About Hudson Institute: Founded in 1961 by strategist Herman Kahn, Hudson Institute challenges conventional thinking and helps manage strategic transitions to the future through interdisciplinary studies in defense, international relations, economics, health care, technology, culture, and law.

Hudson seeks to guide public policy makers and global leaders in government and business through a vigorous program of publications, conferences, policy briefings, and recommendations.
Peter Huessy:

Good afternoon, everybody. My name is Peter Huessy and I am senior fellow here at the Hudson Institute. I'm also president of geo-strategic analysis. Back in 2014, I started a space policy seminar series with the aim of taking issues that weren't necessarily in the news but needed to be discussed. And one of my first speakers was Congressman Rogers and Congressman Jim Cooper. I didn't know it at the time, but they said they would like to create a Space Force. And a lot of what we're doing now in the space business is, "Where are we going?" And there are a enormous number of commercial and military actors. There's the US government, both civilian and military, and industry think tanks and so forth.

And so, today's panel was suggested by a number of our panelists as a way of looking at the cooperation between the commercial and military space operations, how to protect our assets in space and how to work well cooperatively with the US government. My colleague, Arthur Herman, does a number of space things and he will be our moderator. We will hear from each of the panelists just a minute or so, about who they are and what their company does. And then Arthur will take it and discuss what we're going to talk about today and be the moderator and ask questions. So, I'm just going to start to my right, this is Jason Kim who's with NOAA, the Department of Commerce. Just tell us who you are and then we'll go down the row and then to Arthur.

Jason Kim:

Sure. Jason Kim, the Department of Commerce, Office of Space Commerce, which is within the National Oceanic and Atmospheric Administration or NOAA. We are the space industry's advocate voice inside the government when there's all these inter-agency policy debates and discussions about dual-use technologies and we have to find the right balance between national security and foreign policy and commercial economic interests. And so, we're that voice.

But we also have a couple of new mission areas that just within the last year we've taken on. We were restructured so that we took on the licensing function, the regulatory function for commercial remote sensing satellites in the United States. And we've also been assigned through a presidential directive to take on the mission of providing space situational awareness or space flight safety information to commercial and civil satellite operators. So, we're expanding and we are hiring right now. So, if you're looking for a job, check it out.

Chris Shank:

Cool. Jason is my regulator. So, with Maxar, we're roughly 4,500 employees across the US. We actually divide the company up into two main areas, earth intelligence, the commercial remote sensing imaging, as well as the space infrastructure side. So, we build lower earth orbit, a number of imaging satellites where actually Maxar and legacy Space Systems/Loral has built the largest number of geo satellite communications satellites in geosynchronous orbit. For the NASA we're building the power propulsion element for the Gateway that'll be in orbit around the Moon here in a few years, as well as the NASA Psyche mission, which will be going out to the asteroid belt and doing that.

So, exciting variety of missions from commercial defense and intel as well as civil capabilities. So, we span that gamut. We are hiring. Actually, I was hired in ... For the younger folks here, I highly recommend getting on LinkedIn. I was literally hired four years ago, my boss, Tony
Frazier, LinkedIn me and said, "We'd like to take you to breakfast." And I've been on that journey now for four years. I've worked with Walter Scott. Actually, he founded the company back in 1992 when the Land Remote Sensing Policy Act was enacted in the Science Committee. Yes. So yeah, Jason and I go back decades. So, looking forward to this discussion.

**Even Rogers:**

Good afternoon. My name's Even Rogers. I'm the CEO of True Anomaly. About 18 months ago I was in uniform. I was a space operations officer in the DoD for 10 years and I hung up the uniform to start a company called True Anomaly. We are building the technologies and the concepts for a more secure, sustainable and stable space environment for the benefit of US allies and partners.

I saw a major gap in the defense industrial base while I was in uniform and sought to fill that gap with my colleagues formerly in uniform and a great team of engineers based in Colorado, LA. Two sites in Colorado, Denver and Colorado Springs. And our team in DC. We're a venture-backed startup, backed by some very robust Silicon Valley-based investors and very glad to be on the stage with this great panel. And Jason's also my regulator.

The products that we're building have the capability of non-Earth imaging. We'll talk a little bit more about that here in a second. We're focused on the readiness and credibility of guardians as they go seek to contribute to the joint force. And we're focused on preventing operational surprise by proliferating sensors in different orbits for the purpose of space domain awareness and non-Earth intelligence.

**Dean Bellamy:**

Good afternoon, Dean Bellamy, Redwire space. I would echo to say it's a pleasure to be here. Thank you for the invite to be with so many distinguished colleagues and friends that I have here.

Redwire Space, I oversee the national security space activities that we do at Redwire. Redwire, a lot of you may be familiar with us. We do things like working with Maxar, Boeing, and others, to do things like the solar rays on the International Space Station. And we have a partnership with Maxar on a number of activities like Gateway. We also, if you are familiar with the Artemis program and the optics that actually flew on the Artemis program that did all the great photos where you saw the Artemis program, maybe the Moon and the Earth in the background, Redwire did that program as well.

And I would also really echo my friend, Chris, what he said. For the young professionals, the next generation of space professionals and leaders, what a great time to be coming into space and looking at opportunities and having a chance to whether it be work with NOAA or on the industry side, or on the government side doing National Security Space. We were both in uniform together at the same time and a pleasure to be up here with you as well.

**Arthur Herman:**

I'm Arthur Herman. I'm senior fellow at Hudson Institute. I'm director of something called the Quantum Alliance Initiative. Do a lot of work on quantum technology and other issues, but I also
maintain a keen interest in, and I'd like to think some expertise with regard to space and in particular space industrial base issues.

And currently, I can tell you that I am heading up a commission that is based here at Hudson, working on space workforce issues, on questions of workforce development, and so on. Now, we are not hiring, just to let you know that is the case. However, I'm hoping that part of the discussion will be on one of the issues that are being confronted here in the commercial space and also in the government space programs and institutions is the question of workforce development and workforce retention. So, I'm hoping we'll get some views from all of you about that.

Dean Bellamy:

Absolutely. I agree wholeheartedly. I'm glad you were going to bring that up. I think it's an important issue we should all be thinking about, not only in the short term but long term. Right?

Arthur Herman:

Yep. Well, it's going to be one of the issues that we're going to bring up because I think all of you here are in for a treat, because this is going to be a wide-ranging and ... I think you've just listened to the panelists, you realize the wide range of activities and expertise and focus that space and space industry today in the United States encompasses.

But I thought what I would do, just to get us started, is to maybe craft a bit of a narrative for us, to shape the overall discussion. And it begins with once upon a time, the federal government cared a lot about space. Once upon a time, there was an event in 1957 when a Russian satellite called Sputnik orbited the Earth and it triggered a massive reaction in the United States, an all of government, one could even say an all of society and industry, effort to engage in a space race with Russia to see who it was that would be the first not only to send human beings into orbit, but also to land human beings on the Moon.

With the understanding that this was not only an important issue from national pride or from the future economy and technologies that would come forth as a result of a Moon race, but also that this had huge national security implications as well. That who dominated space in the future, it was understood, would be dominant on Earth as well, as a superpower. And in the midst of the Cold War, this enterprise carried a great deal of weight and a lot of credibility with it.

And in fact, so much credibility and so much effort went into it that 12 years later, human beings did end up on the Moon, Americans, not Russians in this case. And as a result of that, the effort that the federal government put into putting men on the Moon became the paradigm for a massive government effort to achieve some great and important national or even international goal. To this day, when people talk about a moonshot effort, what they're referring to is what was achieved in the 1960s.

