

# Space Traffic Management & Orbital Environment

## Sustainability In the NEWSPACE Era

April 22nd 2021

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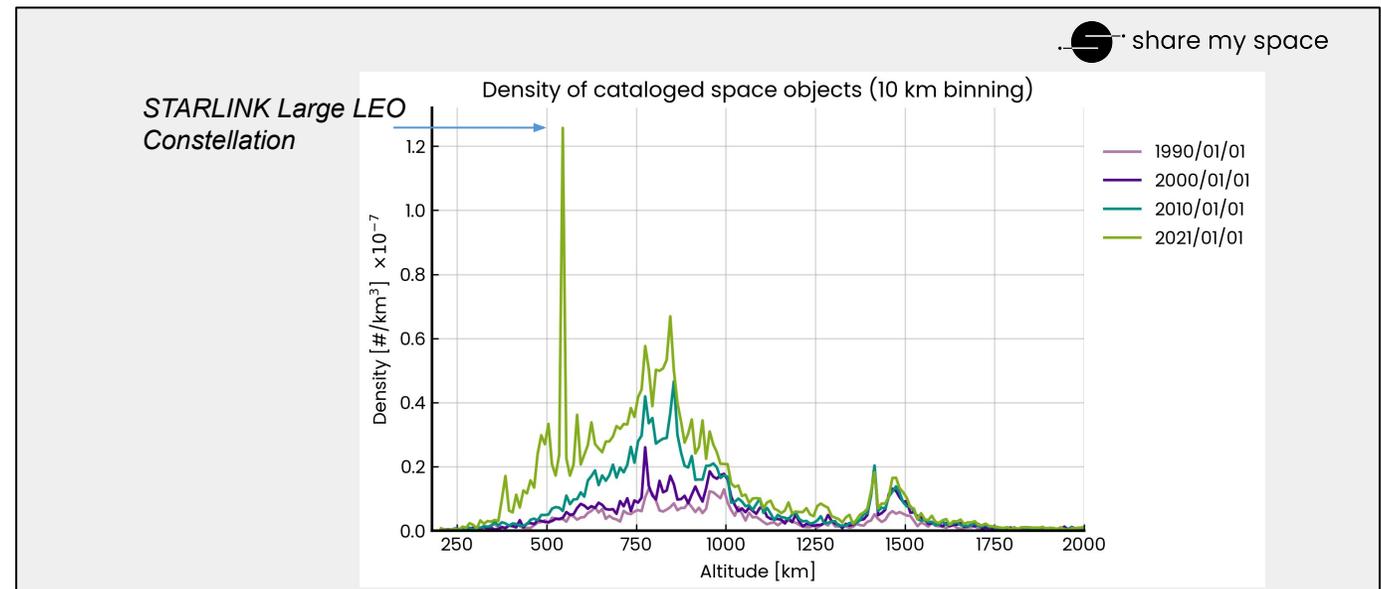
IAASS Member  
CTO Share My Space, France

