



U.S. Space Strategy and Indo-Pacific Cooperation

Introduction.....2

- Ken Weinstein, *President and CEO, Hudson Institute*

Keynote Remarks.....2

- Dr. John C. Mankins, *President, Artemis Innovation Management Solutions LLC*

Panel: U.S. Space Strategy and Cooperation in the Indo-Pacific Region.....2

- Lt. Gen. H. R. McMaster, *US Army (Ret.), Japan Chair, Hudson Institute, and former National Security Advisor*
- Dr. Patrick M. Cronin, *Asia-Pacific Security Chair, Hudson Institute*
- Peter Garretson, *Senior Fellow in Defense Studies, American Foreign Policy Council*
- Dr. Namrata Goswami, *Author and Strategic Analyst*
- Lt. Gen. Steven L. Kwast, *USAF (Ret.), Former Air Force Commander and President, Air University*
- Richard P. Lawless, *Founding Partner, New Magellan Ventures, and former Deputy Under Secretary of Defense for Asian and Pacific Affairs, U.S. Department of Defense*
- Masashi Murano, *Japan Chair Fellow, Hudson Institute*

Capstone Remarks.....2

- Dr. Mir Sadat, *Director, Defense Policy and Strategy, U.S. National Security Council*

Hudson Institute, Washington D.C. Headquarters
1201 Pennsylvania Avenue, N.W., Fourth Floor
Washington, DC 20004
November 13, 2019

TRANSCRIPT

Please note: This transcript is based off a recording and mistranslations may appear in text. A video of the event is available: <https://www.hudson.org/events/1740-u-s-space-strategy-and-indo-pacific-cooperation112019>

KEN WEINSTEIN: I'm Ken Weinstein, president and CEO of Hudson Institute. Our mission here at Hudson is to promote U.S. international leadership and global engagement for a secure, free and prosperous future. Key to Hudson ever since our founding by the late geostrategist Herman Kahn has been policy work at the intersection of technology, policy and strategy, focusing in particular on the critical need to maintain America's qualitative edge, especially in partnership with our allies. We've also had a very special focus on U.S.-Japan relations and on Japan since Herman Kahn's day. Now as space looms ever closer as the next frontier - a place where there is immense potential for humankind, but also an area that poses unique geostrategic challenges, many of which parallel those here on earth - we thought we'd take this opportunity to examine Indo-Pacific cooperation on space questions.

As our event gets underway, I want to acknowledge Hudson's Japan chair, Lieutenant General H.R. McMaster. H.R. needs no introduction. He's a forward-thinking, unconventional strategist, and we're immensely grateful for his presence here at Hudson, for his service to our country in the Army and the Trump administration. And now here at Hudson, I also want to acknowledge the quarterback of today's event, Dr. Patrick Cronin, Hudson's Asia-Pacific Security chair. Patrick is a prolific and insightful scholar who is dedicated to analyzing and staying ahead of security threats in the Indo-Pacific, and we're very fortunate as well to have him here at Hudson. And in addition to a superb, first-class team of panelists, scholars that we will hear shortly, I also especially want to thank Dr. John Mankins, the president of Artemis Innovation Management Systems (ph), an international leader on an array of space issues, who will be keynoting our event this morning. And I'll be introducing him shortly. Space - let's face it; we've come a long way in the last 50 years since the moon landing. Space is no longer an exclusive frontier available only to a few. As vice chairman of the Joint Chiefs, General Hyten, has noted, here in Washington, it's now become a key priority for our leaders in the White House, for lawmakers on Capitol Hill, investors in Silicon Valley and for our joint military forces. It's also a frontier that a growing number of countries are seeking to explore and which private industry is increasingly providing lift to reach with a focus on a - on the potential natural resource extraction and even the potential habitability for mankind in space.