Then interest on part of the federal government in space began to wane. The interest in sending more manned missions to Moon or elsewhere, began to be seen as rather more elaborate and more expensive than the government was willing to take on. The role of the primary federal agency involved, NASA, became more and more restricted to exploratory, unmanned, uninhabited space exploration in the solar system and beyond.
There was the development of the Space Shuttle program, which was seen as an engineering triumph in some ways, but which also was a reflection of a shrinking ambition for the United States government in terms of its role in space and the importance of space. So, that by the 1980s and 1990s, the role of the federal government and its interest in space again to dwindle and fade.

But at the same time, a group of entrepreneurs from the private sector decided that they would undertake the process of opening up space, of bringing a big vision to space again. And you know who I'm talking about, Elon Musk and Jeff Bezos and Richard Branson, and together, along with a number of other commercial companies and private sector companies, they began to fill the vacuum that had been created by the federal government's loss of interest in space and in NASA, which didn't really seem to be engaged in that kind of big vision or massive effort as it had been in the 1960s. And so, commercial space began to take up the slack and fill the role that the federal government had done.

At the same time, two other world powers, Russia and China, also were taking a keen interest in what was happening in space and were thinking about ways in which to use space as a means to gain strategic advantage, not just against the United States as a potential foe, but also as a means by which to expand their own power and influence as superpowers in the world.

And that interest, it grew in using and weaponizing space to the point in 2007 when the satellite shoot-down heard round the world took place and China shot down an orbiting satellite. It was an event which didn't really cause a great deal of interest in the halls of Washington terribly much. It was noticed and government agencies were willing to move on. But in other countries, enormous alarm was triggered as a result of that shoot-down and realizing that space had in fact become now a potential contested zone, a contested sector. That the great commons of spaces be one in which superpower rivalries and conflict could in fact incur and take place with it.

And then, the federal government also began to pay attention as well, and it paid attention in two ways. Number one is with the creation of Space Force, of realizing that the Department of Defense now needed to have a service that was dedicated exclusively to thinking about the space as a domain, a contested domain for which the United States military had to now confront and deal with the issues related to that.

But at the same time, the second part, was realizing that it had to turn to commercial space industry which had now grown, had lowered the cost of space launches, for example, tremendously as a result of the growth of commercial space area. And that now it was going to be necessary that if the United States national security was going to be protected, it was going to have to employ and going to have to enlist cooperation on the part of the domestic commercial space sector as well.

So, a twofold effort has been underway, I would say, in the last five, six years, certainly since the creation of Space Force. And the issue which now, I think, is being confronted and the one that we're going to talk about for the rest of our session today is, how do we bring these two communities together? How do we bring more effectively the commercial space sector and what it's doing and its activities and what it's engaged in and pursuing as a part of its economic and commercial goals. How do we bring that community closer together with the US government community that is dependent upon space?
And we're talking not just about Space Force, we are talking about NASA and its continued role, just as dependent on the commercial side. And then also to the intelligence community for whom so much of their work and activities depends upon their access to an unfettered access to space as a sector, as a domain in which they're able to carry out their national mission as well. So, let me start, having laid out my master narrative-

Dean Bellamy:

Love the narrative.

Arthur Herman:

... let me start by asking each of you that basic question. From where you are now, from where your company is, how do you see that relationship between our government agencies, particularly DoD, and the commercial space sector, working and what kinds of things would you like to see happen from this point on? Should we start with you, Dean?

Dean Bellamy:

Absolutely. Yeah, I could talk for an hour on that one. That was a great opening. So, I will tell you, I agree with everything you said. I would even date going back to 2016 even, because I'll say starting at the White House, and you had instrumental leaders on the DoD side, Doug Loverro, you had folks like Damon Wells and others, that really saw this. And we started something, it was called the Space Posture Review. And that led into really the White House looking at how you've got to have better really collaboration with both commercial DoD and the space traffic management with Department of Commerce. That's where there was amazing discussions with them and really looking at space traffic management.

And to see where that has come to-date now is really exciting. And you and the entire team are doing an amazing job over there, Jason. But I'll tell you the difference, first off, that I think helps is what were artificial stovepipes and walls, right? Where you had the Department of Commerce, maybe DoD, maybe IC, NRO, they started to communicate, the government did, and break down those barriers and realize the value of not only with commercial but also if you go broader with, how do we work with allies even better?

And they really did a tremendous job with that. And so, that has really, I thought, really was the propulsion and initial trigger that really started to see the collaboration between the Space Force and Department of Commerce on, how do you provide safety for objects in space? How do you do space traffic management? Really a key role. How do you leverage Maxar for doing more commercial remote sensing to support the government? And really, the idea of a space war fighting domain now is, how do we have the right space domain awareness up there to ensure we know what's going on? So, I agree with you wholeheartedly and I think the government collaborating with each other better and strengthening that has really been a springboard for us.

Arthur Herman:

That's interesting because what you're suggesting is we're looking at bridging the differences in culture, differences in mission, not just between the government and the commercial sector-
Across government.

Arthur Herman:

... but within the government-

Dean Bellamy:

Oh, absolutely

Arthur Herman:

... as well. And I think one of those points of intersection and perhaps conflict has been between Space Force and NASA. And if we're thinking about a national space strategy, which I try to do in my copious free time, if we think about something along those lines part of it will be, is there a way to create an overarching national mission that encompasses both what Space Force is doing and what NASA is doing?

Even, what about your view on this subject of not just commercial and the government and particularly, Space Force, but also within the federal government?

Even Rogers:

Yeah. Let me offer a slight stage setter about why the collaboration is so important in the space domain, perhaps more so than in any other domains. What happens in the space domain isn't isolated to a particular orbit, typically. So, the consequences of an accident, a mishap, whether that is a mishap that comes from adversary activity or just an accident, accidents happen, isn't isolated to a single operator, isn't isolated to a single nation. So, the deep collaboration will facilitate the lines of communication that are necessary to deconflict risky activity in the space domain, but also offers opportunities, I think, for what we should be seeking as a nation with respect to arms verification and control in the space domain.

Arthur Herman:

Are you thinking about anyone in particular where that kind of verification would be really necessary?

Even Rogers:

Absolutely. I mean, I think that a couple of our adversaries are doing some things in space that should draw special critique given the orbits that they are doing them in and the pace of development of those counterspace capabilities. And the antidote to that really is transparency, and you get transparency through great sensing technologies. In our experience in True Anomaly, there's been really two barriers, to answer your first question, Arthur, there's been two, I would say not barriers yet, but challenges. The first is security classification.

Arthur Herman:

Absolutely.
Even Rogers:

We are undergoing a transformation in the national security enterprise with respect to what we can talk about, up until 2015 saying that space was a war fighting domain was-

Dean Bellamy:

You couldn't.

Even Rogers:

You could not say that. Could not say that. But there are legacy, I would say, incentives and there are legacy stakeholders within the Department of Defense and the intelligence community that are adhering to ways of operating that are preventing progress.

The second piece is the Space Force faces, I would say, a historically specific challenge relative to other domains. They will be expected to get the fight right the first time.

Arthur Herman:

The first time.

Even Rogers:

As opposed to the naval domain and the air domain where small skirmishes didn't have large strategic impacts in the development of the initial doctrine and tactics and technologies for-

Arthur Herman:

And there's centuries of experience and-

Even Rogers:

And centuries of experience.

