

Hearing of the Commerce, Justice, Science, and Related Agencies U.S. Senate “Space Situational Awareness, Space Traffic Management and Orbital Debris: Examining Solutions for Emerging Threats.”

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Testimony of Mr. Paul Graziani

CEO of COMSPOC Corp and Co-Founder of Analytical Graphics, Inc.

1. Opening

Chair Hickenlooper, Ranking Member Lummis, and distinguished members of the Committee – I sincerely thank you for inviting me and the companies I represent, COMSPOC Corp and Analytical Graphics, Inc., to testify before you on Space Situational Awareness (SSA), Space Traffic Management (STM), and Orbital Debris.

While I directly represent COMSPOC and Analytical Graphics, I want to note that I am delivering testimony today to reflect the commercial SSA industry as a whole, rather than any one company. We’ve been delivering SSA solutions for over 20 years and established a big tent approach that should serve as the basis for my testimony.

I applaud your leadership today in holding a hearing on this topic. SSA, STM, and Orbital Debris are indeed critically urgent matters that, unfortunately, have fallen victim to years of stagnation by way of repetitious study and debate, confused priorities and limited, misdirected funding – resulting in very little actual progress. While this topic continues to be of significant interest on the floor, it has been allocated too few resources and too little discernable focus for any significant advancement—despite Space Policy Directive-3 (SPD-3), which formally initiated the STM responsibility and implementation effort for the U.S. Government (USG), over 3 years ago. For the sake of satellite operators, commercial SSA providers, human space explorers, researchers and indeed, the general public, my hope is that this hearing and your leadership will ensure it’s not too late to provide clear legislative direction such that the responsible agency can execute and implement space safety solutions.

2. Benefits the SSA industry brings to the American people

Quite simply, the SSA industry, and a resulting STM regime, enable a safe, secure and sustainable space operational environment for the continued launch and operation of the critical space infrastructure that delivers essential capabilities and services to the global population: navigation, communications, weather/climate, Earth resources and other imaging, health/medical system support, broadband services, and virtual conduct of sectors of the US economy – or US Commerce. The functions of industry-provided SSA range from the identification and maintenance of position/velocity/orbit information on the on-orbit satellite population, to the determination of knowledge and understanding of potential collision risk situations, to supporting the planning, selection, and execution of appropriate response actions, all of which allow operators to conduct safe operations that minimize the risk of accidental collisions that would jeopardize the conduct of and provision of these services.

The average American might not think of satellites in their day-to-day life, but they certainly unknowingly rely on them. Banking, for example – specifically wire transfers – are only possible using precision timing signals only available from navigation satellites. Despite the panic and inconvenience that would ensue at the loss of banking communications, we rely on satellites for much higher stakes.

Consider a natural disaster; whether it's a flood, forest fire, hurricane, or earthquake, satellites help detect, warn and mitigate the loss of human life in these events. Infrared satellites detect forest fires. First responders rely on satellites to find lost victims. Hurricanes are monitored using weather satellites. Any of these events alone can be horrific and even fatal. Further, compound on those scenarios that much of our communications are reliant on satellites. First responders radioing for reinforcements, pilots' connection with air traffic control, phone calls statusing friends and family—are all communications that are at risk without proper satellite safety measures. These are all examples of space-based services upon which the ground, air and maritime domains rely.

The space industry continues to research and innovate, opening new doors to ground-breaking operating concepts, constructs, capabilities, and services. This is evidenced by coverage on commercial space launches introducing possibilities generally undoable even a few short years ago (about when SPD-3 was released). The SSA industry will continue to help keep space open for commerce and its associated research and innovation.

A natural consequence of this activity, along with other factors, causes space to continuously become an increasingly congested and complicated operational environment, magnifying risk to operations and its long-term sustainability. Current USG (via the DoD) spaceflight safety capabilities and services, as well as the Space Situational Awareness (SSA) to support them, fall far short of being able to manage this critical resource in this “new space” regime. However, commercial private industry has been actively innovating, building and providing the necessary SSA and STM capabilities for over a decade.

Space is now indispensable to the American way of life, and STM is fundamental to protecting the valuable resource of space. The benefits of a robust SSA industry will ensure that the space-based services that all citizens use today will continue to be available tomorrow and that new space-based services will continue to flourish.

3. Commercial Positioning

US Commercial SSA providers are world-renowned for their innovation, subject matter expertise, and capabilities. U.S. private industry teams are delivering the most advanced SSA and STM capabilities in existence. Many capabilities have been available for over a decade,

while some capabilities are recent, state-of-the-art advancements, due to commercial industry's on-going innovation. Here are a few examples from U.S. private industry:

- Utilizes state-of-the-art algorithms that curate, process and fuse data agnostically –across all formats, standards and phenomenologies – to generate the world's most accurate orbit information and provide operationally relevant, decision-quality collision warnings
- Leverages open-standards based, service-oriented architectures to facilitate ease of sharing and plug-n-play interoperability with other existing capabilities or future-developed capabilities
- Provides commercial cloud computing architecture to support flexibility, scalability, virtual accessibility, and data security
- Maximizes transparency into data, information, and the processes behind them to support satellite operator confidence-building in risk analysis and assessment procedures to support collision avoidance maneuver decisions, planning, and execution
- Ability to track small pieces of debris down to 2cm
- Expertise to uniquely deploy hundreds of ground-based telescopes in an innovative way to decrease the amount of sun exclusion
- Deploying and routinely using telescopes for daytime tracking at scale
- Acts as the operational arm for the Space Data Association which provides safety of flight services to 700+ commercial and civil satellite operators utilizing the Space Data Center that was deployed and has been continuously operating for 11 years

For the past 3 years, NOAA has been utilizing commercial SSA services from private industry to protect their weather satellites in both low earth and geosynchronous orbit, in part to ensure the most accurate and timely information is utilized.

