National Aeronautics and Space Administration

National Academies Space Studies Board

Space Sustainability | Nov. 19, 2024

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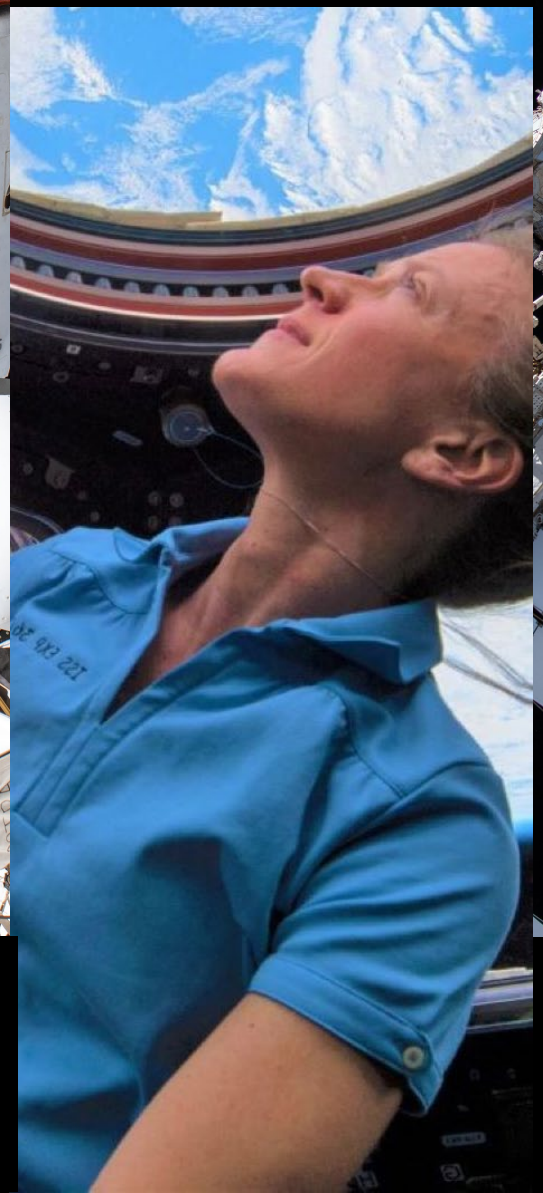
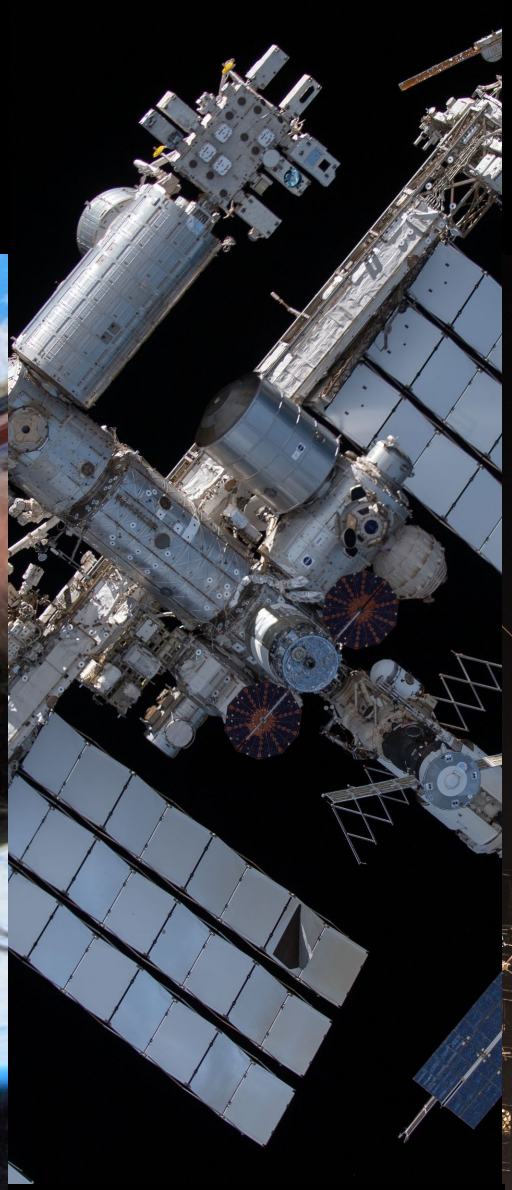
COMMERCIAL SPACE TRANSPORTATION