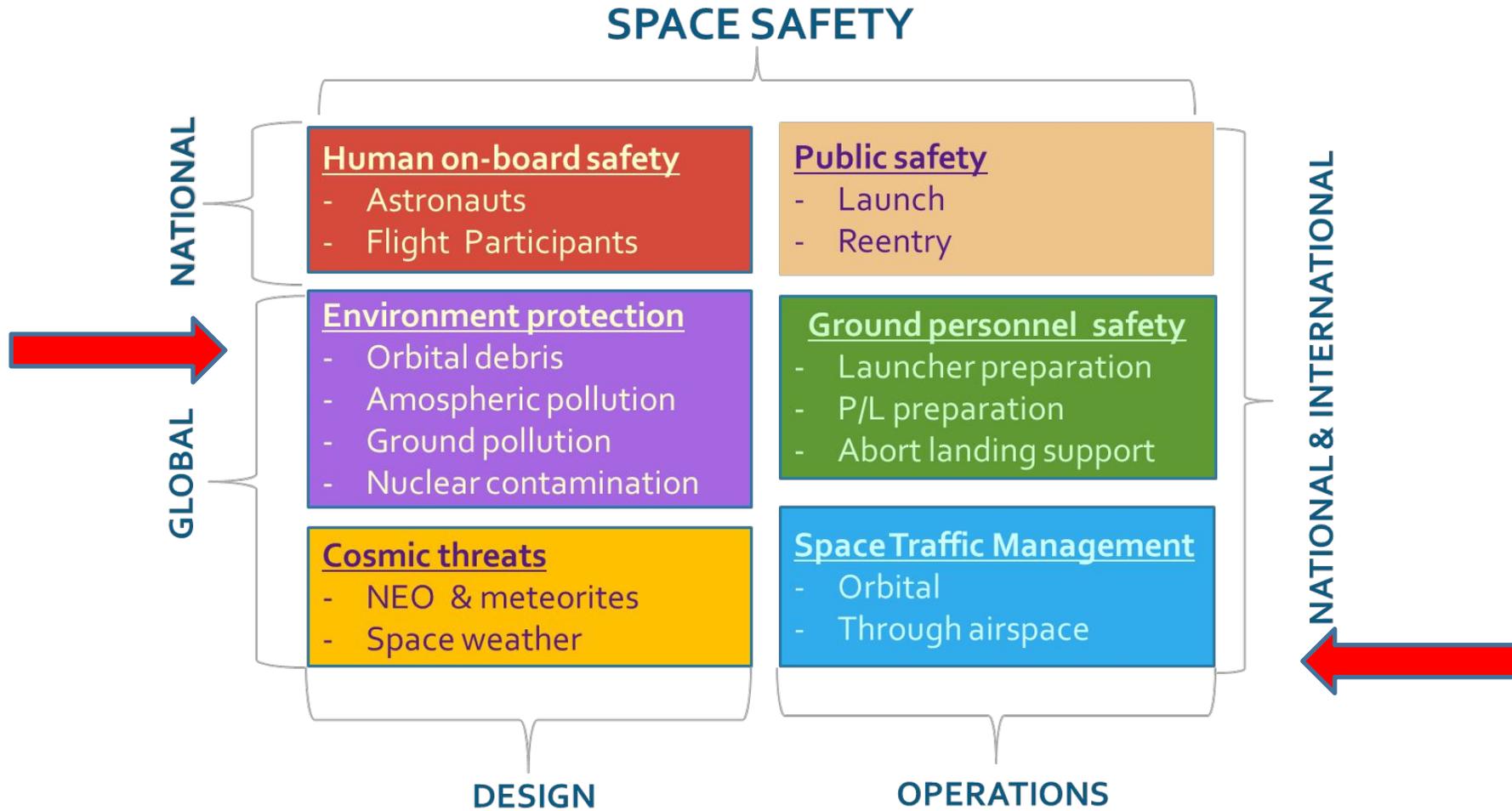
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United Nations Committee on the Peaceful  
Uses of Outer Space

Technical Presentations





## STM and Space Safety

- **Space Traffic Management (STM)** consists of:
  - Safe access to outer space
  - Prevention of collisions in outer space, and
  - Safe return/re-entry from outer space
- Space Traffic Management is an important element of Space Safety because of:
  - Public safety risk (people on ground, at sea or travelling by air) during launch and return/reentry
  - Risk of loss of important (and sometimes safety-critical) space-based services
  - Safety risk for human spaceflight
- Space Traffic Management objective is **Space Environment Sustainability & Protection**

