



Summary of the 2015 AMOS Dialogue

Co-hosted by the Secure World Foundation (SWF) and the Maui Economic Development Board (MEDB) at the Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference in Maui, Hawaii

On Sept. 17, 2015, the Secure World Foundation (SWF) and the Maui Economic Development Board (MEDB) co-hosted the fourth AMOS Dialogue during the 2015 Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference, held on the Hawaiian island of Maui, September 16-18, 2015. The Dialogue was a small, invite-only side event that took place alongside the AMOS Conference. The topic of the 2015 AMOS Dialogue was a discussion of Space Traffic Management (STM), and specifically how to build upon the current space situational awareness (SSA) and conjunction assessment practices coordinated by the U.S. military towards a more robust system that has greater civil agency and international involvement and data sharing between governments and satellite operators. The views were exchanged in a not-for-attribution setting.

Main takeaways from the discussion include a strong focus on norms and the important role that they play in establishing a stable and predictable space environment. Also crucial is the amount of data available to all actors in space, since it is important to get a baseline level of information to all satellite operators. The emerging commercial presence is going to have to be a big part of the equation. The question of coordinating national regulations with international efforts was raised, as was the need to internationalize the conversation to include the BRICS (Brazil, Russia, India, China, and South Africa) at future Dialogues. Finally, it was agreed that there needed to be better engagement between the small satellite community and the SSA community to help correct what was perceived by many as a lack of communication and shared knowledge between the two groups.

The 2015 AMOS Dialogue was divided into two main sessions. The first was an assessment of current SSA and STM practices, policies, and capabilities. Participants were asked to consider the following questions: are current SSA data and services available to operators and government sufficient to provide for sustainable and safe space activities? Which areas are priorities for improvement, and what are the emerging challenges? Are existing international and national laws and policies sufficient to provide for oversight of space activities and STM?

The discussion began with the question of why talk about STM at all; perhaps it would be better to examine the safety and/or preservation of the environment. There was also an exchange of views on the challenge of defining STM - does STM mean efficiency? Safety? Control? To the last question, one participant felt that it was not being done for reasons of control, as that limits usage, and is something of a pipe dream anyways. Several participants noted that a type of traffic management could encourage economic innovation by actually increasing the “carrying capacity” of heavily used orbits.

One participant commented that space traffic management is about managing risk, both individual and collective. Since the space community is still figuring this out, it is important to open the conversation up to as wide a group of people as possible who have a stake in the issue.

It was pointed out that we need to distinguish between SSA and STM. SSA was perceived as mainly a technical function and may not be an inherently governmental function. This contrasts with STM, which one person described as an umbrella term that encompasses activities of how we operate in space, and which could be argued to be a government function. It could be seen as being a spectrum from monitoring to control, and also going from national to international interests, with SSA being the general foundation of STM.

One of the big challenges for STM is transparency. The national security community is hesitant to let go of their near-monopoly on SSA information. But several participants felt that the discussion needs to move to a wider audience beyond just military in order to get beyond secrecy. Concurrently, we must get through the technical and bureaucratic barriers to sharing SSA information, something which SSA providers often have problems in doing.

It was commented that the U.S. Joint Space Operations Center (JSpOC) of the U.S. Strategic Command (STRATCOM) does not do STM. Specifically, it does not feel that it is a “space traffic cop” because it doesn’t tell anyone what to do, but instead provides information on what it sees and lets the owner/operators make their own decisions. Furthermore, it does not enforce rules, because there largely aren’t any. SSA (and STM) is not the military’s job. But simply because they are the only group in town, this means that everyone comes to you. Because of this, STRATCOM is rolling out a program to have better, more accurate data.

It was noted that if we don’t figure out norms now, someone else will. One participant commented that this was due to the democratization of space, or what was described as “Space 2.0.” It was pointed out that we need to adapt to where space is going, much like how there weren’t any stop signs or traffic lights before there were Model T’s. Norms are not needed for everything, either - they should be focused on solving specific problems and concerns.

Our current SSA system is currently creating a false sense of security, or what one participant termed “a train wreck happening.” This is not because the JSpOC isn’t trying, but because they’re not being set up to win. We are making all sorts of assumptions – that the data is of good quality, that people will make the right decisions, and that people want to be responsible. In order for STM to work, we need to have a regulatory aspect, norms, and an enforcement function. Another participant argued that enforcement is the wrong term, as we need instead to talk about encouraging compliance, noting that people comply with rules largely because they are useful.

Having rules doesn’t mean that the rule makers are going to tell operators how to control their spacecraft. There was a strong resistance among participants to the idea of governments telling operators how or when to move, because that is not practical. But there needs to be a norm that someone does move when a conjunction appears to be impending. One participant wondered if there was a herd mentality for norms. For example, if 90% of the people follow the norm for responsible space behavior, are we protected?

The difference with space versus other domains which have set up norms of behavior is that space is not directly observable all the time. There is no global data set that everyone has (at least, not right now), and it’s hard to put together norms because of the lack of shared understanding of what is actually going on and the problem, as well as challenges in verifying others are following the rules. We need to get to a

place where most (if not all) satellite operators have redundant proof of behavior to be able to know for sure.

One participant felt that we cannot wait on the data to have the norms, but norms need to evolve as we improve knowledge. Norms vs. data was described as a chicken and egg situation, and there was a debate about whether the data needed to come first or if norms could be evolutionary. One speaker noted that we do know that debris 10 cm in diameter can kill the International Space Station (ISS), for example, so we can do some minimal education about what some norms should be.

