



Special Release – Tracking Objects, Commercial Solutions and Emerging SSA Markets

Speaker: Gabriel Deville, Consultant, Novaspace – 22 minutes

John Gilroy: Welcome to Constellations, the podcast from Kratos. My name is John Gilroy and I'll be your moderator. Today, in preparation for the upcoming World Space Business Week in Paris, we are going over the state and county outlook of space situation awareness or SSA. Our guest is Gabriel Deville, consultant at Novaspace. Gabriel, I know things must be pretty hectic at Nova Space getting ready for the event of the year. Thanks for making time for this interview.

Gabriel Deville: You're very welcome. Thanks, John, for having me. For sure it's a crucial time for us. It's our main event of the year, but we have an amazing events team and they know their business well, so I'm not worried for them.

John Gilroy: Good, good, good. With space becoming increasingly affordable for launches and the proliferation of constellations currently are planned to be deployed, the SSA market has been significantly growing, so what are the latest numbers? Give me the numbers, Gabriel.

Gabriel Deville: Yeah, it's getting quite crowded up there, John. There's already some 7,000 active satellites currently who share space with over 130 million space debris. Most of them are too small to be tracked. We can only track over 30,000 of them, so all of this for sure is making space operations increasingly risky and less sustainable when it's driving the need for SSA solutions. Basically, the tracking of space objects, both defunct satellites and active satellites, to prevent collisions and enable safe navigation in space. Yeah, it's definitely a growing market with around probably \$180 million dollars in revenue for 2023.

John Gilroy: Wow, that's interesting. Now, I tossed out this word SSA and people tossed out these things like SDA. Perhaps you could define it for our audience real quickly and compare the two, please.

Gabriel Deville: Yeah, of course. It really depends who you ask, to be honest. SSA is primarily the tracking of man-made objects active and defunct in space, but some agencies will include additional things, like the European Space Agency will include space weather and near-Earth impactors, but it is primarily man-made objects. Then indeed, you have the concept of SDA, space domain awareness, and that's more on the side of defense agencies. It includes SSA and the monitoring of debris and space objects, but they also consider space as a tactical theater where there are friends and foes and adversary satellites which may try to destabilize

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sovereignty and national security assets, and those satellites need to be monitored and tracked. This paves the way for new security use cases such as keeping eyes on a specific adversary satellite, monitoring their every movement, or even maybe getting a close up look on it to see what it's up to.

John Gilroy:

Next week in California is going to be an event. There's going to be a new moon and people are going to go see the Milky Way in the desert out there. It's going to be fantastic, and I'm sure some people are going to count those satellites. You talk about 7,000 satellites. So we look at the satellites. What is the overview of the SSA market? Is it all of them, some of them? Give us an overview of specifically who are the players on both the government side and commercial? We're seeing the emergence of commercial SSA services. Who are buying these and why?

Gabriel Deville:

Yeah, great question. SSA capabilities are not that new, but SSA as a market is emerging and rapidly emerging. Right now, it's largely government-centered. It's safe to say that over 80% of SSA data is collected by government capabilities, so government radar and telescopes operated by governments themselves. Over 99% of SSA data is collected by ground facilities, so it's mostly a ground-based market, ground-force-based market. Yeah, governments own and operate those data, those facilities for their own needs, to sustain their own space missions, and they even let out some free collision alerts for whoever actors have objects which are coming close to one another. These alerts are called conjunction data messages. Yeah, government spends approximately \$5 billion dollars per year on SSA and over 95% of this goes to maintaining and developing their own capabilities.

In the wake of all this, you have commercial solutions who are emerging, commercial companies, both legacy and emerging startup companies. Most of them already use government data which they have acquired or which they have been given and they transform this government data into commercial services, but we're also increasingly seeing commercial companies who are developing their own sensor network, their own telescope or radar network essentially on the ground, but also some space-based sensor projects emerging. Companies like Safran, LeoLabs, Slingshot Aerospace, ExoAnalytics and many others are developing their own capabilities.

What you may ask is, what's in it for those companies, since governments are already providing for their own needs and they're already letting out free collision alerts? That's true, but there's pain points and unserved needs all over the board. Even the most advanced space nations have pain points and unserved needs regardless of the indicator, whether it's object revisit rates or how often you can get eyes on one same object, which means how real-time you are, how early you can detect an object, refresh rates, or how fast can you push information through your systems.

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For the user, catalog gives us abilities, or how much of the actual objects are you capable of observing? Geographic coverage, there's a lot of blind spots across the world, specifically on the Southern Hemisphere where there's not a lot of land, so not a lot of places to put sensors. Yeah, through all these indicators, there's a lot of blind spots and commercial companies are essentially trying to address those for governments primarily. As of today, 70% to 80% of these companies' revenues comes from governments. Also for commercial customers, we were saying that governments let out free collision alerts, but these typically have a 99.9% error rates, which results in commercial operators being literally showered with collision alerts, almost none of which are actually actionable, which calls for more tailored paying services to cut down the number of false alerts, basically. Yeah, that's what's in it for these commercial companies.