Arthur Herman:

Historical experience to draw from.

Dean Bellamy:

Absolutely.

Even Rogers:

So, you don't get very many practice rounds. So, what you do in peace time matters, which means that you have to use peace time to iterate very quickly. And to do that requires a public-private partnership that facilitates iteration, that rewards iteration and rewards not having maybe the perfect solution out the gate but instead allows for some flexibility. And this has to start in
the DoD. The incentive structure in the DoD is to take the whole problem and try to solve the entire problem first and then hand it over to industry rather than working in an iterative cycle.

Arthur Herman:

Chris, what about from where you are?

Chris Shank:

I'm going to piggyback off what Even said there. Transparency is a powerful tool for democracies and it is the bane of tyrants. So, the Maxar images that you see that are high resolution and unclassified, that is shared with our international partners and allies, as well as the news media through the Maxar News Bureau, roughly 58,000 articles have been written about this, using Maxar imagery on that. So, the transparency that's needed.

And so, thanks to the Department of Commerce and Office of Space Commerce in particular, last fall they allowed us to then, "Hey, you can take images not just on the Earth now, you can now pivot our satellites around and look at bad actors operating in the low Earth orbit regime as well." So, the activities that were going on by the Chinese and the Russians during that time that were well documented in an unclassified forum in a CNN special that I remember aired in December of 2016. So, when Dean mentioned where we were in 2016, that General John Hiden-

Dean Bellamy:

At the time, yep.

Chris Shank:

... went to CNN, "I need to be able to talk about this." And unveiled that. So, about one third of Maxar has top secret security clearances. So, that's how we have some insight into the government needs in this area and we're a trusted partner. And so, thanks to the Office of Space Commerce working through the interagency process, our ability to then take the transparency that you're seeing today, in the past year and a half on the Ukraine war, we hope to be able to provide some transparency in the space domain as well.

Arthur Herman:

Yeah. Jase?

Jason Kim:

It's funny, because I've been in this job for over 25 years and we were making those arguments to the DoD and the intelligence community 25 years ago that, "Oh, this would be a stabilizing technology if people could see what's going on in other countries or across the borders." And it took us a very long time to get there.
You're talking about the sensing and imaging aspect?

**Jason Kim:**

Yeah. Just the fact that you could take pictures from space without a spy satellite, basically a commercial satellite, in the beginning of this industry, in the '90s, right after the Land Remote Sensing Policy Act was passed through Congress. We created the regulations, but the inter-agency community didn't want to allow licensing of what was authorized by Congress. And we were just talking about one meter resolution imagery back then, when now we can get down to much better than that. I don't know what the actual numbers are and I'm not allowed to give away trade secrets, but you can.

**Chris Shank:**

Oh, three tenths of a meter and then we do double sampling on that, so you can get down to 0.15 centimeters.

**Jason Kim:**

Right. And there are other capabilities that we're arguing for, we're advocating for inside the government and I think you're going to see some news coming out by the end of the month about new capabilities that we're allowing to come out into the commercial marketplace, because we all now recognize as a government that this is in our benefit, it's in our national security to allow this capability. And oh by the way, everyone else in the world is already providing this or a lot of other folks are providing similar capabilities and so, why would hold ourselves back from that market?

**Arthur Herman:**

Now, from the point of view of space and commercial space and access to what satellites do up there, we also have the communications issue as well. How much of that, the issue of telecommunications in space, how much of that is also something which again requires cooperation between both government and also the commercial sectors in order to advance the technology but also to protect it from malefactors?

**Jason Kim:**

Starting with me? Well, I mean, a lot of the licensing and oversight for commercial communication satellites is done through the FCC and there was some news about that overnight, but in general, we do have very high usage of commercial capabilities, satellite communications capabilities within the federal government and the military. People talk about, I don't know if what the exact number is, but they talk about 80% of military communication's going through commercial satellites. That's a very high amount, if that's really true, and I have yet to see that verified.

**Chris Shank:**
That's roughly correct. And of the overall satellite based network ... By the way, I can't speak to Starlink, I'm just talking about on the geo converts, I thought it was on the order of 40% is DoD, the rest of it is your streaming services, DirecTV, that kind of thing.

Arthur Herman:

Right. My apologies.

Jason Kim:

Right. So, you mentioned Starlink.

Arthur Herman:

It's probably a satellite link trying to reach me.

Jason Kim:

Yeah, right.

Chris Shank:

That was a phone a friend for the question.

Even Rogers:

Yeah. In the middle of the discussion.

Arthur Herman:

"Don't forget about us out there." Yes. I'm sorry, Chris, I didn't mean to interrupt.

Jason Kim:

Well, I mean, you mentioned Starlink, right? And that is a capability that DoD and others are interested in because it is one of these proliferated constellations of satellites, not just single points that are easy to, well not easy, but are sitting ducks because they're geostationary, right? So, they're kind of sitting ducks in space. Whereas these low Earth orbit constellations are constantly moving and even if you took out one or two of the satellites, that wouldn't have any effect because they're so proliferated. And so, you get this inherent resilience by moving towards that kind of an architecture.

Arthur Herman:

LEO networks.

Jason Kim:

Right.
Arthur Herman:

Even, any thoughts on this issue about satellite communications?

Even Rogers:

No, not much to add on comms. Yeah. I will say that I think there's been some really interesting and important advances in commercial company access to communications. I'm really not familiar with the regulatory side. We've interacted with the FCC from a licensing standpoint, but a company like True Anomaly could not have existed even 15 years ago, I think, 10 years ago, because the maturity of the defense industrial base and the regulatory framework wouldn't have supported it. It would've cost us way too much money.

So, we communicate with our spacecraft through Azure Orbital and Viasat RTE, and that just cloud infrastructure that allows my operators and Space Force operators to log in anywhere in the world and fly spacecraft securely has been, I think, a tremendous value add. All of this infrastructure is getting disaggregated and commoditized and it's really allowed us to invest where we need to rather than build our own ground stations.

Arthur Herman:

Right.

Dean Bellamy:

Absolutely.

Arthur Herman:

It creates an environment in which you can really operate without worries about, "How expensive is this going to be for us to do this?'

Even Rogers:

Right. We're built on the infrastructure that exists.

Arthur Herman:

Yeah, of course. Of course, you're dependent on that. What about you, Dean?

Dean Bellamy:

Yeah. I will tell you, I echo what my panelists said. I'll say, going back to one comment Even made, I don't know how many people used maps or GPS to get here, but if something catastrophic did happen to a GPS satellite, you might not have your phone, the maps are being able to use those on the phone. So, we knock on wood that we never see that happen in space.

But on the commercial side and with telecommunications, I think it's a really good example of where government and commercial industry and really even with allies too, broader, where they
work together, right? There are some missions that maybe aren't inherently DoD or maybe government where you can just lease capabilities that are there.

And it really goes to when you see, it was General Saltzman and General Thompson and you hear Mr. Calvelli talking about this make-buy decision. If commercial's already there, then maybe we just buy it versus we build it and develop it, and we just use capabilities that are there. And I think comms is going to be an area where just like launch, that they may consider looking at that as a make-buy option and I really echo that. I think that's a change and a pivot from what was happening in the past. Right? So, you go back to the '50s and beyond, there's a lot of times we saw even in the last 20 years, where government will just buy something, or excuse me, build it versus buying it if it's available.

Arthur Herman:

Right. A COTS issue.

