2019 AMOS Dialogue

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On Sept. 19, 2019, Secure World Foundation (SWF) and the Maui Economic Development Board (MEDB) co-hosted the eighth annual AMOS Dialogue, a small, invitation-only workshop at the 2019 Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference, held in Maui, Hawaii, Sept. 18-20, 2019.

The goal of the AMOS Dialogue series is to facilitate discussion among key stakeholders in space situational awareness (SSA), thereby promoting greater collaboration and cooperation to enhance SSA for safe and responsible space activities. To accomplish this, the Dialogue brings together representatives from current and future SSA programs and initiatives around the world with a variety of end users and stakeholders so that they may exchange information and views in a not-for-attribution setting.

The topic of the 2019 AMOS Dialogue was open access data repositories to improve SSA data sharing. There is growing interest from both governments and satellite operators in merging different sources of SSA data together and in some cases making the fused data more widely available, with a few pilot programs and prototypes in the planning stages. This year's Dialogue brought together governments, satellite operators, and astrodynamicists to discuss the key characteristics of such data repositories and how they can provide better data and services over existing solutions while also fostering trust with users. The discussion took place under Chatham House Rule: topics addressed could be used in materials prepared by SWF and/or MEDB in their future endeavors, but would not be attributed to any given speaker.

The major takeaways from this year's Dialogue was that when designed properly, open access data repositories can increase the interest of governments and satellite operators in merging different sorts of SSA data and, in some cases, make the fused data more widely available. Transparency is a key factor to the success of OADRs in general. Challenges to transparency include different technical specifications, secrecy (either for national security or commercial proprietary reasons), trust in the providers, balancing the need of public good versus private interests, ascertaining liability for the data given, and encouraging commercial innovation while at the same time providing enough information to ensure basic spacecraft safety.

The Dialogue began with an overview of U.S. government efforts to develop an open access data repository of space situational awareness data. Space Policy Directive (SPD)-3, issued by the Trump administration in June 2018, established the first national space traffic management policy and made the Department of Commerce responsible for the publicly releasable portion of the Department of Defense SSA catalog through an open architecture data repository (OADR). The OADR would need to do two major tasks: provide conjunction analysis and other kinds of analysis to non-governmental users, and be a place where other entities can contribute their own SSA data to be fused with the U.S. governmental SSA data. "Open" in this sense is not meant to be "not secure," but rather a market of ideas and data that many

entities can contribute to and where different types of data can be integrated. To accomplish this goal, the OADR needs to develop and use data standards in order to ensure quality from multiple providers of data and security protocols to protect sensitive and/or proprietary data. As a starting point, the Air Force Research Lab (AFRL) has shared access to its Universal Data Library (UDL) with the Department of Commerce so that they can start practicing analyzing the data. The Department of Defense (DoD) will still maintain the authoritative SSA catalog.

Next, there was a moderated discussion about useful characteristics of SSA databases and repositories and what characteristics SSA databases and repositories needed in order to build trust with users, provide useful services, improve SSA data and products, and enhance SSA data sharing.

It was noted that the European Union (EU)'s Space Surveillance Tracking (SST) system has an existing framework for data sharing between 8 member countries, but these are only bilateral agreements and there is not yet a multilateral agreement. The data from the SST is used to protect 129 spacecraft (civil, military, scientific, and academic in origin) from the risk of collision. The SST is based on a network of sensors provided by the member States and operational performance monitoring is used to ensure the quality of the data contributed to the system. The monitoring assesses the performance and varieties of data-sharing within the consortium and can detect when there is bad information coming in from a poor sensor.

One key question should be asked when trying to develop a SSA data repository: what are the principles that are trying to be served? One participant's response was that a core principle was a predictable investment climate where commercial innovation is incentivized all the way through. The concept of an OADR has been successfully implemented in other industries, and in those cases, "open" meant freeing people to innovate. It was noted that this focus on an OADR tends to mostly be referring to states and places, but space covers different jurisdictions and space is a commons domain. Do we need to assign nationality to this enterprise? If so, that might be a real challenge.

This raises the question of whether we really want this to be a commercially-driven market, or if it should be a public good. There was a significant discussion of whether creating an OADR could hurt the business case for commercial SSA or whether the market could be split into smaller pieces. Doing so could allow governments to provide safety-related SSA information and products as public goods, while commercial services could provide more exquisite data for different types of on-orbit activities.

