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VIRTUAL TRAVEL

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OPINION

Managing space traffic

Effective guidelines could protect the satellites that are so important in our daily lives and prevent dangerous on-orbit activities. Dean Bellamy says a U.S. Department of Commerce office should receive the funding and authority to get the rules adopted.

BY DEAN BELLAMY

Outer space is a strategic priority and an economic engine for communities around the world, on which we grow more dependent every day. Yet outer space also lacks rules of the road to promote safe operations in space as a constantly expanding number of space-faring nations, companies and even universities have satellites orbiting above. And while people worldwide love to look at the stars, few have any idea that the Earth is increasingly surrounded by debris that poses significant risks to the satellites that enable essential everyday services. Space policymakers and leaders must do more than just admire this issue in hearings and white papers; tangible plans and actions are required before space becomes even more crowded without clear mitigation plans.

The rapid increase of small satellites in low-Earth orbit, or LEO — a total expected to double in the early 2020s — requires an agreed-upon code to deter bad behavior and preserve the space environment for all. One critical first step is space traffic management, or STM, guidelines.

STM guidelines are on-orbit rules of the road that will tell us what we should or should not do in space. Their purpose: eliminate reckless and provoc-

ative on-orbit activities and encourage responsible behaviors. With a shared code of conduct, space operators will have a better understanding of each other's activity. This is critical as the popularity of small satellites continues to grow and the possibility of collisions increases.

During a March 5, 2020, U.S. Senate hearing on the Office of Space Commerce's budget, Secretary of Commerce Wilbur Ross explained that the exponential growth of commercial satellites is increasing the significant risk of catastrophic collisions. If a collision were to occur, its debris would threaten critical national security satellites and potentially put human spaceflight onboard the International Space Station at greater risk. The Department of Commerce is the right home to manage STM so that the Department of Defense can remain focused on its top priority of managing space as a war-fighting domain and deterring adversary aggression. While the Office of Space Commerce is relatively new and minimally funded, the office and its director, Kevin O'Connell, have been terrific STM advocates despite limited resources up to this point.

Just like road signs and lanes provide drivers guidance for operating a car on the road, STM guidelines will do the same for satellite operators. Without STM guidelines, space is a highway that lacks markings to clearly indicate when you should yield or when you have the right of way. Future STM guidelines should lay out that if a satellite is already in orbit, it has the right of way and no other satellites can perform a high-risk maneuver in its trajectory due to the risk of potential collision. Safety-focused STM operational guidelines should also address issues like establishing safe operating distances between two non-cooperative satellites.

Another essential aspect of STM guidelines would be to preserve the long-term sustainability of the space environment by minimizing long-lived debris. Debris generation has serious implications for satellite constellations. A piece of space debris in LEO travels at velocities approaching 8 kilometers per second — roughly 29,000 kph — which gives even the tiniest piece of junk enormous destructive energy (the film "Gravity" had that correct). If a 13-millimeter marble-sized aluminum sphere hits a satellite in LEO, the impact is like a 180-kilogram safe traveling at 96 kph. If this occurred, it could disrupt the space-derived data such as navigation, weather, communications or intelligence data that is intertwined in the fabric of our daily lives.

Since access to space and space-derived data is vital to the national and economic security of the United States, STM guidelines should address operating practices for megaconstellations, debris generation, end-of-life procedures and other types of space operations — and ensure future generations can benefit from the continued growth of the space economy.

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Existing international agreements and documents such as the 1967 Outer Space Treaty and the United Nations Space Debris Mitigation Guidelines do not provide practical STM guidelines for space operations. The best approach to move toward internationally accepted and observed STM guidelines is for the U.S. to lead by example. Such guidelines could then evolve into a collaborative framework for space safety data sharing on accidents, anomalies, close calls and other lessons learned. While the U.N. Committee on the Peaceful Uses of Outer Space reached agreement in 2018 on a set of voluntary guidelines focused on enhancing space object registration and space situational awareness and promoting awareness of space sustainability, it did not set standards for STM. To be clear, space safety behavior is not keeping pace with space activity. There are no internationally recognized STM guidelines, and even in the U.S., advocates disagree on what guidelines should be established.

The Federal Communications Commission has recently been discussing a number of rules related to space safety and STM, including a mandate that all future satellites orbiting above 400 kilometers must be maneuverable to avoid collision and reduce orbital debris. While this specific rule was not voted on during the FCC's April 23 meeting, it will be a step in the right direction if eventually enacted. In the meantime it may be up to the Office of Space Commerce to develop and then expand its STM guidelines into a collaborative framework that will not only advance space operations safety, but also spawn additional breakthroughs.

The Department of Commerce needs congressional authorization that provides the Office of Space Commerce with the authority, resources and immunity from lawsuits to drive STM. The guidelines must be both a federal and congressional priority in the coming year. ★

Dean Bellamy
is a retired U.S. Air Force colonel and the senior director in charge of space strategies and development at Peraton, a national security company established in 2017.