Unfortunately, however, not all actors are committed to the responsible and sustainable use of space. Our adversaries have and are pursuing counterspace weapons and strengthening their military space programs. Of course, China's 2007 successful tests of an anti-satellite - an ASAT weapon was a wake-up call for many and signaled that space was no longer a safe and secure domain, that (ph) one could be exploited to, as others have noted, quote, "leave us left - leave us deaf, dumb and blind in seconds." The ASAT tests showed us just how vulnerable our space assets are, particularly given our dependence on space-based systems, from GPS, ISR and in communications. And it - at this intersection, the commander of the newly set-up U.S. Space Command, General Raymond, has prudently noted, quote, that "our level of superiority is diminishing." Now we're trying to reprioritize space to meet these threats, as evidenced by the Trump administration's revival of the National Space Council under the dedicated leadership of a man who I think would describe himself as a bit of a space geek - and that's Vice President Pence, who's been focused on space issues even before he got to Congress - congressional efforts to lay the legal and financial framework for a DOD restructuring including a Space Development Agency, a space corps - force and a new combatant command, the promotion of space experts within our various service branches, obviously, the reestablishment of a space-

focused combatant command and an increasing cooperation and collaboration between commercial and government organizations.

But we need to do more. And we can't do it alone. Space is obviously the largest and the most unpredictable physical domain, one that's going to require strategy and cooperation to face future security challenges. As we partner together with the Japanese in particular and the Indians as well on the free and open Indo-Pacific concept, we also need to start to think through ways that our three - that our nations can work together in space efforts, strengthening partnerships to improve interoperability, to ensure effective deterrence and defense, considering each nation's individual strength and how to leverage them. And I think that our conference today is going to allow us to explore these issues and to figure out ways to deepen our coordination going forward. And there are lots of different questions that we're going to explore.

Obviously, our satellites are vulnerable to strategic attacks, but they're also vulnerable to the challenge of collision with other satellites and various debris in space, something that we at Hudson through our Space 2.0 initiative that looks at the future of exploration of space, the growing privatization of space, how to maintain U.S. leadership in that domain has already focused on. It's increasingly critical for all of our nations to invest in infrastructure. And I think here is where the U.S.-Japan partnership has become particularly critical, especially as Prime Minister Abe and President Trump have recently agreed that our two countries should partner on the U.S. program to bring - to return manned exploration to the moon by 2024, with Japan helping in significant ways in technical cooperation for this future lunar exploration.

So with those opening thoughts to sort of lay the groundwork for today's discussion, I'm delighted to be able to introduce Dr. John Mankins, the president of Artemis Innovation Management Systems, who's our keynote today. He is, as we all know, an international leader in space systems and technology innovation, highly effective manager of large-scale R & D programs, widely consulted on R & D management and space issues here in D.C. and around the world, spent 25 years at NASA and at Caltech's Jet Propulsion Lab. And his projects included space mission operations, flight projects, system-level innovation, advanced technology, research and development and the like. At NASA, he was manager of Exploration Systems Research and Technology and was responsible for more than a hundred individual projects with over 3,000 personnel. He was also the manager of the Advanced Concepts studies at NASA and the lead for critical studies of space solar power, highly reusable space transportation, affordable human exploration approaches and many other topics. His significant accomplishments have earned him numerous awards and honors, including the prestigious national NASA Exceptional Technology Achievement Medal, of which he was the first recipient. Ladies and gentlemen, please give Dr. John Mankins a warm welcome.

JOHN MANKINS: Good morning. It is a great pleasure to be here at the Hudson Institute and a tremendous pleasure also to be speaking on this particular subject, one on which I have spent quite a few decades and which I regard as absolutely essential to both our future in the U.S. and the global future. So this morning, I would like to present to you a vision of the future which will be radically different than everything we think we know about space and space activity and the space of developments - the pace of developments vis-a-vis space. These changes are being driven first and foremost by dramatically lower launch costs; secondly - enabled by those dramatically lower launch costs - by the emergence of a completely new family of players both in terms of individuals, and firms, and sources of capital, and the kinds of missions and markets that are being opened; a whole new range of new system concepts and types of investments in

systems, which is both now emerging and coming ever faster; a set of technology transformations which have been well-known on the ground here on earth but have been slow to propagate into space systems - and this is rapidly changing as well - and as a consequence of the above, urgently new policy issues and opportunities.