Dean Bellamy:

Yeah.

Arthur Herman:

Now, one of the reasons I asked that question about telecommunications, I was putting on my quantum hat because part of the issue for me is the issue of cybersecurity and the security of communication networks and links in space. And I've been a strong advocate that the next generation of cybersecurity in space is going to be employing quantum, both post-quantum cryptography but also quantum-based cryptography.

And the Chinese, that's one of the areas in which, as anyone who knows the field well will tell you, is where the Chinese lead us by far and away on quantum communications with their launch of the Micius satellite in 2016, and they've been building and developing that capability and expanding it out in ways that I think the rest of the free world is now beginning to try to catch up with. One of the things for example, which I would love to see is a strong push by the United States of developing a quantum satellite.

Dean Bellamy:

I agree with that.

Arthur Herman:

And building quantum satellite networks as well.

Dean Bellamy:

I echo that. I know you may not know this about Redwire, but we're actually building a quantum key distribution satellite for ESA in Europe, and we're actually doing that technology.

Arthur Herman:
The Europeans have really gotten ahold of that-

**Dean Bellamy:**

So, I agree with you on the cybersecurity side and we definitely agree with you that on the quantum side we'd love to see even a demo, right?

**Arthur Herman:**

Absolutely.

**Dean Bellamy:**

Money put aside for demo and really advancing that technology and really continuing to move forward, because the one thing we definitely know on that cybersecurity side, it's something we're going to see not only in communications but across the board with this space-to-ground link, right?

**Arthur Herman:**

Yep. That is it. And then also, two satellites.

**Dean Bellamy:**

You got it.

**Arthur Herman:**

So, you can begin the process of networking as well. But that's for a whole nother panel.

**Dean Bellamy:**

We can do that.

**Arthur Herman:**

We'll have you all back for that. We'll do another panel on that.

**Dean Bellamy:**

Let's do it.

**Arthur Herman:**

But speaking about China, speaking about Russia as space adversaries, both potential and actual, how worried are you, I'm going to go down the panel, about where China and where Russia are in terms of the development of their space, I would, say offensive capabilities, and how worried should we be about that? Dean, and then we'll go down to the next.
Dean Bellamy:

I'm extremely worried about it. So, we should give a shout-out to the intelligence community, Dr. Larry Gershwin and his team, folks like Mike Betts. The intel analysts, going back to, you mentioned 2007, have made predictions and the adversaries have hit every mark that they said they would hit and they're advancing at a rapid pace.

And as much emphasis as the US has put on it, and I give credit to standing up the Space Force and I give credit to the budgets that we have had and you see increase in budgets, the pace and the development, having seven-year cycles on satellites and building satellites, is just not fast enough for the loop that the adversaries moving at.

Arthur Herman:

Yep. Even?

Even Rogers:

Russia and China both deal with space in a similar way, that is that they view space as an information domain and they view it as an opportunity for leverage against US and allies because they know that there’s a dependency. And so, as a result, they’ve had no qualms about building counterspace technologies, none, and building lots of them. The Chinese satellite communications electronic warfare brigades are massive. There are thousands and thousands of SATCOM jammers that China in particular have incorporated into conventional military maneuver units.

So, we should be concerned about it. Where I think we’re not spending enough time talking is really about the coupling between the commercial operators and the DoD in a conflict that extends into space. The Russian-Ukrainian conflict was a great opportunity to highlight this, that commercial operators become targets when they support the DoD. And a large amount of revenue for commercial operators is sourced from the Department of Defense and the intelligence community. This goes to, I think, some dual use issues and the intertwined nature of the space industrial complex and the broader defense industrial base.

And I think there’s a question about both the ethical and fiduciary responsibilities on the part of companies to think about how they deal with being targeted. In fact, I suspect that there are some incentives that would cause commercial operators to be targeted first as a strategic offramp in a broader conflict, because the strategic implication-

Arthur Herman:

As opposed to DoD or intelligence-

Even Rogers:

As opposed to DoD or intelligence community, because-

Arthur Herman:
Interesting.

Even Rogers:

... it is a gray zone. There's uncertainty about whether the United States intends to defend and protect, right? General Saltzman has said very clearly they'd defend allies in space, but that sentiment, as far as I'm aware, have not been extended to commercial providers. So, because everything that happens in the space domain, to go to my previous comment, affects everybody else that operates in the space domain, I think there's a question about how we deal with being targeted and the broad consequences of failure of our spacecraft as a result of adversary action.

Arthur Herman:

You know what? And that really drives home the point, doesn't it? About how important it is to build a strong bond and connection between commercial and our national security space assets. Because if the Chinese realize how important and dependent government, including DoD-

Even Rogers:

That's right.

Arthur Herman:

... is on those commercial, and they see it as the low hanging fruit-

Even Rogers:

That's right.

Arthur Herman:

... for a shoot-down or for disruption via cyber attack, then you've created a vulnerability, right? You've created a vulnerability within the commercial sphere, the private sector, which the private sector needs to step up and be aware of and not just assume that, "Oh, in the case of a conflict we'll get some great pictures of what's happening and images of what's happening." It's going to be much more dangerous than that.

Chris Shank:

Yeah. That's right.

Arthur Herman:

Chris?

Chris Shank:
Yeah, we're heavily engaged in that. We are members of the commercial space operation center out of Vandenberg Air Force Base. We work with the teams at Schriever Air Force Base in Colorado Springs as well. So, we are in that and we share information back and forth with that.

Arthur Herman:
Sure.

Chris Shank:
At an unclassified level, Even was exactly right on some of the statistics. If you're looking for more comprehensive view of Chinese and Russia offensive space capabilities, Dr. John Huth at Defense Intelligence Agency issued out a really good report on that and we contributed to that analysis. I think you can find that online.

Dean Bellamy:
You were also on TV too, about six months ago.

Chris Shank:
Yes. Yeah. Right.

Dean Bellamy:
And I know you'll contribute to that, too.

Chris Shank:
Right.

Arthur Herman:
Jason?

Jason Kim:
Yeah. Secure World Foundation also has a good publication on counterspace capabilities that are out there and I can neither confirm nor deny whether they're accurate, but they're eyeopening capabilities and yeah, we're all very concerned about them. Go ahead.

Dean Bellamy:
Would you agree, in addition to what you're doing with space traffic management, worrying about stability and security in space, I actually think the recent push on norms in space of norms of behavior roles, how to act proper in space, at least is trying to put the guidelines out there, the rules for the road?
Jason Kim:

Right. Exactly. And the commercial sector has absolutely a role to play in demonstrating norms of responsible behavior in space when they're doing things like rendezvous and proximity operations, getting close to other satellites, but doing a hold at a certain distance and then broadcasting that to the world, so everyone can see exactly what's going on. Again, that transparency, that is a normal behavior that we want to promote and the commercial industry is part of that.

But again, space sustainability in general is a huge concern for all of us, not just for national security but for commercial and for civil space. I mean, even the astronauts, I mean, their lives are at stake if we don't have sustainability in space that's going to prevent debris and catastrophic explosions in space from threatening their lives. So, it's in all of our collective interest to maintain the sustainability of space and to keep it safe and to not allow a war to escalate into space. We're all-

Arthur Herman:

We have a space demolition derby that's taking-

Jason Kim:

You might want to cancel that.

Arthur Herman:

The scenario is frightening, but it could be actual.

