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Satellite Conjunction Assessment, Risk Analysis and Collision Avoidance Best Practices: The History, Evolution and Opportunities.

Since Explorer 1 was launched on January 31, 1958, the United States (U.S.) has reaped the benefits of space exploration. New markets and new technologies have spurred the economy and changed lives in many ways across the national security, civil, and commercial sectors. Space technologies and space-based capabilities now provide global communications, navigation and timing, weather forecasting, and more.

Space exploration also presents challenges that impact not only the U.S. but also its allies and other partners. A significant increase in the volume and diversity of activity in space means that it is becoming increasingly congested. Emerging commercial ventures such as satellite servicing, in-space manufacturing, and tourism as well as new technologies enabling small satellites and large constellations of satellites present serious challenges for safely and responsibly using space in a stable, sustainable manner.

To meet these challenges, the U.S. seeks to improve global awareness of activity in space by publicly sharing flight safety-related information and by coordinating its own on-orbit activity in a safer, more responsible manner. It seeks to bolster stability and reduce current and future operational on-orbit risks so that space is sustained for future generations. To this end, new and better Space Situational Awareness (SSA) capabilities are needed to keep pace with the increased congestion, and the U.S. seeks to create a dynamic environment that encourages and rewards commercial providers who improve these capabilities.

The National Aeronautics and Space Administration (NASA) Spacecraft Conjunction Assessment and Collision Avoidance Best Practices Handbook reflects how NASA currently operates, which has evolved over time. Consideration is given to important topics such as spacecraft and constellation design; spacecraft "trackability;" pre-launch preparation and early launch activities; on-orbit collision avoidance; and automated trajectory guidance and maneuvering.

This talk aims to present examples of responsible practices for spacecraft Owners/Operators (O/O) to consider for lowering collision risks and operating safely in space (from LEO and beyond) in a stable and sustainable manner. As technology and innovation continues to improve upon existing capabilities, what kind of new challenges are presented in the SSA community? Can space exploration and commercial ventures thrive while keeping paramount the safety and protection of the space environment? What are the challenges and opportunities that need to be addressed and considered for space situational awareness in Cis-Lunar Space? It may prove useful for entities offering, or intending to offer, SSA or Conjunction Assessment (CA) services to consider such examples of responsible practices to protect the space environment for future use by all.

REFERENCE:

1. NASA Spacecraft Conjunction Assessment and Collision Avoidance Best Practices Handbook, NASA/SP-20205011276, December 2020.