# Ensuring Operational Continuity and Safety through Space Situational Awareness and Space Traffic Coordination

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Space situational awareness (SSA) and space traffic coordination (STC) are critical for protecting satellites, enabling mission continuity in space, and ensuring both safety and long-term stability in use of space. SSA is the ability to accurately characterize the space environment and activities in space and is the foundation of nearly all civil, commercial, and national security space activities. The United States needs to continue to support STC systems (both nationally and internationally) in order to protect stability in the space environment and ensure operational continuity and safety for operators.

## Background

Space situational awareness (SSA) is the ability to accurately characterize the space environment and activities in space. Civil SSA combines positional information on the trajectory of objects in orbit (mainly using optical telescopes and radars) with information on space weather. Military and national security SSA applications (often referred to as space domain awareness) also include characterizing objects in space, their capabilities and limitations, and potential threats. SSA is an inherently international and cooperative venture. It requires a network of globally distributed sensors as well as data sharing between satellite owner-operators and sensor networks. SSA also forms the foundation of space sustainability as it enables safe and efficient space operations and promotes stability by reducing mishaps, misperceptions, and mistrust.

SSA has historically been done by the military for national security reasons, with secondary missions to protect important civil space missions such as human spaceflight. The United States military operates a network of ground- and space-based optical telescopes and ground-based radars that provide the bulk of our current knowledge about the space environment and human activities there. The military tracking capabilities are augmented by space weather measurements from scientific and meteorological satellites operated by civil agencies as well as the military.

The 18th Space Defense Squadron maintains a catalog of the orbital trajectories of more than 47,000 space objects (as of January 27, 2025) which is used to perform a variety of analyses to support commercial and civil spaceflight safety along with military and intelligence applications. These services include providing conjunction assessment warnings to all satellite operators as part of the Space Situational Awareness information-sharing program. The United States has negotiated a significant number of data-sharing agreements with more than 185 commercial sector, academic, foreign government partners, and intergovernmental organizations.

The United States is also in the midst of establishing a civil STC system operated by the Department of Commerce, under Space Policy Directive-3 (issued by the first Trump administration in 2018 and maintained by the Biden administration). Under this policy, the Office of Space Commerce (OSC) will be responsible for space safety information and services for public safety (including commercial space operators), while the Department of Defense will continue to maintain the authoritative catalog of space objects. OSC is developing the Traffic Coordination System for Space (TraCSS) to provide SSA services to civil and private space operators. In September 2024, TraCSS entered service for the first time, covering an initial set of users operating around 1,000 satellites.

Russia, China, and the European Union also have significant SSA capabilities, while many other countries are developing their own—albeit more limited—national capabilities. Private sector SSA services and analysis is a growing segment, particularly in the United States and Europe. In fact, some commercial actors are developing and fielding significant SSA capabilities that, in some cases, meet or exceed those of governments. Commercial SSA data is used to support and augment government catalogs and to provide services in support of public space traffic coordination services under development in governments, such as TraCSS. Services are also provided to spacecraft operators to augment their own satellite positional data and to support conjunction avoidance efforts, including automated collision avoidance systems being developed by large constellation operators. Commercial SSA data is also a key enabler for novel in-space activities, such as satellite servicing and active debris removal. National security agencies may also use commercial SSA data to augment analytical capabilities for intelligence purposes.

Broadly speaking, space traffic coordination (STC) refers to systems and practices, encompassing SSA information, data sharing, and possibly operational guidelines, that seek to reduce the potential for collisions and other incidents in space that could create safety risks for space activities. STC seeks to increase the safety and efficiency of space activities. A near-term focus of STC is detecting and avoiding collisions between active satellites and other space objects but also includes a broader array of policy and operational tools to provide oversight and management of space activities. STC is inherently international in nature as it involves coordination between all operators in the space environment, regardless of their national domicile.

## Current Policy and Gaps or Shortcomings

The growth in commercial, civil, and international space activities and the overall number of satellites has stretched the current military-led SSA framework to the breaking point. Further, recent events such as the February 2022 loss of 38 Starlink satellites due to space weather highlight the important connection between space weather and orbital trajectory predictions. The proliferation of low Earth orbit (LEO) and very low LEO with large constellations makes space weather modeling and forecasting an acute challenge.

In 2010, the Obama administration began an interagency policy discussion on space traffic management (STM) which concluded that the portion of the SSA mission related to the safety of spaceflight activities should be transferred from the Department of Defense (DoD) to a civil federal agency, and leaned towards giving it to the Department of Transportation. In 2018, the first Trump administration issued Space Policy Directive-3 (SPD-3), the first national policy on STM, which assigned the responsibility for civil SSA and a future STM regime to the Department of Commerce. The Biden administration continued these efforts, with the OSC advancing the TraCSS program to initial operations, though further policy and budgetary support is needed to continue this program.

A key issue is how the federal government interacts with the private sector on SSA. The DoD's reliance on traditional defense contractors for developing its SSA capabilities has shut out new commercial entrants that are innovating faster and could provide lower-cost services. At the same time, the current model of providing free SSA data and services to all satellite operators from taxpayer-funded sensors has hindered the ability of those same commercial providers to find private sector customers and investment. SSA information services also support a critical public safety function, supporting safe space activities for a wide range of U.S. (and international) space operators. Shifting to a purely private sector model for providing SSA data and services risks shutting out academic, scientific, not-for-profit, and other users who cannot afford to pay for access. Achieving an appropriate balance between public and private roles in SSA data and services provision is an ongoing challenge. ●

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## Policy Recommendations

### → Maintain efforts to implement SPD-3 and TraCSS.

Since the finalization and publication of SPD-3, the OSC has made steady progress on implementing a civil space traffic coordination system. As TraCSS continues to transition from initial operations to its planned full-scale service, it is of great importance to ensure continuity in this program and work across the administration and Congress to provide full funding for the Office of Space Commerce to implement TraCSS. A civil STC system is a key enabler of maintaining the United States' leadership in growing the space economy, supporting continuity and safety of operations by commercial space actors (as well as other users of the space environment). Transitioning this function from the DoD to the Office of Space Commerce also promotes efficiency by enabling DoD to focus its SSA efforts on fulfilling its national security missions.

### → Lead International Efforts Towards Space Traffic Coordination.

As large satellite constellations are deployed, led in large part by U.S. operators, the need to have processes, practices, and methods in place to share basic space safety information, in order to protect operational continuity and maintain stability in the operating environment, increases. U.S. operators will need to ensure that space safety information can be exchanged with operators from other jurisdictions. With the existing operational expertise of its operators, its existing base of SSA sensors and data, and the deployment of the TraCSS system, the United States is positioned to lead international efforts to establish these basic coordination practices. The United States should proactively engage in international conversations to develop STC mechanisms, which might be voluntary in nature, including working closely with allied efforts, such as the EU Space Surveillance and Tracking (EU SST) program, to ensure an efficient and effective coordination network emerges that supports U.S. interests and a stable environment conducive to the long-term growth of space activities.

### → Leverage commercial capabilities to the maximum extent while also supporting SSA as a public good.

Both the DoD and OSC TraCSS should purchase commercial SSA data and services and pursue international data-sharing agreements in lieu of building new government capabilities. This will promote efficiency, support industry development, and allow the DoD to prioritize existing national sensor networks to support national security needs. The United States should also make basic space safety information services as publicly and freely available as possible. The private sector should be incentivized to develop innovative analytical tools and advanced services based both on public services as well as the data collected by commercial firms.