### UN Guideline B4

*Perform Conjunction Assessment during all orbital phases of controlled flight.*

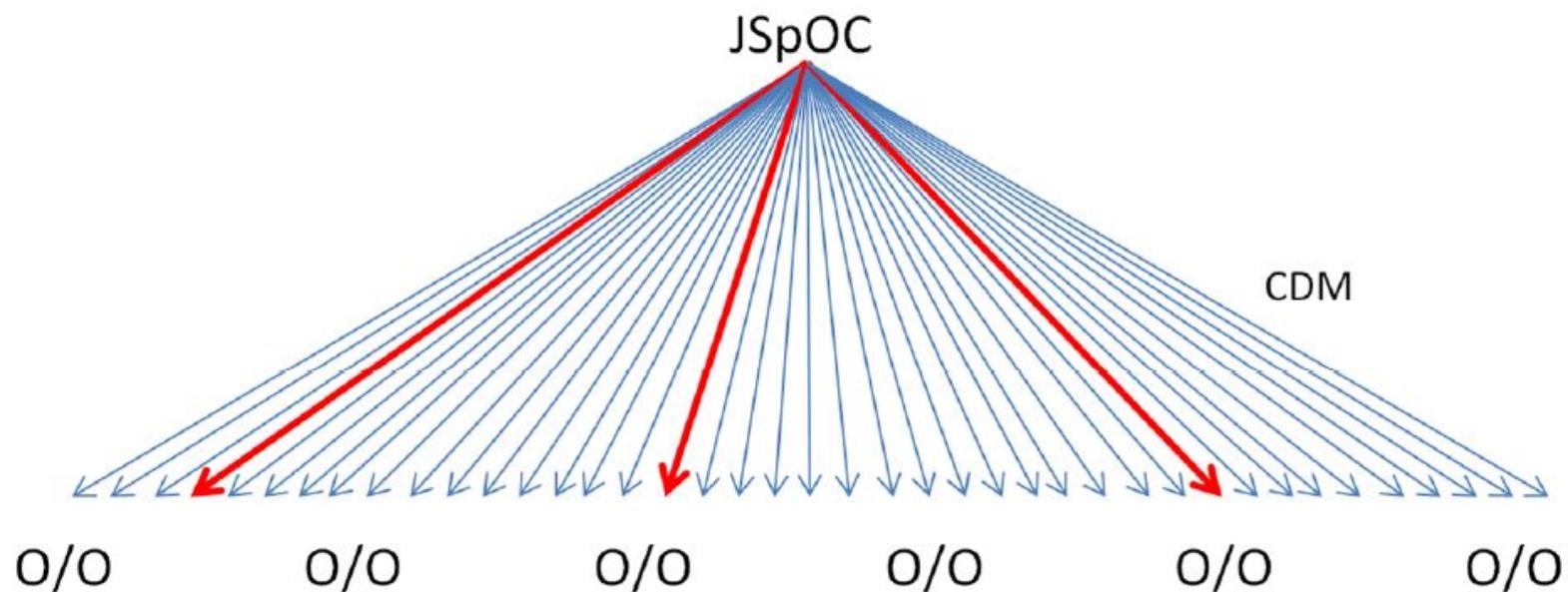


***Safety as Driver of STM***

***Techniques Development***

## Collision Avoidance Manoeuvres

- After the February 2009 collision between U.S. Iridium 33 and Russian Kosmos 2251, the **JSpOC** started sending **Conjunction Summary Message (CSM)**,
- But CSM are close approach notifications, and not direct recommendation to perform an Collision Avoidance Manoeuver (CAM)
- The satellite Owner/Operator has heavy operational constraints to prepare and decide to perform a **CAM**



# The Role of STM 'Middle-Man'

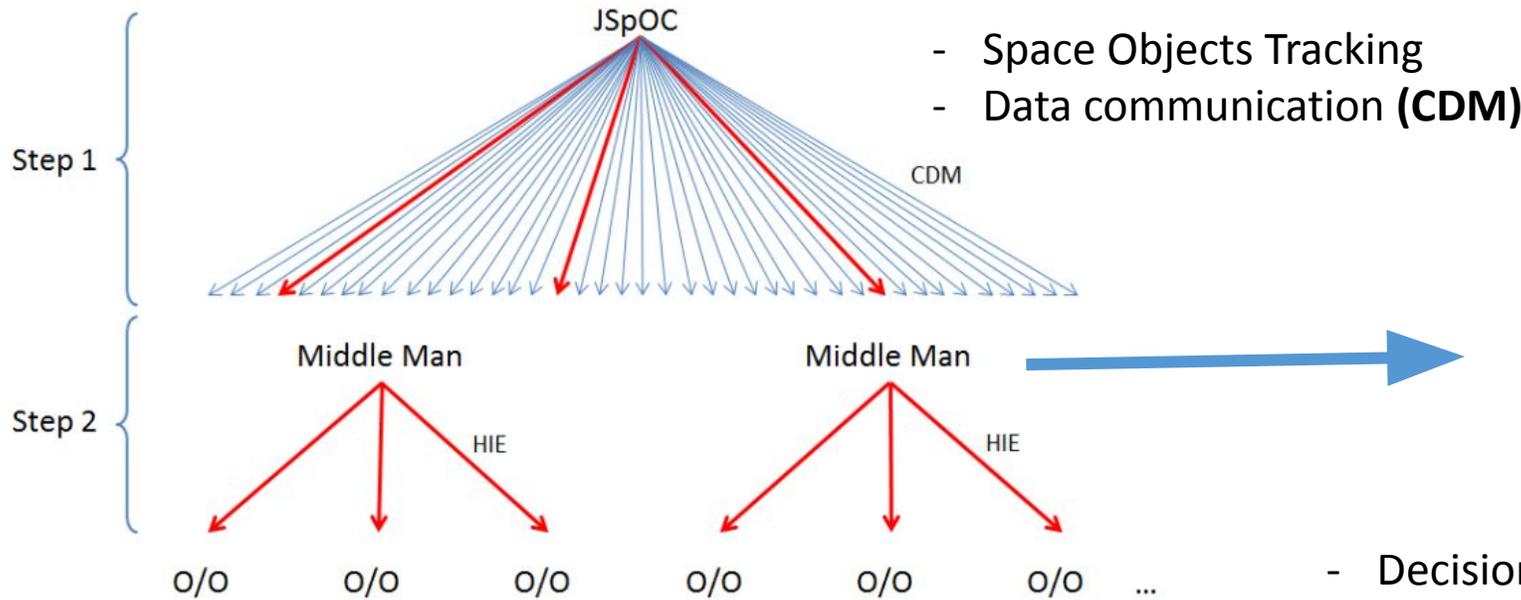
- Middle-Man (MM) public services are now available at CNES / NASA