John Gilroy: Wow, 99%, that's not a good batting average. That's missing 99 balls out of 100 thrown. That's not good. You gave us a pretty good idea of some of the commercial solutions that the government's at least trying to provide. I want to move into, who needs the SSA and how do needs vary across defense, civil and commercial operations? You gave us a general idea, but for example, I imagine each one of these different constellations or networks have different requirements for SSA. Some must vary. Is that correct?

Gabriel Deville: Yeah, that's very true. They have different requirements. On one hand you have, okay, governments and commercial. Governments are more interested in painting a complete image of the space sector, not only their objects, but it's also all the objects out there. Commercial companies are more focused on monitoring their own satellites and ensuring mission safety for their own satellites. If you zoom in on governments, you have civil governments who acquire SSA data for basically as a public service, as a tool of sovereignty. Then you have defense operators who have extremely high requirements and who are acquiring basically data to ensure their critical national security missions.

John Gilroy: Your company, Novaspace, it has a SSA report and they mentioned three revenue scenarios for SSA in the next ten years, so can you talk about what those scenarios are and how they would affect their accuracy?

Gabriel Deville: Yeah, sure. We expect SSA as a market to reach, over the next decades, over the whole decade, \$2.5 billion dollars in revenue for commercial suppliers of SSA. I stress this is only the revenues from the sale of commercial data and services, not for the construction and the maintenance of government SSA facilities. The different scenarios expect maybe \$2.5 billion dollars, give or take about half a billion dollars. The main variable here is the extent to which governments will actually open to commercial solutions.

Right now, what we are seeing is that governments are interested to buy commercial SSA solutions. They're already buying some. To give you an idea, out

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of \$5 billion dollars spent on the SSA by governments last year, 3% to 4% of this was used to acquire actually commercial data, commercial solutions, so they're definitely interested, but they're still looking exactly on how to integrate this data into their own capabilities, because the thing with governments, especially with defense operators is that they have insanely high quality requirements, which can be really hard to reach with commercial systems.

There's a 2023 GAO report which found that it would be really hard for commercial companies to meet the high requirements of the Department of Defense. Nevertheless, they are interested. They are already acquiring commercial solutions, whether it's defense side, which is harder to address for commercial companies, but the USSF is expected to spend some \$60 million dollars in 2024 to acquire commercial solutions. Meanwhile, on the civil side, you have some programs which are really geared toward acquiring commercial solutions such as the Office of Space Commerce's TraCSS program, which should spend some \$40 million in '24 to acquire commercial solutions and back in Europe also, the European Union's SST program, which also should spend some \$14 million dollars in '24 to acquire commercial solutions. Yeah, the main variable looking forward is definitely the extent to which governments, defense and civil, will open their SSA budgets to commercial solutions.

John Gilroy: Earlier in the interview, you talked about government programs, but now when you say the word 40 million, all of a sudden, it's like, he's not just talking. This is 40 million dollars. There's a lot of effort being put into this. I love these specifics. This should be the numbers show. Gabriel gives the numbers, because these numbers are wonderful.

Gabriel Deville: Sorry.

John Gilroy: No, it's not sorry. No, this is what my listeners want. I meet my listeners out in the streets and I talk to them and this is what they want. They want the gritty. Show me the numbers. We'll take the Tom Cruise thing and spin it around. Show me the numbers. Let's flip things around here and maybe look up at the moon. A lot of SSA services are based on looking at space from the ground. There are new services that are looking at space from space. Can you discuss the emerging space-based SSA?

Gabriel Deville: Yeah, sure. It's true that we're seeing more and more projects for space-based SSA sensors. There's the government ones, which are really dedicated to inspection and close-up surveillance of objects in space. The US has GSSAP satellites or the SILENTBARKER satellites, but there's also projects of commercial constellations. You would put dozens or hundreds of optical sensors in space to track space objects, but from space rather than from the ground. The idea behind this is that you theoretically can do things from space that you cannot from the ground. For instance, you're not bound by bad weather, which as everyone knows, when you're observing space from the ground, you're much

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less constrained by daytime. You have lower downtime due to sunlight. If you have a good coverage of the earth, you have less geographical blind spots.

If you have satellites over the Southern Hemisphere, then suddenly you're bringing light on this blind spot, which is typical of ground sensors. From space, you can also do, you can get close up to specific objects you want to look at. Again, something that you cannot do it from the ground. All these things are theoretical advantages which are being pursued by companies such as NORTHSTAR, Digantara, True Anomaly, and many others. It's definitely emerging. There's been some demonstrators already launched by NORTHSTAR earlier this year. It comes with challenges, obviously. It's a higher cost. You have to work with the physical constraints of a satellite platform as opposed to a ground facility, but yeah. There's probably definitely a niche market or maybe not a niche market for them that they're looking forward to.

John Gilroy: Yeah. For example, this NORTHSTAR, these different companies, do they use a different type of technology or what kind of new technology is being used to observe satellites from other satellites? It's got to be a different approach.

