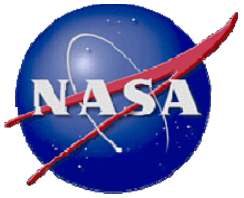
National Aeronautics and Space Administration



Highlights of 2018-2019 NASA Orbital Debris Research Activities

J.-C. Liou, PhD

NASA Orbital Debris Program Office

Head of NASA IADC Delegation

37th IADC meeting

ASI HQ, Rome, Italy, 7-10 May 2019

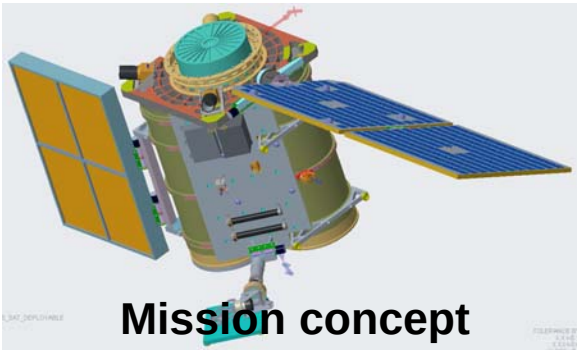
Modeling Highlights

- **Orbital Debris Engineering Model (ORDEM)**
  - The current effort to update ORDEM from 3.0 to 3.1 focuses on improving the model with newly available radar, optical, and in situ measurement data
  - Debris population updates completed in April 2019
  - Bumper comparisons and analyses underway, to be followed by NASA Engineering and Safety Center (NESC) review and the model release in December 2019
- **Large constellation study**
  - The objective is to quantify potential long-term negative effects from large constellations to the environment in low Earth orbit
  - Key results and recommendations published in September 2018

Measurement Highlights

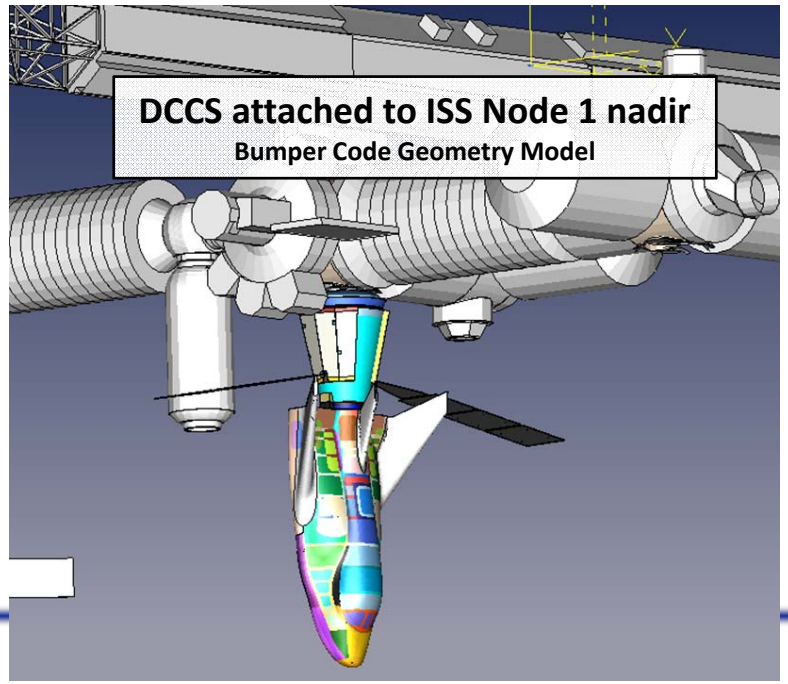
- **Eugene Stansbery Meter Class Autonomous Telescope (ES-MCAT)**
  - Recoating and reinstallation of the primary mirror completed in November 2018
  - Data collection for additional testing underway
  - Full Operational Capability (FOC) expected in October 2019
  - Routine data collection for ORDEM 4.0 to start in November 2019