**CAESAR:** Conjunction Analysis and Evaluation Service: Alerts and Recommendations

**CARA :** Conjunction Assessment Risk Analysis (CARA)

- Middle-Man (MM) commercial services are now available :

*ComSpOC\_US, Leolabs\_US , ShareMySpace\_FR*



- Space Objects Tracking
- Data communication (CDM)



- Risk Analysis & Assessment
- Detect High Risk Event
- Maneuvers Optimisation
- Skills & Expertise
- Readiness 24/7

- Decision
- Maneuver Preparation & Action

## Collision Avoidance Manoeuvres

- Emergence of NEWSPACE actors (**x10**) and NEWSPACE satellites (**x10**)
  - Risk awareness should be disseminated among new entrants.
  - In particular, Cubesat operators often have little legacy and limited means (ie flight dynamics, space safety experience).

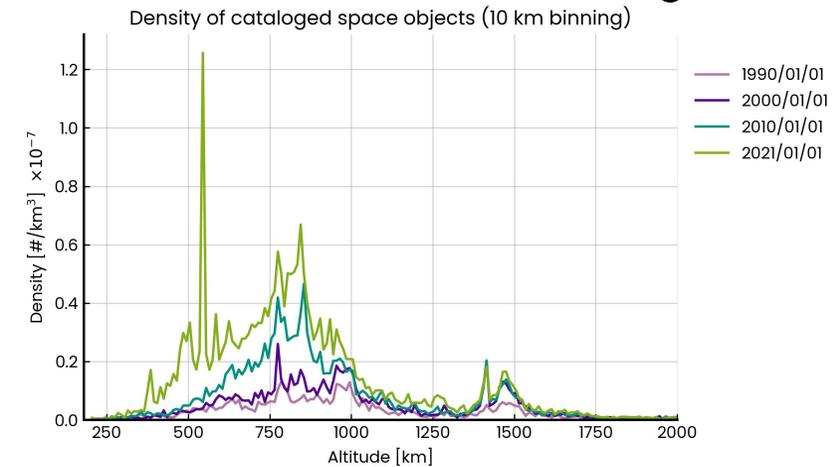
=> **Private SSA/STM service providers can assist new operators (cubesat and large constellations) as well as “traditional” operators that wish to control their costs.**

- Improvement of debris detection capabilities (**20 000** → **200 000** catalogued debris)
  - USAF Space Fence, EU-SST: Radar, Telescope, Laser Observatory Networks

=> **Commercial Network: ExoAnalytics, Leolabs, Ariane Group, Safran, Numerica, Share My Space can improve debris detection and catalogue accuracy and raise awareness.**

- As a consequence, Multiplication of Orbital Conjunctions Rate (**x10, x100 ?**)
  - Overload in operations and on resources
  - Collision avoidance process needs to be automated.

=> **New private SSA/STM service providers improve predictions and advise operators.**



### UN Guideline C1

*Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities.*



***Space Sustainability requires  
an Organized International  
Cooperation***

## Organize Space Sustainability Internationally

### Governmental and international regulation

- Define borders and interfaces between military and civil/commercial STM
- Launch an intergovernmental cooperation between space faring countries for creating international voluntary STM rules, instead of bilateral agreements (eg NASA-SpaceX)
- Delegation of safety submission specific review process to commercial auditors (training by historical reviewers – Space Safety Institute)

### Space Safety / Sustainability label certification process

- Could be key to raise and maintain the level of compliance across the industry in line with the evolving legislation.
- It aims to simplify the overall process, hence reducing costs and leveraging profit & growth for commercial satellite operators.
- Reference and best practices remain defined by competent international entities (IADC, ISO).
- Supported by non-profit initiatives: World Economic Forum Space sustainability Rating Framework (with ESA, MIT, UT-Austin)



## Organize Space Sustainability Internationally

**SPACENEWS**

### Assure Space won't cover collision risk in low Earth orbit

by Debra Werner — March 11, 2020



### Incentivize space actors to implement best-practice in their space missions

- Access to insurance policy at acceptable prices (Assure Space, Hiscox, AXA)
- Meet shareholders expectations in terms of sustainability (ISO 14000 family)
- Sustainability and environmental protection as a virtuous and commercial argument.
- Simplification of review process (case by case) to a more generic certification process (at company level) for space operators & integrators. The framework can be compatible with the UK 2018 Space Act for example.

## ***Conclusions***

## Conclusions

- Space Traffic Management is an international safety issue that requires **international coordination** and **harmonised rules**.
- Public and commercial SSA service providers could facilitate international cooperation in Space Traffic Management and compliance with debris mitigation guidelines
- Leverage business incentives for space industry actors to comply with best practices through a **Space Sustainability Label**.
  - Cost rationalization for safety reviews (from project-specific to a company-generic process)
  - Insurance access, shareholders/investors attractivity,
  - Image to public opinion (environmental protection)