I'd like to - I'm presenting you with an argument that everything we think we've known about space during the last 50 years is about to change radically and quickly. And this is the fundamental transformation - orders of magnitude reduction in the cost of launch. And I apologize; it's a little bit of an eye chart, but I wanted to get it into the record. A number of my charts have a little bit of data and a few images to look at. The world changed four years ago next month with the first Falcon 9 reusable stage landing successfully back on earth. And if you look at things that were written 10 years ago or even eight years ago, you don't see any - it's like looking into movie from before mobile phones. You don't realize how ubiquitous these pocket computers are and the interconnectivity of today's world until you look at a movie from 1997. And other than the interconnectivity and (unintelligible), it's almost - it's hard to tell that it's a completely different world now.

But if you go through an airport, every other person you see is looking at their device, is connected to somebody half a world away, is somehow using the assets in space that were mentioned a moment ago, is somehow et cetera. This transformation - the transformation in launch is going to be even more profound, I believe. In particular, Falcon 9, Falcon 9 Heavy (ph), the Falcon 9 reusable is just the tip of the iceberg - essentially substituting computational power and the ability to control at the individual rocket-engine level, a fully reusable, vertically landing vehicle getting rid of essentially the whole requirement that we believed in in the space shuttle and other vehicles for thermal protection systems, aerodynamic reentry, all of that stuff just going away for the first stage and the change that it brings to the cost of access to space. Whereas 10, 15 years ago, it was typical to talk about 15- to 20,000 dollars per kilogram, today, the price points which are being listed and which will be delivered not only by SpaceX, but shortly, by Blue Origin are down around \$1,500 a kilogram - so a fact - an order of magnitude reduction - and soon with New Glenn and - at least, SpaceX is arguing - with the Starship and the Heavy booster, \$200 a kilogram. And it's not just SpaceX and Blue Origin.

If you look at what's going on in the international community, all sorts of companies are trying to catch up. They're all now working on computationally controlled, thrust vector-controlled boosters in stages that will be able to achieve these same kinds of feat - not today, but soon. I would say within 10 to 12 years at most. So this has tremendously far-reaching impacts because, as was mentioned by Heinlein many years ago, low-earth orbit is halfway to anywhere. So this is an energy map there on the right side. It's an energy map of the inner solar system - top areas of interest as far as we are concerned - we in this room are concerned - over the rest of this century - namely, how much energy it takes to go from low-earth - earth to low-orbit, from low-earth orbit to other destinations both in earth orbit, the earth-moon system and in the inner solar system. And a fundamental fact, as it happens, of the solar system in which we live is that once you get off earth, which it - in quantitative terms is characterized as the Delta-v, the change in velocity that you have to achieve - it's about 9,500 meters per second. I'm an SI guy, not a English-units guy. I'm a physicist by background.

And that 9,500 meters per second includes gravity losses; it includes aerodynamic drag. But once you're in low-earth orbit, anywhere else you want to go in the solar system is about 4,000 meters per second - 3,500, 4,000, 4,500. And this is the secret sauce behind Elon Musk's

argument that his Starship is going to be able - once it's in low-earth orbit is, with refueling, going to be able to go anywhere that it wants. It's going to go to the moon. It's going to go to Mars. So it's about 1,800 meters per second to go down to the lunar surface from lunar orbit, about 4,000 meters per second to go down and back up. It's about 4,000 meters per second to go from Mars orbit to the Mars surface. It's about 4,000 meters per second to go from earth vicinity to Mars vicinity and so on. So once you've got really low-cost access to low-earth orbit from earth, with refueling, with reusable systems, you can do anything anywhere for double the cost. I.e., you're halfway to anywhere. And this fundamentally changes space. We've seen this now just this past week with SpaceX's launch of the next batch of their Starlink network. And you've got it coming with OneWeb.