There are many more examples where individual satellite operators are indeed looking for and leveraging private industry commercial SSA services. However, this remains a minuscular population of operational satellites and doesn't address the scale needed to protect the space operational environment.

A critical infrastructure component of an STM system, is an Open Architecture Data Repository (OADR), which is not available in today's legacy US Government capabilities. In November 2020, DoC's Office of Space Commerce (OSC), conducted an OADR industry day to perform market research for commercial capabilities to support an OADR. Private industry demonstrated the ability to satisfy all 10 required functions of an OADR as stipulated by OSC.

In short, commercial companies are better suited than the government to provide a higher standard of SSA because, by design, their capabilities are more universal/interoperable due to the diversity of their customer base, the pace at which commercial innovates, and the commercial practices that enable the private sector investment. On the opposite end of the spectrum, the government builds capabilities that are very specific and uniquely situated to government owned and operated systems. The nature of government contracting ends up restricting the broad application of products and services available from private industry for SSA and STM, and it

stifles the innovation necessary to continue to meet evolving SSA and STM challenges as they arrive in the “new space” operational environment.

4. Importance of international leadership in these areas

SSA and space safety services have long been provided free of charge to the satellite operator community via the Combined Space Operations Center (CSpOC) under the purview of the 18th Space Control Squadron (18SPCS). Using data collected by the Space Surveillance Network, the DoD has performed a laudable job of providing these U.S.-provided SSA Sharing services, to include obtaining the necessary Congressional authority, instituting the requisite operational procedures, and building and maintaining partnerships with various foreign government and commercial entities. The DoD should be commended for its foresight and understanding of the need to support space safety for the sustainability of space operations, as well as its diligence in establishing a paradigm for SSA sharing.

However, the U.S. national security space regime is becoming increasingly threatened due to adversary actions. This is, in part, the reason for the recent reorganization around national security space, to include the re-institution of U.S. Space Command and the standup of the U.S. Space Force. Associated with this reorganization, the DoD has directly stated a compulsory demand to focus on space as a warfighting domain and a desire to transfer SSA sharing and space safety functions to another USG organization (and identified the Commerce Department for this purpose).

Combined with the aforementioned lack of progress in standing up a U.S. SSA/STM regime for these civil/commercial concerns, non-US governmental entities, and their associated non-U.S. commercial counterparts, now have an opportunity and seek to seize the initiative in this mission area. If successful, they would then promote their leadership paving the way for the development of international standards and best practices with respect to space operations, SSA and STM. These efforts could then result in processes, standards, and best practices that, are not favorably pre-disposed to U.S. priorities and concerns; they may even artificially complicate or constrain U.S. space operations, including national security space.

In addition, this would consequently mean that the associated non-U.S. commercial entities would be able to grab the larger percentage of the potential market share for private industry-provided SSA and STM capabilities and services.

Indeed, the current German presidency of the European Union has set a high priority on STM to maintain and promote European sovereignty, not only for its regulatory impact but also to open markets for related goods and services. The European Cooperation for Space Standardization has stood up a regular meeting panel of 20 subject matter experts to coordinate and harmonize European industries and agencies positions on STM related standards and to contribute to the development of STM implementation standards in the framework of the International Organization of Standardization (ISO).

And the EU is not the only non-U.S. effort underway. While the U.S. might hope for the best here (and realize that hope is not a strategy!), there are also efforts underway with potential adversaries like China and Russia that will undoubtedly seek to complicate U.S. management of its space concerns and equities.

5. Recommendations for congressional action on civil SSA and STM

In Summary, the space sector is experiencing explosive growth, this creates a more difficult satellite operational field, protecting our satellites is essential to American every-day way of life, the status quo is unsustainable, and better capabilities exist and are assessable through commercial options.

The U.S. needs to take advantage of the commercial innovation and the rate at which commercial industry delivers solutions that address space safety challenges. Below are recommendations to do so:

- Energize and motivate the space commerce by empowering NOAA and the Office of Space Commerce to fully embrace commercial SSA providers through contracts just like NASA and other agencies do; a no-cost demonstration is not incentivizing private industry to continue to invest and innovate and simply, does not meet the spirit and intent of collaborating with industry for an STM Pilot.
- Implement a national STM Pilot for space safety and continued space economy growth
- Fully resource and adequately fund the Office of Space Commerce to take advantage of existing commercial STM services available from private industry.
- Provide clear, deliberate direction to acquire, prioritize, implement, and deploy existing commercial SSA and STM services available.
- Utilize the market research already performed by the Office of Space Commerce.
- Leverage research and development for studying hard problems where solutions don't exist and to improve upon promising ideas and algorithms; Avoid the unending analysis of alternatives or yet another year of market research or technical studies that have all been performed and results reported. The solutions already exist; they just need to be utilized.

Again, I applaud this committee for taking leadership and holding this hearing. Consistent with the August 2020 National Academy of Public Administration (NAPA), there is an impending crisis as it relates to satellite operations and managing the collision threats, the growth of on-orbit satellites and the critical nature of space-based services provided from satellites. There is an urgent challenge and private industry is well prepared to meet the challenge. We look forward to your direction to remove the obstacles hindering the full utilization of existing commercial solutions.