



Submitted Electronically

February 27, 2023

Kuiper Systems LLC (“Kuiper”)¹ thanks the Office of Space Commerce (“OSC” or the “Office”) for the opportunity to provide input on scope and industry needs for U.S. government (“USG”) space situational awareness (“SSA”) data and basic spaceflight safety services and related issues. Through its Kuiper System, Kuiper is deploying a non-geostationary satellite orbit (“NGSO”) system to provide affordable, reliable, high-quality connectivity to customers and communities around the world. Space safety is a priority for Kuiper, and accurate and accessible SSA data are essential to a safe and sustainable space operational environment. Below, Kuiper offers input on OSC’s proposed scope of basic SSA services and additional enhanced services.

Kuiper Supports Continued Progress on Civil SSA Transition

Kuiper supports the continued transition of civil SSA services to the Department of Commerce as a critical step to maintaining U.S. leadership in the responsible use of space and maximizing the benefits of the growing space economy. Building on previous requests for information (“RFIs”) regarding the provision of SSA services, this RFI represents a commendable step toward determining the scope for such services and other aspects related to the development of a curated, trusted data catalog equivalent to, and building upon, current USG capability. Kuiper supports OSC’s development of a robust data integration architecture that will enable enhanced tracking and analysis through the Traffic Management System for Space (“TraCSS”). Providing basic, free-of-fee SSA services will enhance flexibility and responsiveness to enable a range of owner/operators to function safely in an increasingly complex orbital environment. We believe this will further encourage proactive data sharing by and between owner/operators. It will also provide an avenue to leverage the growing ecosystem of commercial sensors and products, and serve as a foundation for higher-tier commercial services.

Kuiper recognizes the importance of ensuring a predictable operating environment, and OSC’s proposed services would bring notable safety benefits by improving predictability. Kuiper also supports the development of shared operational protocols between operators, including predictive trajectories based on ephemerides, well-characterized covariance, planned maneuvers, and collision avoidance maneuver logic to help ensure predictability in its own operations. In the future, operators will look to machine-to-machine communication protocols and mechanisms as important tools in coordinating physical operations in space, and—as OSC expands its role in providing SSA data and basic spaceflight safety services—these types of mechanisms may also play a part in OSC’s involvement in SSA and spaceflight

¹ Kuiper is a wholly owned indirect subsidiary of Amazon.com, Inc. These comments reflect only Kuiper’s views.

services. Additionally, OSC should consider efforts to utilize commercial and government capabilities to continually improve and modernize SSA services.

Proposed Scope of Basic SSA Services

As SSA responsibilities are transitioned from the Department of Defense (“DOD”) to OSC, the Office should prioritize ensuring that operators in orbit have access to a common baseline of safety-related data, as well as a meaningful way to process and validate operator data into the system. Specifically, Kuiper believes that ten of the proposed services² would be sufficient to support the needs of current and planned space operations—and, together, would at least match the USG services currently provided by DOD. Kuiper urges OSC to take into account the following considerations and features in developing TraCSS:

- Maintaining a database of satellite characteristics with input from owner/operators regarding mission phase and status, along with necessary contact information for coordinating conjunction mitigation (which OSC indicates will be included), should be a high priority. In addition, Kuiper recommends that owner/operators provide updates to OSC on satellite status information at least three times per day.
- Participating owner/operators should be required to provide, at a minimum, point of contact information to facilitate conjunction coordination when necessary. OSC should also ensure that basic catalog data, such as two-line element sets (“TLEs”) or their equivalent, are made available for all tracked objects that do not conflict with national security goals. Making available this basic data would support space object prediction.
- TraCSS should provide time-tagged updates for maneuvers and satellite status. These time-tagged updates would further enhance awareness and safety by allowing for more accurate predictions.³
- TraCSS should be able to process and share ephemeris data from owner/operators as well as provide a quality assessment history of predictions against observed ephemerides.
- With the enhanced prediction and modeling abilities noted above—and with the services OSC has indicated will be included—the Office will be well-positioned to offer both routine conjunction assessment (“CA”) screening and conjunction data message (“CDM”) production, as well as special or on-demand CA and CDM services to owner/operators through an Application Programming Interface that supports the high-frequency queries that are required for large constellations.