You've got several private companies now proposing to deploy networks in space that will fundamentally change access to the Internet here on earth globally and permanently. And this is a stack of actual SpaceX Starlink satellites. Sixty of them launched the other day. Already in the last six months, a single company has launched the largest network in space, period, ever. Within - by the time they finish the planned network - they're looking at 42,000 of these satellites - they will have launched a space object on the - thinking of the system as a single object - on the order of a million kilograms and something like 40, 50 megawatts of power. And the reason they're able to do this is because of the dramatic cost reduction. If you read from the left to the right, the left is high cost; the right is low cost. And then the cost of the system, as a consequence - there's a bunch of assumptions that go underneath these numbers, but as a consequence, what you see is that the cost of this kind of system would've been unimaginable at \$15,000 a kilogram, but at \$1,500 a kilogram, it becomes possible for the right market. And at \$200 per kilogram, all sorts of new markets open up, and it becomes inevitable. In particular, another market that's been long anticipated is that of public space travel and tourism.

There was a very nice study done 25 years ago called the Commercial Space Transportation Study, oversaw - seen by NASA, a gentleman by the name of Bill Pylon (ph) with team members from Boeing and various other companies, basically posing the question 25 years ago, what would happen to a variety of important markets if the cost of getting into space were drastically reduced? This particular curve just shows one of the figures from that report, which is available online. If you wanted to get a copy, it's a lot of fun. And what it illustrates is that the cost per pound - these are English units; I apologize - drops below about \$10,000 a pound, about \$5,000 a kilogram. The number of people who might be expected to go into space as public - for space tourism drastically increases because this is a log-log curve. The black line at the top is the maximum number. The - is the minimum number, low probability; the bottom line is the high probability. And so, essentially, when it gets below about \$200 a kilogram, it's projected to be anywhere - at this time, anywhere from 100 to 100,000 people might go to space at those kinds of price points.

That will result in significant new activities in earth orbit and, within space refueling and reusable space transportation systems, in significant new activities outside of space tourism. Nope. So one that I'm going to highlight in particular is a topic on which I've spent a fair amount of time, and that is space solar power. And so I'd like to just illustrate the idea. If you're not familiar with it, it has to do with putting up large space systems, harvesting solar energy in space and then delivering it to terrestrial markets. Several fundamental barriers to space solar power have been the cost of the space system, the cost of the space hardware, specific technologies associated with the assembly and construction of what would inevitably be extraordinarily large space

systems, and then the resulting cost per kilowatt hour for power delivered by those systems and whether or not it could be competitive in the terrestrial marketplace.

So the main focus here being that the - as the cost of launch comes down, the cost contribution to the price of electricity that such a system could deliver becomes extraordinarily tiny - i.e., on the order of, this cost of transportation becomes about a penny per kilowatt hour as a contribution to the cost of such systems. And at that point, it really comes down to the cost of the hardware. Cost of launch at these low price points that we're approaching will be completely irrelevant - and the cost of electricity, which could be delivered. And I'll go back to this figure for just a moment. And I just want to highlight that - this is the Starlink photograph. It's essentially 60 RF - solar-powered RF satellites in a stack launched last spring. Another one was just launched this year, and I - if I remember - launched last week - if I remember correctly, the vehicle that was used to launch the first package and the second package was the same vehicle, so just reused, if I've understood the press accounts properly. There is no fundamental difference between a mass-produced satellite stack and the mass-produced pieces that would go into one of these modular approaches to solar-power satellites. And if I looked at the - I've been looking at the numbers trying to extract from some of the public filings what I think the prices are for the hardware - the costs are for the hardware that SpaceX is launching.

My estimate is that there are a planned constellation of some tens of thousands of satellites, that they're going to be at something like \$5,000 a kilogram and that the price of electricity - there are 40, 50 megawatts that they're going to have within their full system - is going to be a basic - very, very comparable with terrestrial energy prices. Now, compare that to the cost of space solar power onboard the International Space Station. If you run the numbers on the cost of that hardware and the cost of the marching army and all of that, what you end up with is a cost of like \$50 a kilowatt-hour for about a hundred kilowatts. Now, as long as our space systems are limited to kilowatts and to tens to hundreds of dollars per kilowatt-hour, very few ambitious things are going to be done in space. However, once one can do megawatts to hundreds of megawatts in space at cents per kilowatt-hour, everything we can contemplate doing in earth orbit and elsewhere in the inner solar system where the sun shines fundamentally changes, including the ability to use such platforms for the extraction of resources from the asteroids, for the delivery of power to the lunar surface for operations and for resource development, and then for delivery of power beyond the earth's vicinity, for example, at Mars.