Chris Shank:

I was at NASA during that time of that the Chinese shoot-down of their weather satellite. And that explosion in space and the orbital debris, if you haven't seen the movie Gravity with Sandra Bullock, that's real world, our astronauts are having to take shelter in the Space Station because of the risky behavior, the bad actors like that, it's either the Chinese or the Russians. When the US has done its shoot-down in the 2008 timeframe. It was purposefully done so that it would de-orbit immediately.

Arthur Herman:

Exactly.

Chris Shank:

It did not create this debris cloud like has gone on. And that is why we need to thank you for allowing us to provide that transparency out there, because we are all subject to the same flight safety risks and we need to mitigate those risks for that, to what Even said earlier about the bad actors on this.

Even Rogers:
A path to space sustainability is integrated deterrence and commercial partners have a responsibility in that.

**Dean Bellamy:**

I agree with that and I think one of the key elements of that integrated deterrence is going to be better really space domain awareness of what's going on.

**Even Rogers:**

That's right.

**Dean Bellamy:**

There's so many gaps of knowledge. And I think that's one of the first places if you had one more dollar on the commercial side that should be invested in commercial, right? You've got two operators here that would be the right folks that actually go to provide that better information and situational awareness.

**Chris Shank:**

And I got to say in terms of, we discussed earlier about the US government recognizing this is a priority need, Air Force Secretary, Frank Kendall, to which the Space Force report to, his first operational imperative is the space order of battle. Now, what is it? Those of us who've worked in this, knows what that means, but that is, know your enemy’ space order of battle and know your own.

**Dean Bellamy:**

I agree with you. I'll throw an analogy out, if that's okay? So, if you think of it, a lot of us drove cars here to get here today and the cars have rear backup cameras, right? And I grew up driving a car, a 1970 and '60 car that had no rear-view and back-view camera, but you wouldn't think of buying a car today without it. So, having better situational awareness up there on satellites is to me, makes a lot of sense. Just like having a rear-view camera on a car would.

**Arthur Herman:**

Yeah. That's interesting.

**Jason Kim:**

I mean, to me it's more like having a windshield.

**Dean Bellamy:**

Oh, even better. So, Jason, great analogy. That sounds good, right? I mean, if you think of it at home, right? At home, most people have maybe a Ring camera or something like that at home. Can you imagine 10 years from now, everyone will probably have it. Can you imagine that they're going to say, "What, you mean you didn't have the ability to know somebody is knocking
on the door and it's a package?" Right? I mean, it's the windshield. Right? I like that analogy, Jason.

**Jason Kim:**

If you think about the airspace, taking a different analogy, we've been able to pack more and more and more flights into the same airspace. Why? Because we have better situational awareness. We have ADSB, which is GPS-based, so we have a more precise understanding of exactly where all the vehicles are. That's what we need for space. That's what we're trying to build with our space situational awareness capability that's leveraging a lot of commercial capability that's out there, that's better than or at least provides better coverage than what the DoD is covering right now. So, we want to consolidate all of that and share it with the world and again, provide even more transparency about what's going on in space.

**Even Rogers:**

Jason, the air analogy is a useful one here, and actually the naval domain is too. You talked about air being more contested and more congested. There are also things like norms of behavior in the air domain that are proceduralized.

**Jason Kim:**

Yes.

**Even Rogers:**

For example, air-to-air intercepts. Air-to-air intercepts happen all the time. The corollary to that is a rendezvous in proximity operations activity in the space domain. And very rarely do air-to-air intercepts result in any sort of catastrophic activity. So, there's ways that I think the industry partners and the government can work together to establish those procedures, demonstrate those procedures and adhere to them. And again, I think I'd like to see industry come together and lead that charge because we really are building the first generation of proliferated rendezvous and prox ops technologies.

**Dean Bellamy:**

And that's dual-use. Whether it be for NASA, or civil, or on the DoD side. Right? So, it would really be a dual-use thing and I think, industry leading it's a great idea, Even. I think that's awesome.

**Arthur Herman:**

I have a feeling that we're going to have a lot of interesting questions from our audience. But before we go to that, what I'm going to do is to wrap up this portion of the discussion, is give each of you a minute to talk about, as you look down the road, the next 10 even 15 years, what are going to be the key drivers in terms of where American space leadership is going to be going? But also, what are the key drivers or obstacles to the growth of the commercial aspects of America's space enterprises as far as they go?
And I will be disappointed if you don't mention workforce, for selfish reasons, workforce is part of that. But a minute each and then we'll open it up to the audience. Jason, you want to kick us off?

**Jason Kim:**

Okay. Thinking five, 10 years down the road, I mean, by then we'll actually have the landings on the Moon and cislunar activity taking place. And to me, that's always been a fantasy, but it's really happening and we're going to have things like the Starship operationalized, where we're going to have access to space that is, I mean, hundreds of times cheaper than it is right now. And you'll have so much more activity than even what we're seeing today, which is already crazy compared to five years ago.

We're going to need more government involvement. I don't want to say regulation, but we need more oversight of what's going on and we'd also need to clear the field, so that regulations don't hold back all this commercial innovation. It's going to take a while to put those things in place.

**Arthur Herman:**

Chris?

**Chris Shank:**

I see a lot of young people in the audience and Jason's older than ... We worked through this in the '90s in the GPS, changing that policy for the dithering of the code kinds of things. Those things I worked on when I was early in my career was the working on GPS and the proliferation of that capability.

I have to say in setting the table for the history, I think especially what enabled SpaceX and Elon to take off was the government investments both in the Air Force side and NASA side for his Falcon rocket and delivery of cargo and then crew to the International Space Station. So, that retirement of the space shuttle has allowed the US launch industry to really take off.

Now we're filling them up ... Now that it's so much cheaper to get into orbit and we have taken launch share away from a number of international competitors on this, now the satellite applications, the growth of satellite applications like what Even is doing, what we're doing, and others are doing, is really taking off.

And the message that I've given to a number of guardians, space guardians, that are younger, is that this is the most exciting time I've seen in my career. That everyone is working really hard. There will be failures along the way, but we're going in the right direction and it is an innovative direction. And that is what is attracting workforce into this.

For us, in terms of commercial remote sensing and commercial imaging, what we're seeing as a result of our transparency operations in Ukraine is that our growth in international partners has really been skyrocketing, because they want to be able to leverage our capabilities as well. We'll be launching we'll our next generation satellites here soon and we're going from handling 4 million square kilometers a day of imagery to 525. The growth of artificial intelligence and machine learning in order to handle this much data is necessary. And we are hiring like crazy. If you know C++, Java, et cetera, Python, give us a call. There, there is my workforce.
Arthur Herman:

Thank you.

Even Rogers:

One of the hallmarks of being a startup CEO is that I am focused on the next week and the next month.

Arthur Herman:

Let alone thinking five, 10 years out.

Even Rogers:

Well, we do think about it and we started this company, my co-founders and I, and the team that we've been able to assemble, didn't start this company to get acquired. We built this company because we recognize the need for a secure, stable, and sustainable space environment for US allies and partners.

We have a grand and exciting vision and I think what that looks like is proliferated sensors in all orbit that create a more stable environment, that create transparency. They create opportunities for diplomacy in a more connected world. And we're very excited to be part of the journey. And we are also aggressively hiring. 40% remote workforce. We're standing up offices in DC and LA and we have a headquarters in Denver, brand new, beautiful factory where we're going to be pumping out one Jackal spacecraft every five days. Unprecedented scale for a complex prox ops capable satellite. So, if you want to come join the team, give me a call, see one of my team members who are here.