ASTRONAUT PREPARATION & HUMAN SPACEFLIGHT RESEARCH





INTERNATIONAL SPACE STATION/ MICROGRAVITY SCIENCE

LAUNCH SERVICES

SPACE COMMUNICATIONS AND NAVIGATION

SPACE SUSTAINABILITY AT NASA

Historical Context

1979

ODPO

Established the Orbital Debris Program Office to observe, understand, monitor, and model space debris

1995

Interagency Report on Orbital Debris

NASA issues a comprehensive set of orbital debris mitigation guidelines

2001

ODMSP

The first version of the Orbital Debris Mitigation Standard Practices is established

2004

Meteoroid Environment Office

Established by OSMA in response to growing concerns about meteoroid impacts on spacecraft

2005

CARA

Conjunction Assessment Risk Analysis program set up to assess risk of close approaches

2019

ODMSP Updated

Provides a reference to promote efficient and effective space safety practices

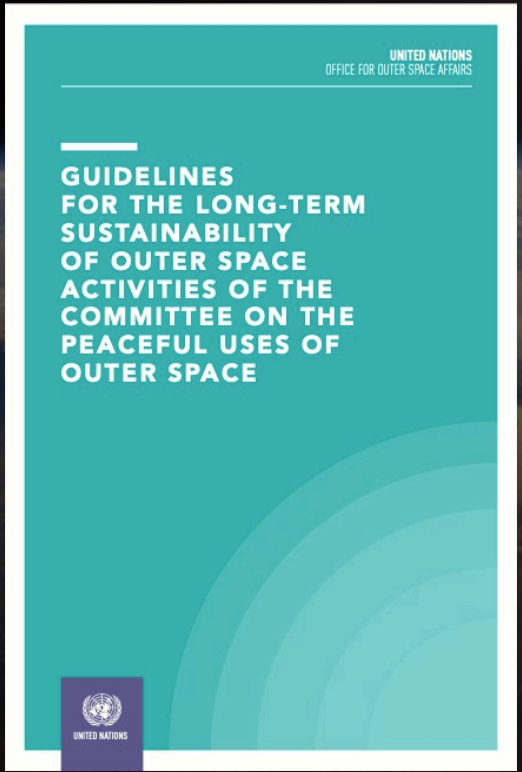
2021 & 2022

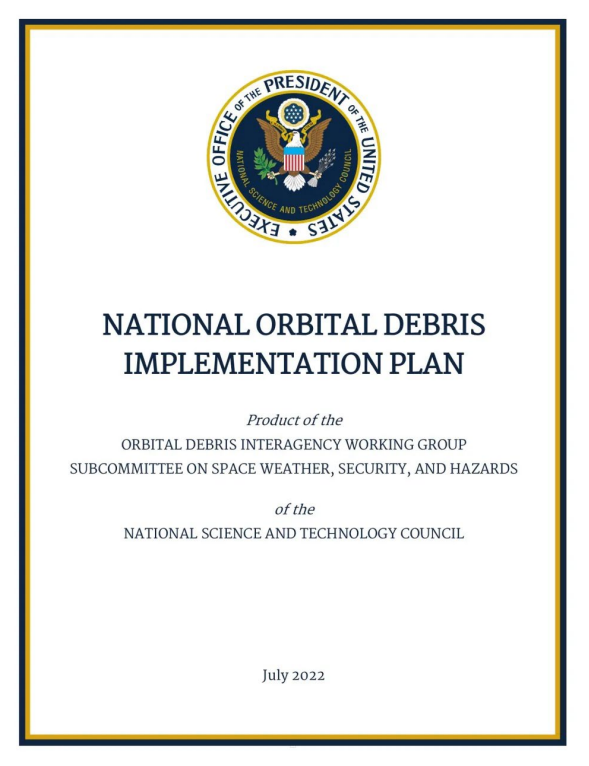
National Orbital Debris R&D Plan and Implementation Strategy

Shift to integrated approach for space sustainability, calling for coordinated national effort

SPACE SUSTAINABILITY AT NASA

Foundational Documents

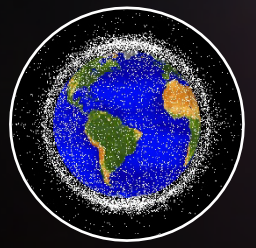




SPACE SUSTAINABILITY AT NASA

Current Technical and Organizational Roles

NASA's approach to managing space debris has evolved to include several key players.