In addition, these technologies and these systems will make possible the develop - the deployment and the assembly of extraordinarily huge imaging systems. And it's - this is a picture that I had done 25 years ago. But if you'd - you should notice the resemblance between these panels, which are being installed to form this enormous imaging system, and the panels that made up the Starlink satellite stack that was launched last week. And the only difference between the two is the structural system on which you deploy the pieces, the robotics that you'd have to have to do that assembly and the fact that it's an imager rather than an RF system. So these kinds of systems, deployable in months or weeks by independent, relatively small actors, is well within the technical reach of what's being discussed and what's being done right now because of low-cost launch. In addition, the development of the moon - again, at a hundred dollars a kilowatt-hour, the development of the moon, its resources, the eventual settlement of the moon is all unthinkable, but that is going to rapidly change as well. There's a moon rush going on, if you haven't noticed.

Ten years ago, almost nobody wanted to go to the moon. Today, there are on the order of two, three dozen spacecraft probes, missions, orbiters, CubeSats, landers, rovers, subsurface probes all on the way to the moon from multiple countries, multiple companies, numerous universities. And they're all going in large measure because of the verification that there are, in fact, ices at the poles of the moon not as a trivial scientific data point but as a massive resource, which, in combination with the reusable space systems that I described a moment ago - space transportation systems - allows those vehicles to be refueled not deep in the gravity well using fuel brought from earth but high in the gravity well with resources taken from the lunar surface. And so these resources will have application basically in providing transportation throughout cislunar space, the earth-moon system, as well as destinations beyond at prices of a thousand dollars a kilogram rather than a million dollars a kilogram, which we have grown accustomed to as a transportation cost to put something on the moon or to put something on Mars. And a three-order-of-magnitude transformation change in cost in less than a decade will simply change everything that we can do in all of these places.

And I've got here another one of my little curves. It basically just shows that the earth's orbit contribution to the cost of putting 10,000 kilograms - 10 tons - on the surface of the moon, once you get below the Falcon 9 reusable price points, then it just becomes vanishingly small. So we go from a Saturn V kind of scenario, with billions of dollars per person on the moon, to the future, which will be hundreds of thousands of dollars or a million dollars per person on the moon, i.e., a three-order-of-magnitude reduction in that cost with reusable space transportation and reusable - and refueling in space. So I want to just close with a highlight and bring it around to the - in particular, to the U.S. and Asia-Pacific space context and highlight a particular aspect of space solar power and its potential impact on an entire region. So one topic that I've been spending a fair amount of time on is actually the potential application - I need to actually get you to the correct slide, sorry - the potential impact of this on Indo-Pacific dynamics.

So if one were to develop a solar power satellite and to place it in a geostationary earth orbit at a location above the equator, so aligned with the middle point of the outback of Australia, the outer circle that you can see here is, essentially, the addressable earth from that satellite in the geostationary earth orbit. So everywhere below that in that circle could get power from that satellite - not at the same time, but the power from that satellite could be sent to any of these - any location within that circle. And as a consequence, there is a unique opportunity for a partnership between Australia and the U.S. and Japan to develop a solar power satellite system to deliver power initially to Australia, where there are unique market opportunities because of the very large-scale mining activities in Australia that are extremely remote from the power grid or from other energy sources, which could then grow into power with several satellites that could be delivered continuously, independent - solar energy, completely green for markets throughout the Asia-Pacific region, and to do so at prices on the order of five cents a kilowatt-hour and, as I said, without regard to the vagaries of weather.

So this kind of capability one would have an immense benefit to the relationship among Australia, the U.S., New Zealand, Japan. Also, you'll notice off over there to the right, also, India. If you put the satellite just a little bit further to the west, you'll get a much better coverage of India. So a single satellite or set of satellites could deliver power throughout that region and make possible the sustainable economic development - further economic development for approximately 40% of the world's population. So that will be the kind of power that will come from the revolution in space. Thank you very much.