Arthur Herman:

What's that number again?

Chris Shank:

EvenRogers@linkedin.com.

Even Rogers:

Surprising number of spam phone calls after doing all this,

Arthur Herman:

I'll bet.

Even Rogers:

Yeah.
Arthur Herman:

Dean?

Dean Bellamy:

One, I agree with you and all my panelists. So, I will tell you, what I see, a lot of people saw Oppenheimer the movie recently, so we won't maybe have something as established as the Manhattan Project, but I think it starts really with government. And I think in the next 10 years we're going to see those continued collaborations between Department of Commerce and Space Force and NASA and everybody come together as a really one direction and unified over the next 10 years. And I really see that. And then, I see the ability for them and us to work really well together on the commercial side.

I see continued work where example, I think you're going to see collaboration between commercial and Space Force. Doing a space domain awareness project like you're talking about doing, preventing something catastrophic, right? I see collaborations expanding where more commercial is leveraged, remote sensing, I think you're going to see commercial's role in that continue to expand and expand, because it's contributing and playing such a vital role.

And I actually see that we're going to do amazing things on the biotech side. Right? I think if you look on the NASA and NOAA side, whether it's more pharma work, more greenhouse work on the International Space Station, whether it's more some of the things like 3D printing and doing things like that on the International Space Station, I think you're going to see a lot more growth in technology.

So, from a workforce perspective, I would say that for our generation, if you go back to 1959, '60, you're at that mark. And for the next 25 years is probably going to be the greatest, really, 25 years in space ever, I think, on the high-tech side. And really, if you look at the VCs, we don't talk about the VCs, but companies like A&E have invested so much money and the people on Wall Street that have helped out to support the space industry have been another third leg to the billionaires, to really allow us to excel at a rate we couldn't have seen before. And I don't know if we give them enough credit and we should, because they have played a really vital role really helping out the space industry.

Arthur Herman:

Yeah. Should we open up to questions? I told you there'd be questions. We'll be coming around with a microphone. If you can, in asking your question, just identify yourself and whatever affiliation you care to disclose. The one proviso we'll put in is not to have questions about UAPs. We'll actually be meeting in a classified section afterwards to discuss. No, we won't.

Dean Bellamy:

That's actually pretty-

Arthur Herman:
But in any case, but that's the one I place where I don't want to go. But anyway, for everything else. Shall we start here at the front and then work our way back?

**Chris Orr:**

Good afternoon, gentlemen, and thank you for your time. I'm Chris Orr, senior defense editor for 19FortyFive, proud Hudson donor and former Air Force security forces officer. I hasten to add that the enlisted portion of my Air Force career was spent with Air Force base command at the frozen tundras of Minot Air Force Base, North Dakota, safeguarding Minuteman III nuclear ICBMs.

And before I ask my question, I need to throw a good natured jab at Chris. Chris, as a proud USE Trojan alum, I'll try not to hold your Notre Dame alumnus status against you. I just had to throw it out there. That aside, my question. The proverbial elephant in the room, EMP, electromagnetic pulse threats. Whether the people here love Donald Trump or hate him, the fact is he's the only president who's ever made a serious effort at addressing deliberate EMP strike threat. Now, in fairness, Barack Obama did address naturally occurring EMPs, i.e., solar flares such as the Carrington event of 1859.

But again, Mr. Trump, especially with executive order 183865 is the only POTUS to actually address deliberate, manmade EMP attack. And as I've written in a couple of my op-eds, the Biden administration-

**Peter Huessy:**

Could you get to your question?

**Chris Orr:**

Yeah. Sorry. So, point being is that what is now being done to address EMP threat that you gentlemen are willing and able to discuss in an unclassified forum? Thank you.

**Chris Shank:**

Yeah. I'll take a stab. At a certain level, yes, electromagnetic pulse is a dangerous threat. Can't talk about it too much in open forum, but this is something that has been pursued from near peer competitors with that capability and there's a couple things on mitigation techniques in terms of hardening, using different frequencies, that kind of thing that you can do.

But the chief technology officer for Maxar came from Lawrence Livermore National Labs where he worked for Edward Teller and Lowell Wood out there. So, we are deeply reminded of that threat.

**Arthur Herman:**

And then, a question on this side as well to the third row, and then I'll come around to this side.

**Chris Shank:**
I can't say, go Irish, one more time?

Arthur Herman:

Please.

Chris Orr:

As long as you're not a Cowboys fan, too.

Ted Voorhees:

Ted Vorhees, Covington & Burling. In talking about threats, we heard China and Russia mentioned a lot, obviously. My question goes to organized crime, gray area, deniable threats. Think about the Wagner Group. Think about the little green men in Ukraine in the very beginning of the conflict. Could you say a word about what is the level of risk of these gray area, organized crime being used?

Arthur Herman:

Let's call it non-state actors.

Ted Voorhees:

Non-state actors, but maybe they're state actors, but they're deniable.

Arthur Herman:

Right.

Chris Shank:

That's a multi-intelligence problem. So, we approach intelligence, our support, we're primarily in the GEOINT part of the business, but there's HUMINT, open source, et cetera, in order to corroborate the various evidences. And that is what is going on when you look at the atrocities in Bucha and who in Russia was involved in that. So, Maxar is working with the State Department and others in terms of putting the file together of evidence of who was responsible.

Arthur Herman:

Peter, do you want to take a shot at that?

Peter Huessy:

I just have to apologize to my panel, I have to host John Harvey who's doing an NSA nuclear seminar in one minute down the hall. So, I want to thank all our friends here and you particularly, Arthur, for coming here and it's been a delight to have you, but I apologize, I do have to run down the hall.
Arthur Herman:

We’re not breaking up the party.

Peter Huessy:

No.

Arthur Herman:

Oh, okay. Okay. Very good.

Dean Bellamy:

Peter, thank you so much.

Arthur Herman:

Thanks, Peter.

Dean Bellamy:

Thank you.

Even Rogers:

Thanks.

Arthur Herman:

Anyone else want to talk about the role of non-state actors in space or the ways in which this can be a threat? Apart from the one that comes from, let's say, in terms of superpower rivalry, but also simply, in other words, as space becomes a Wild Wild West, are we going to end up with a lot of rogue actors in the-

Chris Shank:

Haven't mentioned the gray zone, that is totally gray zone operations.

Dean Bellamy:

It definitely is, but I look at General Saltzman, right? He just did change of command with General Sejba on the orbital test range and STARCOM, right? Which is your Space Force training and readiness command. And I really think General Saltzman is worried about everything and this would be a part of that. And by making sure that he's putting the most robust training plan and to really take those procedures and build the muscle memory for those guardian operators, I'm very encouraged by that as a priority and encouraged to see them looking at that as ways that whether it's a state actor or maybe a potential non-state actor doing something, that we have people in place trained and prepared to handle those situations.
Arthur Herman:

Yeah. Question here and then I'll work our way back. Go ahead.

Sam Visner:

Sam Visner with the Aerospace Corporation and also vice chair of the board of directors of the Space Information Sharing and Analysis Center. Just two brief comments. First, on norms, I've done some work on this and what we found so far is that while norms for space systems have held up fairly well up till now, norms for cyber systems have not, and in fact, they seem to be eroding. And as space systems become more dependent on cyber systems and vice versa, there is reason to be concerned that the norms that have protected space systems will erode alongside the norms associated with cyber.