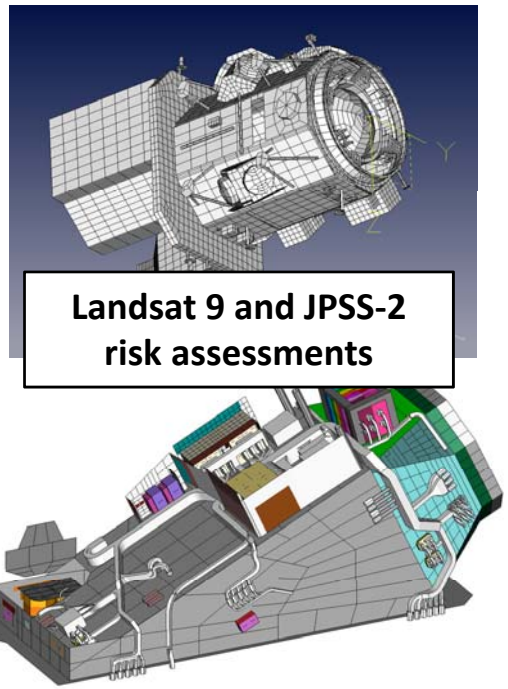
- **DRAGONS upgrade and mission opportunities**
  - Collaboration with JAXA to upgrade DRAGONS with the JAXA conductive grids (“DRAGONS-J”) underway
  - Efforts to pursue high altitude (700-1000 km) mission opportunities continue

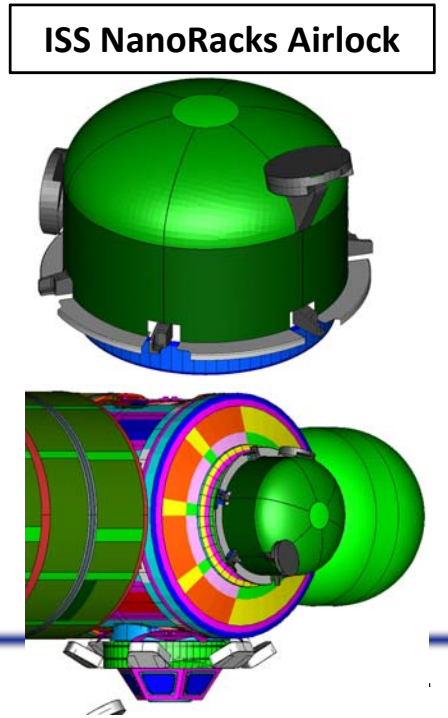

Mission concept

MMOD Protection Activities

- **Tests and assessments performed by NASA's Hypervelocity Impact Technology (HVIT) group at the Johnson Space Center for the following spaceflight programs**
  - ISS cargo vehicles: Sierra Nevada Corporation Dream Chaser Cargo System (DCCS)
  - ISS commercial crew vehicles, ISS payloads, new hardware and exploration space suit
  - Landsat 9 and Joint Polar Satellite System-2
  - SLS Exploration Upper Stage Pressure Vessels & Composite Overwound Pressure Vessels (COPVs)
  - Orion European Service Module (ESM): jointly with European partners
  - Orbital Debris Program Office on-orbit impact sensors hypervelocity tests







Space Policy Directive-3

- **The Space Policy Directive-3 (SPD-3), the first U.S. National Space Traffic Management Policy was released in June 2018**
- **The policy provides general guidelines and direction for space traffic management, and contains key references and guidelines specific to orbital debris**
  - Address the threat from orbital debris, improve fundamental knowledge of the space environment, promote orbital debris mitigation and best practices with the global community, *etc.*
  - The SPD-3 also tasks NASA to lead an interagency working group to update the U.S. Government Orbital Debris Mitigation Standard Practices

2019 International Orbital Debris Conference

- **Preparation for the 2019 International Orbital Debris Conference (IOC) continues**
  - The first of this “once-every-4-year” conference will take place in Sugar Land (greater Houston area), Texas, on 9-12 December 2019
  - The 4-day conference will cover all aspects of micrometeoroid and orbital debris research, mission support, and other activities
    - **Measurements, modeling, operations and mission support, and environment management**

All are invited to attend the 2019 IOC!