PETER GARRETSON: All right. So trying to bridge that amazing vision from that vision to policy, thinking about what are the opportunities for cooperating with other democracies in the Indo-Pacific? So what was not in John's discussion but in the context of great power competition, it's important to realize that we have a competitor that is intent on supplanting us as the primary space power by 2045 - there's an announced tool (ph) - and that they see the same vision that John has laid out for a lunar industrial civilization with space solar power that will be delivering on the order of \$10 trillion annually in the 2050 time frame.

It's very tempting when we start to think about cooperation to get limited into the previous discussions that were entirely about exploration. And one of the things that I hope John's comments have done is to break you out of the thought that it's about exploration and science. Fundamentally, the future in space is about exploitation, economic development at a massive scale. And so that needs to be not a part but the absolute center of our thinking on policy. It's also very common for us to think in a narrow, statist sense about launch - to focus on our launch vehicles that are - that NASA is building versus theirs and to miss this larger and incredible transformation that is happening in the commercial sector, currently led by the United States but with an extreme set of fast followers somewhere in the neighborhood of 140 launch companies worldwide, all or at least half of which appear to be trying to go after reusable launch. And that's going to be, as John told you, utterly transformational to what we can have as ambitions in space. So as John said, we're going to have entirely new concepts. And the center concept that should be concerning all of us is space solar power because it has the ability to completely alter everything about global dynamics, energy and scale.

And that's the thing, right? Talking about scale and significant markets - that should completely alter, you know, what is the center of our thinking about cooperation in the Indo-Pacific. In the many-trillion-dollar space economy that is unfolding, what do we want as a nation and as a set of nations from this new frontier? And how do we wish to author that century ahead? So the United States has a number of very important interests in space. Some are specific to space, and some are space-enabled. But I would say that the thing that benefits us the most in terms of the sorts of values that we would hope to impart to the future - the values of freedom and liberty for individual human beings is power. It's the global primacy that we have available to us, and the ability to use space to advertise our values for emulation and collective action. The other things are very specific, but it is what space does for everything that should matter the most.

So what we need to be thinking about is to build an entire ecosystem where the United States supplies certain things that enables everyone else to plug in. So we need a shaping strategy to maintain that balance of power in favor of democracy and liberty. We need a shaping vision, a vision that's noble that attracts the uncommitted, that undermines those who would oppose us. And we need a shaping platform of what we want to do and show where others can plug into that ecosystem. So the strategy - I would say we need to be betting on our fellow democracies and the resources of space to build a much brighter future for humanity. The vision should be a multitrillion dollars of wealth and green energy to empower a fully developed society of human liberty. And the shaping platform needs to be an end-to-end reusable transportation system that enables that Third Industrial Revolution. So within that, what is the role of the United States, and how do we build space for our partners and allies?

At the bottom, the roots are that cislunar space access, and then the cooperative institutions and financial institutions that enable access to capital in the specific domain. At the top, it's providing that top shelter for freedom of commerce as we do on the high seas via United States

Space Force. And in the middle is everything else. That's both the commercial sector and our partners in supply in this vast space. If you look at what underwrote U.S. primacy, our - the global economy, our partners' security and the overall regime that favors international security and individual liberty. We built a series of institutions post-World War II that enabled that to happen, and we will need to build a new set of institutions specific to the space domain similar to this, similar to the standards that OECD made, similar to the sorts of alliance relationships that we had with NATO and Japan and similar to the sorts of policing functions that we did with the Navy and with the Air Force.

So there are obvious places to start with the four big, major partners and then the peripheral partners that are getting into the space domain there. We should be focusing on the nexus of where all these things come together. And so at the nexus of liberty, democracy, security and economy, we have institution design and cooperation. We have space mining, space solar power, asteroid defense and, of course, specific to security, defense among space agencies. I think it's appropriate that Hudson takes this on. Many of you may not know, but in 1977, there was this extremely prescient work by Herman Kahn himself written for NASA that was restricted and not allowed into the public until a few years ago. And it is - it's very consistent with the future that John laid out, but written 42 years ago. And then just out is a fantastic report by thinkers at Air Force Space Command that lays out very different visions for the future and where we would or wouldn't go.