While most agreed that enforcement of norms should be at the national level, responsible states should step forward and take the lead. However, there was the worry that state regulations could be too strict and drive industry away. The concept of forum shopping for the most favorable regulatory environment was brought up, but it was noted that it can only be an issue after regulations have actually been established. And one speaker pointed out that operator best practices are useful, but there are times when accepted practices are not best practices (as is the case in some industry responses to cyber intrusions).

It was suggested that the Interagency Space Debris Coordination Committee (IADC) space debris mitigation guidelines could serve as a model for norms. They went from technical standards to receiving international organizational approval through the United Nations and were implemented via national laws. Another speaker noted that norms are really about operator best practices, and asked how do we distill all the knowledge that we have?

This was followed by a discussion of the increasing popularity of small satellites and the concerns that other stakeholders have about their effects on any STM regime that may emerge and the challenge that they present to SSA in general. One participant said that the possibility of a \$10,000 cubesat taking out the ISS keeps many space debris experts up at night. Education about dangers of space debris is helpful, as it is one of those threats where there is a low likelihood of occurrence, but the consequences are massive.

Another participant worried that education and compliance to norms of behavior for STM might not go far enough. Instead, there should be a minimum set of operating parameters for operating in space that must be followed and you have to agree to work responsibly if you have assets up on orbit. The concept of putting a satellite so small that it cannot be tracked was brought up as something that was “literally crazy.” Along those lines, another participant felt that there should be a minimum size threshold of satellites that is contingent on our ability to track them. It was commented that relying on the cubesat to emit a signal is not enough, since the satellite needs to be trackable even if its signal is not working. It was suggested that we should help others get to our point, technically speaking, in terms of best practices and norms of behavior, so that their activities on orbit are safe.

The discussion then moved into how the norms need to be pliable. It was said that the guidelines/norms need to be evolutionary, and that if in the future, we have credible science showing that the guideline is not good enough, we need to have the courage to evolve them. For example, several participants brought up the rule that low-orbit satellites should be de-orbited within 25 years of their end of life. It was argued that this rule, while fairly widespread, is insufficient and should be updated to be stricter. Finally, several participants felt that it was important for states to step up and take responsibility for removing inactive satellites and other debris instead of waiting for a rule to be made, as regulations most likely would not be able to keep up with innovation.

The second session of the AMOS Dialogue focused on ways in which there could be improvement in governmental, industry, and international engagement and cooperation to enhance SSA and STM. The participants were asked to consider the following questions: What steps can be taken by governments and

operators to improve availability of SSA data and services? Should there be agreement at the international level on STM before developing national practices, policy, and regulations?

The conversation began with the assertion that space objects being “trackable” is a U.S.-centric idea, as the vast majority of spacecraft operators or even launchers don't have the ability to track their objects, with the United States really being the only one who does. This assertion was disputed, as another participant pointed out that tracking is a physics term, not a U.S. term, and that tracking from a ground-based telescope would be a good STEM project as it doesn't require a lot of equipment. It was pointed out that many countries have a 40-cm telescope which is capable of tracking objects in geostationary orbit (GEO).

However, it was pointed out that it is not enough to have the data – users must also have the ability to know what to do with it, which requires a significant amount of capacity-building at that level. One possible way to meet that need is to create an international space traffic monitoring service that would be analogous to the International Global Navigation Satellite System (GNSS) Service (IGS). IGS began as an experiment to monitor GNSS satellites and share the data collected by them, and now is one of the primary means by which countries monitor the quality of GNSS services. An international space traffic monitoring service would not get funding for the monitoring itself, but instead from the applications of the data. Another participant argued that the lower-level sensor data needed to be shared, not just the derived products. In regards to quality of the product, it was acknowledged that there most likely would be errors at first, but that problem would resolve itself over time, and that having lots of measurements would make the bad data stick out. It was asserted that this would also offset the limitations of relying on the JSpOC data. Yet the conversation came back to the fact that at the end of the day, somebody would need to get paid to create products from the data that is collected.

Another suggestion was a program to develop a standardized passive tracking device to put on every object that goes into space, with the possibility of seeking funding to then offer it for free to everyone who could use one. However, it was pointed out that while this may be an option for future satellites, it does not solve the problem of tracking debris which has already been created, and debris is what many are very concerned about. If debris is to be removed from orbit, we first need to know where it is. One participant asked if it would be possible to create a set of public facts that countries could sign off on about what will happen if we don't do anything about space debris in order to educate and express the urgency of the issue. However, not all space users agree that it is an extremely pressing problem. Some nations are worried that norms would be created that would limit their access to or use of space, and often these international discussions are held amongst allies and don't include all major space users. Even if they did all agree on the urgency of dealing with space debris, this already exists through the IADC report, which has concluded that we need to start debris mitigation and removal. Furthermore, there would be challenges in simply figuring out who in the U.S. government would be in charge such a process, as no U.S. agency has been tasked with cleaning up space debris. Finally, for debris removal, an additional concern is that no one has done it, so no best practices exist that could help shape efforts to do this.

It was suggested that a conference be held where satellite operators, launch providers, and national users would get together and write down norms of responsible space behavior – perhaps a “Constitutional convention” of sorts. One participant thought that this could be turned into something of a self-certifying scorecard, where every time you have a launch, you get a score in terms of how well you followed best practices, which could be made public. This would be a way to reverse the shaming which is traditionally used to punish those who do not follow established norms and would instead give accolades to people who strive to behave transparently and responsibly.