ODPO
The Orbital Debris Program Office is the forefront of NASA's technical efforts in space sustainability.

MEO
The Meteoroid Environments Office manages and mitigates risks associated with meteoroids.

TOPO
The Trajectory Operations Officer is responsible for risk assessment related to close approaches for human spaceflight missions.

Heliophysics
Conducts science needed to develop models of the space environment.

CARA
The Conjunction Assessment Risk Analysis program provides critical support for all non-human spaceflight missions and coordinates with DoD and others responsible for SSA.

Space Technology
STMD supports early-stage development of technologies applicable to orbital debris mitigation, tracking, characterization, and remediation.

OIIR
Supports interagency and international efforts in regulating space activities, standardizing practices, sharing knowledge, and coordinating actions.

OTPS
Provides policy and technical expertise to help create a cohesive approach to space traffic coordination and debris mitigation

SPACE SUSTAINABILITY AT NASA

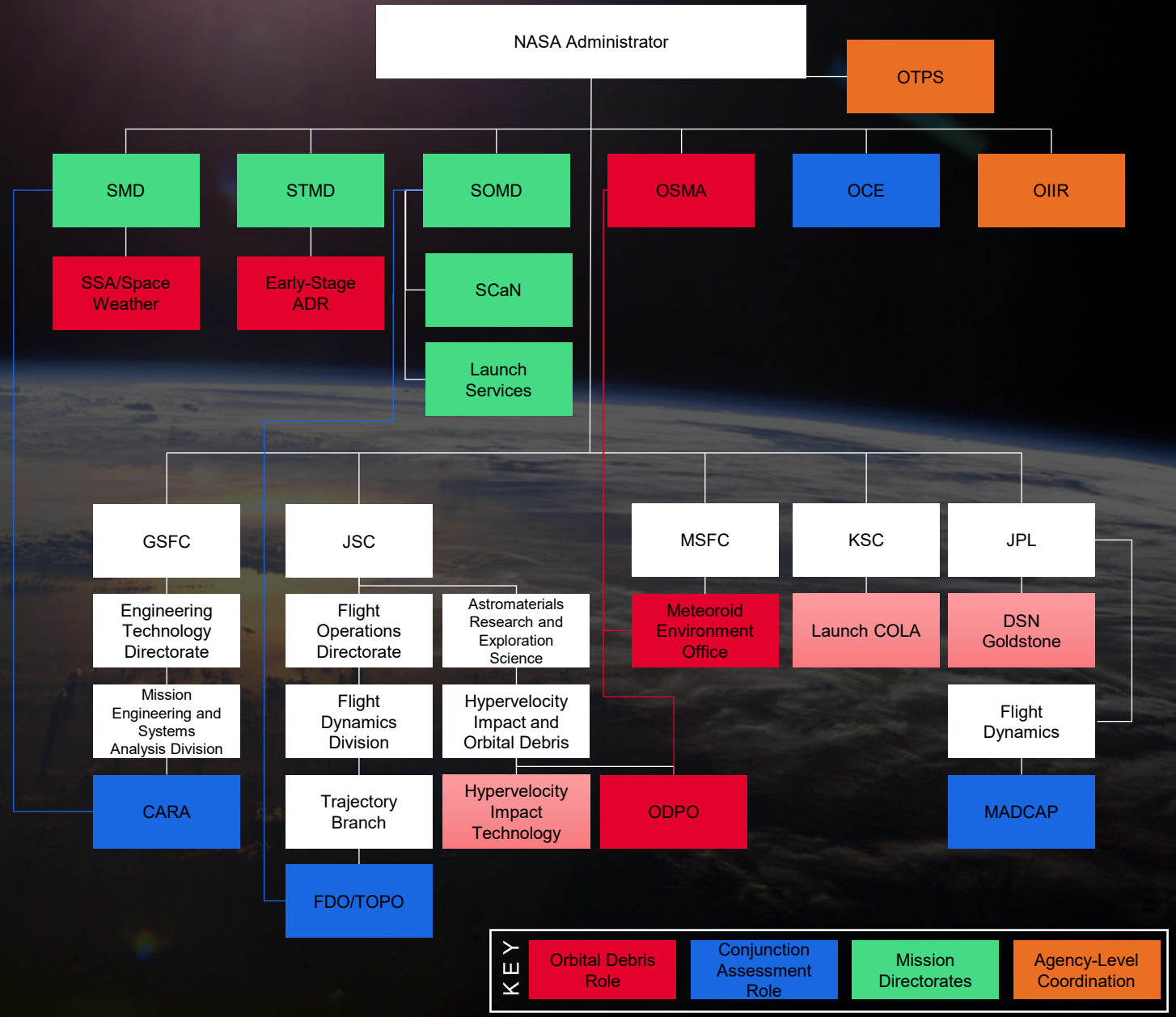
Challenges and Gaps in Organizational Structure

