Data Sharing for Space Traffic Management

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Agenda

- Why was the SDA created

- Introduction to the SDA

- SDA Participants

- SDA's Main Services (Current)

- Why is SDA unique

- SDA Current challenges and opportunities

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Why was the SDA created

- Seek and facilitate improved management of the shared resources of the Space Environment
- Enhance the safety and integrity of satellite operations through wider and improved coordination between satellite operators
- Improve the accuracy, timeliness, and transparency of collision avoidance predictions
- Adopt best practices across members
- Provide a computationally and legally secure framework for operations
- Combine authoritative owner/operator ephemerides to obtain best result

Introduction to the SDA

- The SDA is an association of 30+ satellite operators focused on **space safety**.

- SDA Members collaborate and pool operational data to enable better **Conjunction Assessment** (CA) and **Space Traffic Coordination** (STC), to mitigate the risks of satellite operations and preserve the space environment.

- The SDA's **legal structure** enables secure pooling of operational data and ensures that these data are used exclusively for the intended purpose.

- The SDA provides services through the **Space Data Centre** (SDC) webservice.

- The SDA operates on a non-profit basis and comprises public, commercial, civil/scientific.

SDA's Main Services (Current)

1) SSA product consistency and quality control checks.

2) O/O Eph vs O/O Eph Conjunction Assessment.

3) Ephemeris vs SP catalogue screening and summary of fleet-wide conjunctions.

All services are agnostic of orbit domain, mission type, size.

The SDA also raises awareness on satellite operators' best practices and shares relevant news and information.

Why is SDA unique

- SDC scans **<u>all</u>** input data (TLE, SP, Eph) to find and report irregularities.
- Assesses veracity, accuracy, timeliness, and completeness of all SSA products.
- Ephemeris are **ingested**, not shared.
- Ephemeris are **normalised**.
- Ephemeris **includes** effects of manoeuvres.
- SDC scope and content are unique in the spaceflight safety arena.

CDM ID 623334019

Creation Date: 2023-12-13 06:19:30.000000 UTC (2.0 hours ago)

Upload Time: 2023-12-13 07:51:50 UTC (0.5 hours ago)

Conjunction for 28628/INMARSAT 4-F1 [P] and 41729/JCSAT-16 [+]

CDM min range at TCA (2023-12-13 11:34:17.657000 UTC; 0.13 days out) = 4.989 km

Ephemeris vs. CDM/TLE Comparison

Primary	SP Range at TCA: 171.862 km	TLE Range at TCA: 171.824 km

Primary ephemeris epoch: 2023-12-06 00:00:00.000 UTC (7.35 days old)

CDM vs. TLE Comparisons

Primary Range at TCA: 0.182 km	Secondary Range at TCA: 10.068 km

CDM Conjunction Comparisons

SP vs. SP	TCA: 2023-12-13 11:34:17.657 UTC, 4.989 km
Ephemeris vs. SP	TCA: 2023-12-13 11:34:36.330 UTC, 176.481 km
Ephemeris vs. TLE	TCA: 2023-12-13 11:34:54.588 UTC, 185.698 km
Ephemeris vs. Ephemeris	N/A

Complete AGI Viewer Scenario

Notes:
- Valid SDC ephemeris for primary
- No SDC ephemeris available for secondary

SDA Challenges and Opportunities

Challenges

- Infeasible to scale up without public funding and support.

- Divergence of regulatory regimes.

- Culture/language barrier.

- Technology outpacing regulators, the rise of mega constellations, In-Orbit Servicing, electrical propulsion.

Opportunities

- A proved working model for the implementation of COPUOS Long-term Sustainability guidelines on "Safety of space operations"
    - B.1: contact information
    - B.2: accuracy of orbital data
    - B.3: space debris monitoring
    - B.4: conjunction assessment

Conclusions

- The SDA is an association of public and private satellite operators committed to mitigate the risks of satellite operations and preserve the space environment.

- The SDA provides orbit regime agnostic services enabled by the secure pooling of Members' operational data and contact details.

- The SDA operates on a not-for-profit basis (services are provided at cost), which hinders scale-up activities.

- The SDA represents a successful working model to enable the implementation of the Long-Term Sustainability Guidelines.

- All member states operators are invited to join us, public, private, civil or military. Engage with the SDA at www.space-data.org.

Glossary

- **CA** – Conjunction Assessment

- **CDM** – Conjunction Data Message

- **COLA** – Collision Avoidance

- **Eph** – Ephemerides

- **O/O** – Owner Operator

- **SDA** – Space Data Association

- **SDC** – Space Data Centre

- **SP** – Special Perturbations

- **SSA** – Space Situational Awareness

- **STM –** Space Traffic Management

- **STC** – Space Traffic Coordination

- **TLE** – Two-Line Elements