The other thing is, I just wanted to make you aware that the Space Information Sharing and Analysis Center, which is up to about, what, 80 members now? Is working as a bridge between government and industry on cyber threats mitigation event intelligence, and is serving as a bridge mostly on the unclassified side, to ensure that there is good correlation. So, this, I think, is part of the collective defense and integrated deterrent strategy that I think our country needs. And if you're interested, we can talk to you more about this.

Arthur Herman:

I'd love to do that. I'd love to hear more about it.

Sam Visner:

Thank you.

Arthur Herman:

And then on this side, we had a question there. Why don't we start with the one there and we'll move across? Either way. Give him the microphone first, who gets there first.

Ken Meyercord:

Yeah. I'm Ken Meyercord. Retired. My only expertise in space is knowing who Flash Gordon was, which someone will have to explain that to the kids. And I don't know what it was we weren't supposed to talk on, AUP or UAP. I don't know what that is. My question is, is whatever creates crop circles, space-based?

Jason Kim:

He just went there.

Chris Shank:

Yeah.
Arthur Herman:

I think we'll save that for the classified section as well. Okay. The question to the back there. Go ahead.

Bruno De Souza:

Afternoon, Bruno De Souza. I'm a Fulbright visiting scholar at the Space Policy Institute. Thank you for your remarks. I'm conducting a project on space traffic coordination. The European Union and the US share the oldest Space Alliance and at the same time they're the biggest economic block. From the private sector point of view, you spoke about ESA, EU is the biggest client of ESA, so where would you like to see the European Union move? I'm thinking specifically about the EU being a big bureaucracy, clawing for power and through regulation. Where would you like to see them move? Thank you.

Arthur Herman:

That's a great question and it opens up, I think again, the big difference between the first space race and the current one. First one there was two players. Right? There was Soviet Union, and there was the United States. Today, in terms of space power, in terms of use of space and development of space, we've got a multitude of countries that have now become involved in it, which means it's a much more complicated playing field, but it's also the case that so many of those players are US allies, including the EU and including NATO.

And so, in what ways does the international dimension of the growth of space commerce, but also of the use of space, how does that both complicate the picture for the United States, but also perhaps open up opportunities that our competitors, Russia and China, miss out on? You want to take that one, Even?

Even Rogers:

Yeah. Broadly, international cooperation is clearly a net positive force. I think the EU is an untapped resource here, and I think that it is likely to wake up in the same way that you've seen some of the awakening of NATO vis-a-vis Russia and Ukraine.

The reason I mentioned NATO in particular is because there's an increasing awareness of supply chain issues associated with a protracted conflict. That is very, very poignant when it comes to space because you just don't have the infrastructure that's capable of generating replacement units for things that need to go into a space domain. So, I think there's an opportunity for leadership. I think the initial step to that leadership is likely via NATO, and that I think that's certainly where True Anomaly's trying to plug in.

Jason Kim:

I could throw in, the EU has always been a great ally in terms of space cooperation across a whole number of areas, Earth observation, GNSS. Although in the beginning we talked about GPS, Galileo was viewed as a rival to GPS, and we actually made efforts to try to throw a banana peel under their program before it became fully operational. That's not really the case anymore. We found a way to work together and actually get more benefit when you use GPS and Galileo together at the same time.
And in fact, it's not just the two of us, it's all nations that are developing GNSS and we've created an international committee on GNSS, where we align our standards and our commitments and our transparency, our documentation, so that we can all work together and get the benefit. That's where I'd like to see us go for space situational awareness that yeah, we have our own system in the US, the Europeans have the EU SST systems. Japan has their system that they're developing.

We can federate all these systems. They just need to be able to talk to each other. We need to develop the standards and the data transfer capability and the formatting to make sure that they use metric system, we don't. That they can actually input the same data together and come up with a better product. Google does that kind of stuff every day, right?

Arthur Herman:

Right.

Jason Kim:

Taking can all kinds of diverse information, putting it together. We can get there too. It's going to take some work.

Arthur Herman:

Dean, you mentioned EU. So, go ahead.

Dean Bellamy:

Yeah. I was going to say to that question specifically, right? If you take a typical DIME strategy, diplomatic, information, military, economic, and you apply it holistically, we've done pieces and there's some areas like you mentioned, not only with Department of Commerce, but US Space Command has done, like SSA sharing agreements and things like that.

But taking a step back between the two really entities and looking at a broader DIME strategy that makes sense for both parties would make a lot of sense. Right? The piece where you heard General Saltzman, as you mentioned, Even, talking about, "Will we protect allies?" And all that. Is a piece of a broader strategy. I think that that would be something that would be welcomed, I think, by whether it be EU, NATO and also the United States.

Arthur Herman:

And the EU has taken a big leadership role in quantum satellite development.

Dean Bellamy:

Yeah.

Arthur Herman:
I mean, their deadline for launching one I think is like in 10 minutes. I mean, this is not some far off dream that one day will happen. They've laid out the plans for it, EU has. And I would love to see the United States becoming one of the four, a fourth quantum satellite launch program that would be integrated with the EU and also with the other two.

Dean Bellamy:

So, Arthur, I agree wholeheartedly. And from a Redwire perspective, if you think of it, when you mentioned, Even, earlier about security clearances and there's barriers that we have, right? But if there's a way there could be co-development, whether on the commercial side or on the government side, there's probably benefits across the board.

But being able to share that data, collect that data, as you talked about, even the standardization of how you would do that, but I would love to see greater collaboration in that area, because I think it just makes sense for the US and allies as a whole. Right? And you could even go broader than just Europe. There's a lot of folks that are out in the Pacific that are great partners and allies to the United States.

Arthur Herman:

And I just think that the area of quantum communications and space, leadership should not be left to China.

Dean Bellamy:

Absolutely.

Arthur Herman:

And I think the EU stepping up is an important step in that direction. Next question. The gentleman here to the ... There we go.

Mitch Ledbetter:

Mitch Ledbetter here. You talk about sharing data and SSA data. What about the integration of international components being integrated together?

Dean Bellamy:

That's a great question.

Arthur Herman:

Go ahead.

Dean Bellamy:

I'll jump and then I'll let folks in there. I think we're very risk-averse sometimes on the government side of using some of these international components, maybe from a cybersecurity
perspective. But I think if you put a cybersecurity framework in there, looking at the software, to evaluate the software to make sure that there's no cyber effects like you could have, as you mentioned with commercial earlier, to mitigate those cyber vulnerabilities. Then I think there could be a broader use of those components where it makes sense, where it's appropriate. I know at Redwire we do a lot of cybersecurity on space components, but it might be broader than just that. But that's a great question. What do y'all think on it?

Chris Shank:

This is outside of Maxar, but I know that we're flying some SSA payloads with the Japanese, for example. Like-

Jason Kim:

QZSS.

Chris Shank:

QZSS, right. So, there is collaboration going on. Also ground networks, say, ground-based radars are going into other countries. So, in terms of working that, so it's more of a ground-to-space type operation through radar or electro-optical.

Even Rogers:

There are aspects of this US-based space industrial base that have not been able to meet our needs. We have had to go to international companies.

Arthur Herman:

Is that right?

Even Rogers:

I mean, primarily UK and a couple of European companies, but we just were not able to get components fast enough at a reasonable price from some US providers. There are many awesome US providers that we leverage for the Jackal spacecraft and future spacecraft going forward, but you can't get the job done with just the US supply chain.