Dispersed Responsibilities
Responsibilities are spread across multiple Mission Directorates and Centers, causing fragmented oversight and coordination issues.

Delayed Decision-Making
Lack of central authority leads to delays in decision-making and slower responses to emerging issues.

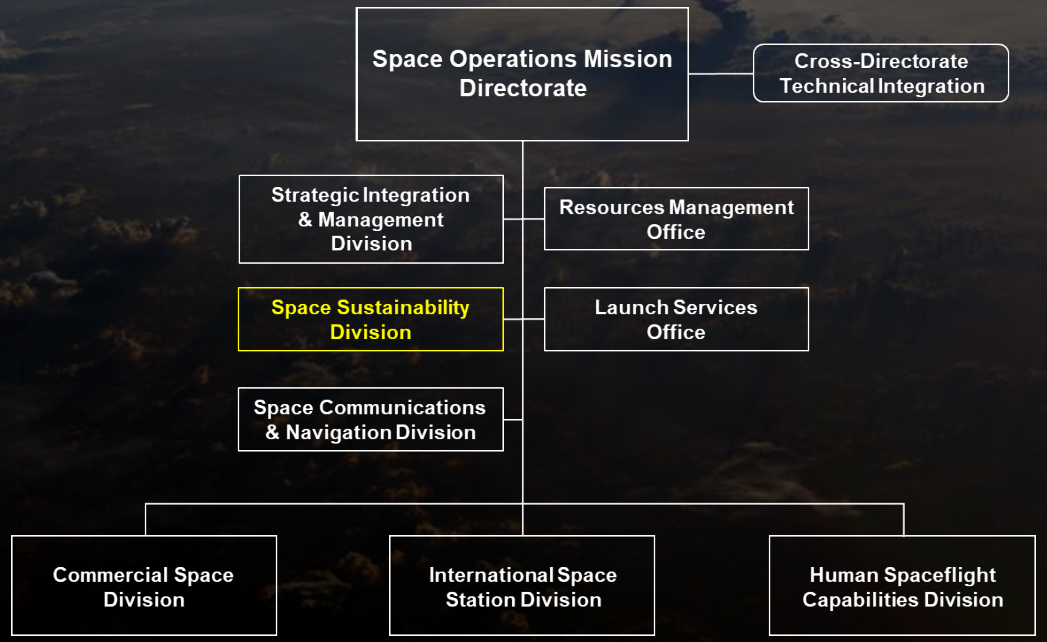
Coordination Issues
Multiple entities create difficulties coordinating efforts and aligning strategies, impacting efficiency.

Policy Implementation Challenges
Implementing new policies is complicated by limited budgets and tight schedules, hindering progress.



SPACE SUSTAINABILITY AT NASA

A Unified Organization



Debris Mitigation
Define specific roles and responsibilities for managing space debris mitigation to minimize collision risks and protect assets.

Safety Protocols
Implement safety protocols to ensure the protection of spacecraft and satellites from space debris and other hazards.

Technology Roadmaps
Create and update technology roadmaps to guide the development of advanced solutions for space sustainability.

Sustainability Initiatives
Advance initiatives to promote long-term sustainability in space, including policy development and international collaboration.

External Coordination and Partnerships
Enhance external coordination, align with broader frameworks, and engage industry and international partners to maximize commercial solutions.

1st Principles

Operate safely in the space environment
Make the space environment safer for operations

1. Manage harmful interference/congestion
2. Manage waste and its adverse effects
3. Conserve scarce space resources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QUESTIONS?

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