SPACE DATA ASSOCIATION

www.space-data.org

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What is the Space Data Association?

- The Space Data Association (SDA) is a not-for-profit association formed by and for satellite operators to provide reliable and efficient data-sharing critical to the safety and integrity of the space environment and the RF spectrum.

- The SDA was founded by **Inmarsat**, **Intelsat** and **SES** — three of the leading global satellite communications companies. These three companies, plus **Eutelsat**, now form the Executive Board of the SDA. The Standard Members are represented by **Paradigm**.

SDA Charter

- Seek and facilitate improvements in the safety and integrity of satellite operations through wider and improved coordination between satellite operators

- Seek and facilitate improved management of the shared resources of the Space Environment and the RF Spectrum

SDA: A BRIEF HISTORY

Space Data Association
A Brief History

- **SDA incorporated in the Isle of Man on 19th June, 2009**
  - Formed by Inmarsat, Intelsat and SES who become Executive Directors
  - Eutelsat joined as Executive Director, June 2011
  - Administrative services agreement with Mansat Ltd.
  - Issued RFP for the Space Data Center
  - Developed membership agreements
    - SDA Memorandum and Articles of Association
    - SDC Data Terms and Conditions
- **Issued RFP for the Space Data Center**
  - Signed SDC 'Service Provider Agreement' with AGI 11th April, 2010
- **Systems Development**
  - SDC Initial Operations Capability began July 2010
    - SOCRATES GEO and LEO users transferred from CelesTrak to the SDC
  - SDC Full Operations Capability achieved Sept 2011

Space Data Association Membership

- **Executive Directors**
  - Eutelsat (Mark Rawlins), Inmarsat (Ruy Pinto), Intelsat (Toby Nassif) and SES (Stewart Sanders)
- **Standard Member Director**
  - Paradigm (Rick Greenwood)
- **Standard Members**
  - AMOS-Spacecom, Arabsat, Avanti, Echostar, GE, GeoEye, NASA, NOAA, Optus, Paradigm, StarOne, SS/L, Telesat,
- **Civil Participants**
  - NASA, NOAA
- **IOC Participants Not Yet Members**
  - Eumetsat, Indovision, Canadian Space Agency, GISPDA, Digital Globe
- **Including IOC participants**
  - 237 GEO satellites from 15 operators
  - 110 LEO satellites from 7 operators
  - Approx. 65% of GEO satellites processed in SDC through operator data

Space Data Association
System and Process Support

- **SDA Technical Advisers**
  - SDC Oversight (Paul Welsh, AGI)
  - SDC Operations Manager (T.S. Kelso, Ph.D, AGI/CSSI)
  - SDC Program Manager (Dan Oltrogge, AGI/CSSI)
- **SDA Ltd. Administration**
  - Corporate & Membership Administration Services (Ian Jarritt, Mansat, IoM)
- **Legal/Strategy/Government Policy**
  - Andrew D'Uva (SES), Rich Dalbello (Intelsat), JJ Shaw (Inmarsat), William Blunt (SES), Denise Olmsted (Intelsat), Paul Welsh (AGI)
- **Flight Dynamics**
  - Dean Hope (Inmarsat), Joe Chen (Intelsat), Pascal Wauthier (SES)
- **RF Interference**
  - Steve Smith (SES), Ron Busch (Intelsat)

This list is not exhaustive and the SDA requires the active support of its member. Many of us are involved in multiple of these activities.

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Some Statistics

Statistics from the first 5.5 months of FOC operations

- **Oper. Ephemerides files uploaded by members: 39,109**
- **CA runs executed: 39,109**
- **Pairs of satellites processed for CA: 3,471,665,589**
- **Conjunctions detected (50 km threshold): 702,090**
  - Equates to approx. 2.6 million conjunctions for all GEO active satellites per year based on 50 km threshold
  - Growing confidence in predicts will allow smaller thresholds to be used > less conjunctions requiring action
- **TLE's in database: 7,840,346**
- **Satellites in database: 15,275 of which 152 are SDA members**

Space Data Center
FOC FAQ

- **What does the SDC currently provide?**
  - CA Processing for SDA Members, against SDA Member data, against some other non-Member contributed data and against TLEs; CA participation is compulsory for members. Other data sources are being pursued
  - Points of Contact data which is also compulsory for members

- **What does the SDC not currently provide?**
  - RFI data sharing. The framework for this is in place but the data contribution and retrieval is still being developed

SDA KEY TECHNICAL POINTS

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- The SDA/SDC is the only CA process that uses operator data including manoeuvre planning predicts
- Other processes do not use owner data
- AGI/CSSI analysis show that TLEs alone aren't sufficiently accurate or reliable to be used for CA processing or for geolocation measurements
- TLEs from spacetrack.org are regularly a week behind operator data in reflecting maneuvers