Arthur Herman:

Are we talking about microelectronics or other kinds of ... Or, can you talk about it?

Even Rogers:

I'd rather not name our suppliers, but-

Arthur Herman:

No, I'd understand that.
Even Rogers:

... significant subsystems that are critical beyond electronics, we've had to source from international providers.

Arthur Herman:

Interesting. Interesting. I think we have time for one more, if someone wants to launch a query at this point. Here we go.

Matthew Tweden:

Cool. Hi, Matthew Tweden. I am interning here at Hudson. I wanted to ask a little bit about workforce development and the fact that multiple times y'all brought up employment gaps, opportunities. From the employment angle, where are y'all seeing skill shortages? Where are y'all seeing barriers in the talent pool development, whether that be shortcomings of policy, the limitations in security clearances or whatever, the talent pipeline, and what can be done on a policy level to address that?

Arthur Herman:

Oh, I love that question.

Dean Bellamy:

I love that question. Good intern, by the way.

Even Rogers:

Is that a plant?

Dean Bellamy:

I love that.

Arthur Herman:

He's probably on LinkedIn right now.

Dean Bellamy:

Please do. Please send a LinkedIn note. No, I'll tell you, one area, right? We are hiring as well, like my colleagues here, but I will tell you on the software side, system engineering side, mechanical engineering, physics and mechanical engineering, a lot of those are really important skillsets we want to have. But cleared billets is an issue on the security side. It's very hard to get cleared engineers from the government unless you have a direct contract.
This is one where companies like ourselves can be at a disadvantage because there's not an approach from the US government that incentivize some commercial companies with extra security billets. So, it is a limitation and Achilles heel for some.

**Arthur Herman:**

Say that again.

**Dean Bellamy:**

Security billet. So, unless you have a contract, right? And you get five security billets, it's very difficult to actually have cleared, even if they have a TS clearance to be sitting on a SCI billet, right? To be sitting on a billet with the government. And so, unless you have a bunch of them, unless you have a bunch of contracts like a Lockheed or Northrop-

**Arthur Herman:**

With those specific billets?

**Dean Bellamy:**

Yes. Yes. So therefore, what you're limited from, so for competition, let's say you want to compete on a, we'll just say an NRO program or somebody like that, or a top secret program where a big company like a Northrop or Lockheed has thousands of people cleared. If you wanted to go compete on it, you may only have five, or 10, or 20. So, it is definitely a limitation.

**Arthur Herman:**

Yeah. So, you're stuck.

**Dean Bellamy:**

You are stuck.

**Arthur Herman:**

Right, with a limitation?

**Dean Bellamy:**

You can be stuck. So, I would say, security billets is a challenge that we all face at different levels. It's just a challenge. But I'll tell you-

**Arthur Herman:**

Is that true?

**Even Rogers:**
Absolutely.

**Arthur Herman:**

Even, Chris?

**Even Rogers:**

Oh, I’ll say there’s two issues that we face at True Anomaly. The first is, really qualified, clearable individuals who have the latest and greatest practices coming out of their universities or other companies that we typically source talent from. So, there’s both the part of having already had a clearance but not having a clearance and then it taking 24 months to get through the clearance process. And that’s not a pace that we’re really moving at. So, we are having to hire on the front end with the expectation of receiving classified contracts, just because it takes so long to get through the process.

The other piece I really want to highlight is the diversity of the workforce. It is very challenging to hire a diverse workforce into space and aerospace and into tech in general. We really value that, but we’re thinking about, how do we invest in Colorado and in California to make sure that we have access to the best talent that we can possibly get?

**Arthur Herman:**

Got it. Chris?

**Chris Shank:**

At the policy to execution level, I know there was some legislation a couple years ago to speed up the process for security clearances and now we have benefited this past year. It’s gotten better. It’s nowhere near where it needs to be, but it’s better. And so, we’re not done yet. That’s execution.

I do have to say though, Maxar’s brand recognition because of the war in Ukraine and people’s awareness of Maxar and our imagery and the sense of mission that we have and that we bring to our work. We have gotten some outstanding resumes. They’re coming in better than they were in years prior. So, we’ve been able to take advantage of that in terms of filling our workforce needs. So, things are getting better in that regard.

But it’s always a tight market. There’s the people, then there’s the skill mix for that. You cannot hire enough really good software engineers, because that’s what you’re looking for, because there’s specialties within specialties there, for that. So, when we talk AI, ML, those are people that are 10 years into their career say, kind of thing, because they’ve worked down this path.

And now what we’ve been able to provide to them, as I mentioned, we’re dealing with petabytes of data. We are 120 petabytes of data on the Amazon Cloud right now. So, that if you want to do the most cutting-edge AI/ML work, you’re able to swim in an ocean of data. This isn’t just data lake kinds of stuff. So, it is incumbent upon us to let folks know about that, about, “This is why people want to come to Maxar is, the work is challenging, it’s meaningful. It’s not simply doing software coding on a dating app.” Kinds of things.
Arthur Herman:

So, you really get a chance to really stretch yourself-

Chris Shank:

Yeah.

Arthur Herman:

... if you're an AI/ML engineer.

Chris Shank:

Yeah. So, there's the sense of mission and then there's competitive salary as well.

Dean Bellamy:

So, Chris, I think you brought up culture, as another key aspect of the question, right? The sense of mission that you were talking about there, Even's been talking about it also at True Anomaly. We've got it as well at Redwire. That culture really is when you do that and you pair it up with really offering meaningful, fun jobs for folks is what's allowing them to say they can come in and make a difference now and be a key player now. And we're really seeing that on our side too.

And that's exciting when I really do think the next 25 years for the folks, I wish and hope to be around and involved in it for the next 25 years because it's going to be an exciting ride with all that they're going to see that's going to transpire.

Arthur Herman:

Jason, do you have any last words on this or any other issue before we close down?

Jason Kim:

I mean, the workforce issues that we're facing are different because we're a government agency and we're just inept at hiring at all. But we're authorized for 35 billets right now and we've got half of them filled, because we just can't get our HR system working.

But I think that the space industry has had this challenge. I think you're overcoming it with things like what you talked about, where you could put all the investment that you want into the STEM field and education, but then those kids will just go off and get video game jobs or special effects in the movies.

Arthur Herman:

That's right.

Jason Kim:
And how do you make space more appealing? I think what you talked about with the mission-oriented or helping sustainability of the Earth’s orbits, I think that’s more of a thing that Gen Z will respond to, that they’re doing something meaningful in their lives.

And then, you’ve had the SpaceX, the missions that were all over the news with these astronauts and then we’re going to have Artemis. I think those are things that are really going to help re-spark the inspiration for the younger generation in the same way that Apollo did.

Arthur Herman:

Look, space is cool. I mean, there’s no doubt about it. No, I mean, you cannot-

Jason Kim:

It wasn’t though.

Arthur Herman:

It was not. But if you put together the way in which space has been sold in the broader culture, whether we’re talking about Star Wars or the whole presentation about what can happen, the possibilities of taking place in space. But then also too, I think come back to Maxar and Starlink and about the war in Ukraine. Suddenly the reality of how that can be decisive in the battlefield or in the battle space, I think is also something that sparks imagination.

If you have an industry that sparks people’s imagination, especially young people, that’s a really hard asset to squander unless you’re really trying. And I think it’s the one that we really need to cash in on as we go forward with everything that we’re doing here. This has been a great panel. Let’s thank them for presentation.

Chris Shank:

That was great. Thanks.