² In Kuiper’s view, the following proposed services meet or exceed services currently provided by DOD and are essential to meet the needs of current and planned operations: Satellite Attributes, Capabilities, Status, and Point of Contact; Receipt and Sharing of Predictions Owner/Operators Ephemerides; Routine Collision Assessment (“CA”) Screening and Conjunction Data Message (“CDM”) Production; Special CA Screening and CDM Production; Launch Collision Avoidance (“COLA”) Screenings; Re-entry Management and Assessment; Precision Probability of Collision Calculation; Conjunction Object Solution Improvements with Additional Tracking; Risk Assessment Time History Plots; Space Weather Sensitivity; Design-time Assistance for Improved CA; Breakup Detection, Tracking, and Cataloguing. See 88 FR 4970 (Jan. 26, 2023).

³ Providing metadata, such as time of last update for satellite status data, would be valuable. Knowing when the last time a satellite was designated “maneuverable,” for example, or how old a predictive ephemeris is, assists in evaluating the data’s value in decision making.

These CDMs should include a probability of collision (“PC”) calculation that accounts for the size and dynamics of the relevant objects and their relative trajectories. Further assessments of collision consequences and debris production based on these models could be valuable for understanding debris propagation and resultant collision risks, but are not essential from an owner/operator standpoint.

- Ensuring adequate deconfliction during launch and reentry (as OSC indicates will be included) should also be a high priority for TraCSS capabilities. Collision risk assessments based on accurate data will ensure adequate orbital separation. For station-keeping payloads, reference trajectories with appropriately sized keep-out volumes may be sufficient in lieu of propagation and covariance modeling.
- Reentry assessment and forecasting remain essential to deconfliction and ground safety. Making available the information that owner/operators need to plan, monitor, and—if necessary—execute reentry maneuvers, would significantly reduce risk. Given the dynamic nature of these activities, the update rate should be no less frequent than three times per day.
- Finally, Kuiper strongly supports OSC’s planned integration of space weather modeling and forecasting in TraCSS and its derivatives, as these phenomena have significant impact on orbital paths and satellite behavior. Incorporating the work carried out by the National Oceanic and Atmospheric Administration’s Space Weather Prediction Center, along with owner/operator observational data and commercial sources, would greatly enhance responsiveness and preparedness for space weather events and their effects on satellites. Given the constantly changing nature of space weather, updates should be provided more frequently than the current rate of three per day.

Beyond those services that are proposed to be included, Kuiper’s view is that one of the services excluded from the proposed scope—Breakup Detection, Tracking, and Cataloguing—is essential to long-term space safety and establishing consensus-based best practices. Monitoring breakups and tracking debris are cross-cutting functions important to other federal agencies, including DOD and the National Aeronautics and Space Administration (“NASA”).

OSC Should Balance Wide Availability with Appropriate Incentives

Consistent with its commitment to ensure the safety and sustainability of the space operational environment, Kuiper strongly supports the wide availability of basic services necessary for all owner/operators to safely operate satellites, regardless of level of participation in TraCSS.

Kuiper supports efforts to enhance the safety of the space operational environment through consensus-based operational standards. That said, Kuiper recognizes that tying the availability of basic space safety services to meeting good actor conditions could impact efforts to ensure the broadest participation. Before adopting any such requirements, Kuiper urges OSC to thoroughly analyze the data available on owner/operators that do not currently participate in formal data sharing agreements with U.S. Space Command and assess whether such agreements encourage participation in good practices, as intended, or prevent owner/operators from being able to perform operations responsibly as a practical matter.

Additional Comments

In addition to enhancing safety for owner/operators, a strong foundation of basic SSA services is an important precursor to international discussions of norms and best practices regarding deconfliction. While secondary to the important operational mission on which OSC seeks input here, OSC should continue working with other agencies, including NASA, DOD, and the U.S. Department of State to support and coordinate the United States' participation in international standards developments for space traffic coordination (e.g., as part of the Consultative Committee on Space Data Standards). Internationally recognized standards and formats for data sharing, particularly those created with input from the U.S. commercial space industry, will provide a robust foundation for future international discussions and help ensure that the United States remains a leader in the global space economy.