A key public policy choice inherent in creating an OADR is where and how you incentivize innovation. A good example of this was the public policy debate in the mid-1990s over opening up greater access to the civil Global Positioning System (GPS) signals. Prior to that, a random error placed on the civil signal prevented a lot of applications and there was a strong push to charge for the service. The policy decision made in 1996 to turn off that error concluded that the value to the economy as a whole from a freely-available, high accuracy position, navigation, and timing (PNT) service far outweighed the potential revenues. As a result, the free, government-provided GPS signal has sparked a degree of innovation in commercial receivers and applications that went far beyond anyone's wildest imagination. It was impossible to predict what people would use the data for, but that's good - that's the kind of innovation that makes the world a better place.

Another example the group discussed was the weather forecasting enterprise. Again, this was another case where commercial innovation focused on packaging government data that had already been collected, vetted, and made available to the general public. As a result, a robust commercial market has sprung up for developing algorithms based on that data that could be marketed to specific industry sectors such as agriculture. Additionally, there has been innovation at cooperative institutes that allow for grad students

to address new analysis techniques for improving accuracy and timeliness of forecasting or to address known problems offline, like hurricane intensity changes. Once they were ready for usage, a disciplined peer review and approval would take place before new algorithms would be installed in weather models.

One of the participants pointed out that the United States has the luxury of debating a government-centric model vs. a commercial one, as most other governments have only the government option and do not have an indigenous commercial SSA sector.

This discussion of public vs private goods raised the question as to what is an inherently governmental responsibility when it comes to SSA data and services. What basic level of services should be provided by the government versus provided by industry? Should the basic level needed for space safety continue to be free of user fees (which is what SPD-3 calls for)? Should the commercial sector help define where this basic level of services stops? This is essentially a political question that the government needs to decide.

One participant felt that it was crucial to map what the different stakeholders and users of the SSA data and services want, as that would affect what sort of data that they needed. For example, satellite operators need to know if their owner/operator data is right; they need ephemeris and covariance and the most accurate and timely CA screening possible. Alternatively, NGOs want data to name and shame and encourage certain kinds of behavior, so they need access to a lot of historical data but don't need very timely or accurate data. Meanwhile, scientists want data to model space environment and debris populations, so it can be months old but it needs to be very comprehensive and accurate.

Next, there was a discussion about interactions between different SSA database efforts, where participants examined different government, industry, and academic efforts currently underway to develop SSA databases and repositories and what measures can be taken to improve compatibility and collaboration.

The question was raised about how open is open? Can operators hide how many close approaches they have, or even the fact of a collision? What is required to be shared? In the air transportation world, there are national laws requiring release of proprietary data for public safety (like accidents). One of the participants asked if the group could imagine a commercial airline hiding data that one of its aircraft went way off course and nearly had a collision. It was noted that these air traffic transparency and data sharing rules haven't hurt entrepreneurial spirit of airlines; why do we assume that SSA sharing rules would necessarily be harmful to new actors?

At the end of the discussion, the participants reinforced that transparency is key to the success of any OADR and sharing data does not mean that it will automatically hurt business. Transparency (or lack thereof) may be a cultural issue; if owners/operators don't share SSA data, it may lead to the question of what are they trying to hide. Transparency is essential, as it leads to confidence in the underlying data and answers. Using commercial data as the foundation can make that easier, although that is not an option for the United States at the moment as SPD-3 mandates DoD data as the foundation. The other key was to establish standards as to what is "good enough data" to contribute to the OADR, which will encourage more contributions. That standard should be based off end user needs.

Several participants also noted that having more than one OADR may be preferential to trying to develop just one that could satisfy all end users. An example might be on OADR where operators share information as to where their spacecraft are and another OADR for debris where everyone's sharing information and it's officially nobody's data.

The final point that was raised was that there needs to be more effort put into reaching out to new actors, both commercial and governmental, and getting their input into the process.

About Secure World Foundation

Secure World Foundation (SWF) is a private operating foundation dedicated to the secure and sustainable use of space for the benefit of Earth and all its peoples. SWF engages with academics, policy makers, scientists, and advocates in the space and international affairs communities to support steps that strengthen global space sustainability. It promotes the development of cooperative and effective use of space for the protection of Earth's environment and human security. https://swfound.org