveyard Orbit

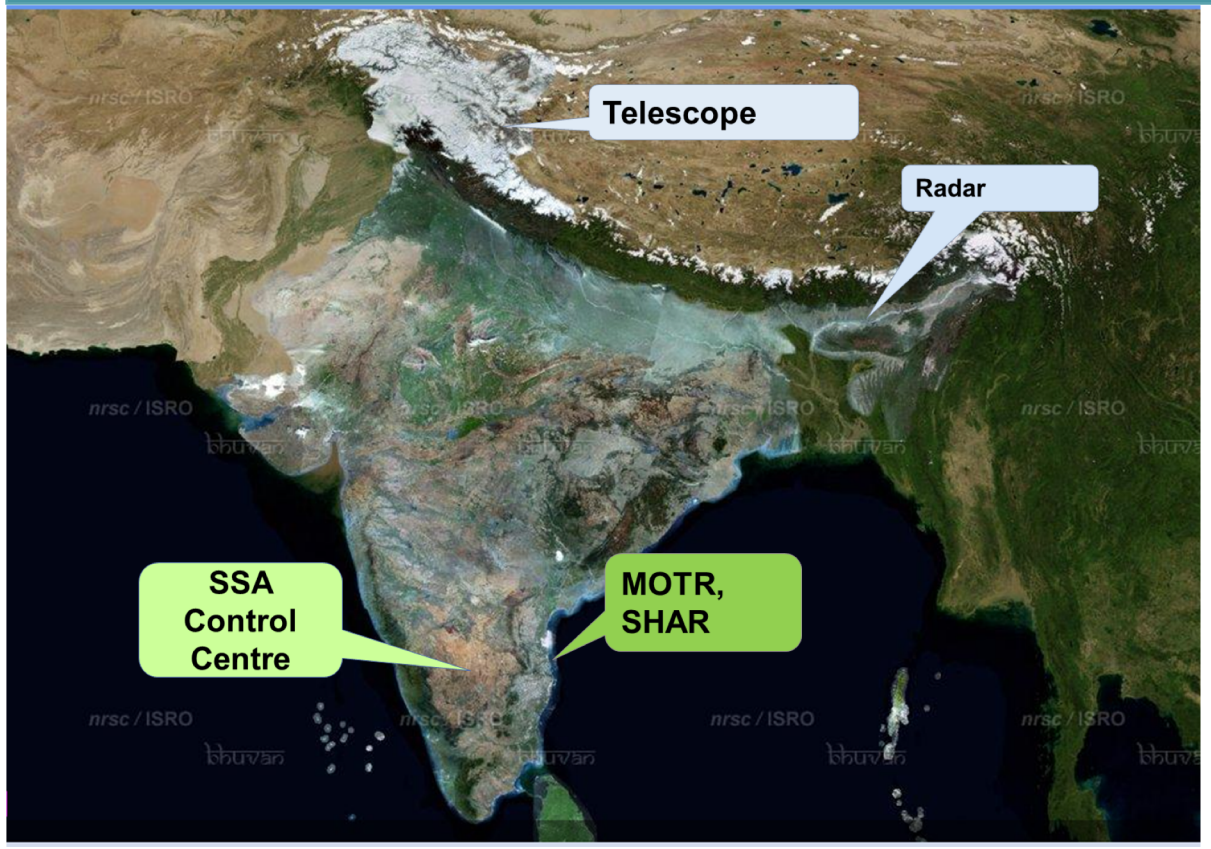
- Raised to 400 km, nearly circular orbit above GEO through a series of manoeuvres (16-23 Mar 2023)
- Passivation before decommissioning

Observational Capacity Building

Multi Object Tracking Radar (MOTR)

- L-band Phased Array Radar at Sriharikota, 10-object simultaneous tracking capability (50 cm size up to 800 km slant range), refurbishment completed, trial tracking in progress

NEtwork for space object TRacking & Analysis (NETRA)



Radar Observation Network for LEO object

Optical Observation Network for GEO object

Control Centre: processing observational data, analyzing space situation, data exchange and collaboration

International Cooperation, Awareness Raising

International workshop on "SSA & STM – Growing Concerns on Space Environment", 11-13 Jan, 2023

International Conference on Spacecraft Mission Operations with theme of "Emerging Technologies and Automation in Ground & Space Segment mission operations (ETAGS) : 8-9 June, 2023

Student workshop on SSA-STM in October 2023

इसरो isro
IN-SPACe

Regular interaction with emergent private operators for authorization and registration through IN-SPACe

Thank You