Gabriel Deville: It's yes and no. From ground, the different systems you can use can be optical, so telescopes, passive optical. You can use radar. You can also use LIDAR lasers and you can use passive RF. From space, you're working with the physical constraints of a satellite platform, so the way to go is optical, is telescopes, very much like those used, similar to those used by constellations doing earth observation, but optimized for space observation, because they require much less energy than radar does.

John Gilroy: You talked initially about 7,000 satellites out there. If you listen to satellite and space pundits, some say 30,000 more by 2030. I don't know. Pick a number. It's like they reach into a hat and they just pick out a number. What future use cases do you foresee for SSA?

Gabriel Deville: Yeah, the clear use cases are, yeah, tracking and cataloging to ensure safe operations, but for sure there are many other proposed use cases. Some of them in the near future are expected to be close-up characterization and observations, whether it's for rendezvous and proximity operations and docking for in-orbit services, whether you want to dock to extend lifetime or de-orbit a satellite, you need very precise observations of operations and you need close-up observations as well. There's also the security use case of inspection, going to see adversary or resident space objects of interest to see what they're up to, if they're changing their altitude, if they're coming a bit too close to the national security satellite, you want to get close-up eyes onto them. Then there's use cases which have been proposed for more distant orbits, specifically in the cislunar region and lunar orbits.

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This is all very much emerging, but amidst the renewed interest for the moon, amidst multiplying lunar programs, it is going to be more and more relevant to have eyes on cislunar space. Especially if you have very high-value, very high-criticality missions such as crewed missions going to the moon, you definitely need to have eyes on all the objects which could be on your trajectory, but for now, it's definitely at a very young, nascent level. There was originally in the Space Development Agency's Proliferated War Space Architecture constellation, which is very talked about, which is to provide data relay and early warning. Originally, they had planned for an additional layer, which would have been for cislunar SSA fueled by Chinese programs to the moon, but it was shelved for now, but maybe it will have successors in a decade to come as the spotlight comes back on.

John Gilroy:

Gabriel, I want to dig a little deeper in there. I'm sure if you went to McGill University, everyone would be interested in going to the moon. That's really exciting. It's all kinds of fun, and we know there is growing activity out in outer space beyond Earth's orbit, also known as we mentioned cislunar. Future SSA markets have plenty of runway with United States, China, India, Japan, Russia, all others at various stages of planning for future lunar missions. Lots going to be going on the moon, so my question to you is, is surveillance technology keeping up with these lunar activities that you mentioned?

Gabriel Deville:

As of now, it's primarily focused on the markets which are confirmed, so companies right now are multiplying sensors focused on low earth orbits because that's where activity is really multiplying, so we have SSA companies which were previously focused on GEO, who are now trying to focus on LEO. You have SSA companies which were focused on new, which are trying to push their sensors up to GEO. There are many propositions to make sensors for earth orbits adapted to more distant orbits, but I would say that this is not, as of today, an investment priority for most stakeholders.

John Gilroy:

Good, good, good. Now, we've talked about the government and commercial big players and what they're doing. You mentioned it frequently, so are there investments being made in SSA from just startups?

Gabriel Deville:

Yes. Yes, there are. As you know, there has been a big wave of private investments in the space sector between 2020 and 2022. It's definitely in a cool down phase now in '24, but there was a lot of money poured into the space sector regardless of applications, especially launch companies over in these recent years. In SSA, it was a relatively minor investment field, but relatively minor does mean \$800 million invested in SSA startups between 2017 and 2024, so it is substantial. You have to put it in relation with the \$60 billion which were invested in the whole space sector, private money invested in the whole space sector from 2017 to 2024, but still, \$800 million for SSA companies such as NORTHSTAR or True Anomaly, who raised \$140 million each or Minerva Space, which raised \$150 million. Yeah.

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- John Gilroy: Wow. You've got the numbers, man. That's great, Gabriel.
- Gabriel Deville: It happens.
- John Gilroy: We're not going to let you sleep here. We're asking more about numbers here. What about, take this conflict of investments, okay? Are there large investments being made to in-orbit services just themselves?
- Gabriel Deville: Yeah, in-orbit services, whether you're talking of life extension, including refueling or active debris removal or et cetera, SSA is and will be relevant for all of them because they require proximity operations and docking between spacecraft, which requires having eyes on them. As of now, it's definitely an emerging market, several markets, which is definitely being pushed by commercial supply rather than demand-driven. There's still a way to go before it becomes a buyer's market, although we are seeing governments investing money in technology and in preliminary demonstrations. Over the past 10 years, it's quite substantial. Governments invested some \$3 billion dollars in in-orbit services. In-orbit services are often seen as a mean of flexibility and sustainability and safety for space operators, but we're still waiting to see a big wave of confirmed customers before calling it a buyer's market.
- John Gilroy: Wow. I think our listeners are going to love this and go back to the transcript and pick up all those numbers, because you're very glib and fluid with these numbers, but to me, the specificity is exactly what my listeners want, so I really appreciate your time here, Gabriel.
- Gabriel Deville: Great to hear.
- John Gilroy: I'd like to thank our guest, Gabriel Deville. He's a consultant at Novaspace.
- Gabriel Deville: Thank you so much, John. Thank you so much to Constellations for having me.