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- **Radar and optical networks face challenges and scheduling constraints that satellite operators do not have**
  - Limited observation resources, conflicting mission objectives and priorities, track mis-association problems, lack of sensor scheduling and sensor lighting constraints
- **Other tools and systems are not set up to use operator data in their routine screening**
- **Intelsat studies have shown that the vast majority of Intelsat-on-Intelsat conjunctions were not identified by other industry sources (other than Intelsat and SDA)**
- **The Space Data Center (SDC) processing is fully automated, incorporating the very latest maneuver plans, frequent tracking observations and detailed satellite modeling.**

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- **Satellite operators are the ONLY source of maneuver plans for their satellites, and the SDC is the only system routinely using it for conjunction screening**

- **Opportunities exist for other entities to partner with the SDA to complement the unique capabilities each brings, improving the quality of conjunction warnings for all.**

SDA LEGAL FRAMEWORK AND DATA PROTECTION

Participating in the SDA

- Meet the membership criteria & apply
- Obtain SDA approval
- Agree to **Space Data Centre Terms & Conditions**
- Comply with Isle of Man & business formalities (**Memorandum & Articles – Letter of Guarantee**)
- Provide operational Points of Contact data
- Complete SDC data acceptance and validation process for your satellite data
- Receive SDA services

Legal Liability Objectives

- **SDA legal arrangements intended to:**

1. **Encourage data contribution & use**
2. **Protect data from deliberate misuse**
3. **Allow contribution and use of data on "as is" basis**

Data Use Control / Legal

- **How does SDA obtain & protect member data?**
  - Legal agreements between subscribers and SDA
    - Permitted Uses for SDC data/products
    - Prohibited Uses for SDC data/products
    - Retransmission to third parties prohibited
    - Obligations for member data contribution
    - Legal liability issues are addressed by enforceable contract
      - Isle of Man law allows the members to enforce the terms of the agreement directly against other members
  - Multiple technical / security controls within SDC

Permitted & Prohibited Uses

- **SDC - Permitted Uses:**
  - Operational support, including Safety of Flight
  - EMI/RFI resolution of actual harmful interference, including at ITU
  - Support for insurance underwriting
  - As legally required by national regulatory authorities
- **SDC - Prohibited Uses:**
  - Any commercial purposes (sales, planning, marketing, etc.)
  - Securing orbital-spectrum rights
  - Transmittal to 3rd parties (except for Safety of Flight)
  - **Any other use that is not a Permitted Use**

SDC Data Sources (As of 12 Mar 12)

Data and Source	Purpose
GP Two-Line Elements (space-track.org)	Conjunction Assessment (CA) for objects not in SDC (e.g., debris)
SDA Member Ephemerides and planned maneuvers (SDA Members) *Measured by operators (ranging, etc.)*	Populate SDC with current Member object information for CA and EMI/RFI support
SDA Member satellite and operations center / POC details	EMI/RFI resolution & Geolocation support Populate “phone book”

Member Data Contributed

SDC Mission Area	Data Contributed by Member for Its Fleet	Other Member Direct Data Access?
CA & Maneuver Planning Safety of Flight	Measured Ephemerides Planned Maneuvers	Only for identified conjunctions Analysis products provided
EMI/RFI Resolution RFI Alerts Service	Satellite communications payload configuration Reference Emitters / Calibrators Satellite beam configuration & patterns Local Oscillator / Translation Frequencies Nominal Satellite Longitude Stationkeeping box size per satellite RFI event alerts	Some, but primarily analysis products provided
Operational Contact Information	Satellite bus and payload Control Center Information for each satellite	Yes

Key Initiatives

- **Grow membership**
  - Goal is for 100% membership of all operators in all regimes
- **Develop Government and industry relationships**
  - Seek cooperation with US and other Governments
  - Data sharing and improve best practices for all parties
- **Secure access to additional data sources**
  - Improve accuracy of data, particularly for non-active objects and debris
- **Develop space insurance relationships**
  - Aim to secure preferred terms for SDA members since we are better managing risk
- **Implement data sharing for RFI mitigation**
- **Financial: Reduce Operating Costs, Improve Service, Revise Funding Model**

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Other Initiatives Under Consideration

- **Space Weather repository**
  - Industry contacts have suggested that SDC could be used to distribute Space Weather data to users. In return, SDA members who participate in this service would provide space weather data processors with more detailed information on in-orbit experience of space weather, including anomalies so that better models can be developed.
- **Carrier ID repository**
  - Once fully implemented, the Carrier ID users will need a reference database to correlate the unique Carrier IDs with actual contact points for the uplink; contact points will most likely be the relevant satellite operator who will themselves have details on the actual uplink operator.
- **Enhanced Services**
  - Beyond core CA and Points of Contact services which are compulsory, develop Enhanced Service offerings which would be voluntary.

Contacts – For Presentation Follow Up

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