And I encourage all of you to look at that in terms of background for this broader space industrial future that we are talking about. But in thinking about key directions for policy, we need to create a broad system of norms and institutions to grow commerce and activity in the space domain that needs to not have exploration as the center, or it needs to have development or industrialization as the center word. It needs to focus on scale. We need to be thinking about bilateral recognition of claims with other democracies, and we need to be willing to shoulder the burden of protection via U.S. Space Force and to provide domestic leadership in terms of vision, the technology investment in those industrial space technologies and then legislative frameworks in the manner that we would hope others to copy. And of course, centerpieces - we have to make sure that we are investing in the logistics system that will enable all of that. So I'll leave you with this thought that the best way of thinking about space in terms of an analogy is thinking about it as analogous to the maritime domain.

H R MCMASTER: As I joined Hudson as the Japan chair, which is a great honor for me, you know, Dr. Weinstein told me that there would be no math. So I (laughter) - but thanks, John. It was so clear. I could - even a historian could follow it.

MCMASTER: We're really here at a critical moment, I think all of us realize. It's a time of tremendous change - tremendous change in the space domain with tremendous implications for us geostrategically, you know, here on earth. And there's no better place than to have this discussion than at Hudson, a place that is committed and a team that is committed to a secure, free and prosperous future. The space domain and the competitions that are now ongoing in the space domain have tremendous implications for that future.

And we have a tremendous panel to help give us insights into, what are these emerging challenges, and what can we do together across our free and open societies to guarantee the future that is part of Hudson's mission statement? We heard already just today some significant changes that are happening. We thought that space would be uncontested and that we would

have, really, relative freedom there. But we know it's contested now. And as Peter just told us, I think there is a very useful analogy in connection with the maritime domain and what closed, authoritarian countries - China, in particular - are doing to restrict movement there. I think it's certainly not unreasonable to assume - and we know, actually, that China is taking actions now to restrict our freedom and access to the space domain, as well. The public and - versus private - you know, the - really, it's been government that has dominated operations and capabilities in space and the - just the explosion of the private sector. And what John said - it was really, just a few years ago, almost unpredictable in terms of the scale - and then, of course, as John has mentioned today, you know, the decreasing cost, the increasing number of players, the increasing number of systems.

So we have a great panel to help us understand better, what are the nature of these competitions, and what can we do across the free and open Indo-Pacific to ensure that we do secure that future that's secure, free and prosperous? We have with us four tremendous panelists. First will be Lieutenant General Steven Kwast, who is a - who spent a lifetime studying space and its implications. He has helped develop, I think, our strategic vision for space and has ensured - I think to help us ensure that we can maintain our competitive advantages in space. He's been the president of Air University. And he's been really critical to developing the Space Force, not just in terms of the hard capabilities, but the people capabilities. And he's been an educator of those that are really defending our freedom and our ability to operate freely in space every day. Then we have in Masashi Murano, who we're so privileged to have as our Japan chair, helping us understand better how to make what was Prime Minister Abe's vision years ago of a free and open Indo-Pacific a reality. And today, of course, Hudson, I think, is on the cutting edge of that understanding by including space, understanding the competitions there and the implications for that free and open Indo-Pacific.

Dr. Namrata Goswami is an author and an analyst who is a thought leader on a broad range of security issues in India and internationally. And now she and her consultancy are working on, what is the nature of great power competition in space? What are its implications? And she'll help us understand what India's space priorities are so that India can help advance and protect its interests in space, as well. And then, finally, we have Richard Lawless. I think I'll ask you to kind of clean up on the initial opening comments. And he's the perfect person to give us a perspective of a career intelligence officer with tremendous experience across the Indo-Pacific, as well. And so he understands the capabilities that are now in space, the contested domain of space, as well as its implications for regional security cooperation across the Indo-Pacific. And he has extensive experience in the area of nuclear nonproliferation and regional security. So welcome to all of you. Please join me in giving them a round of applause to welcome them here to Hudson.

(APPLAUSE)

MCMMASTER: And Steve, I'll turn it over to you. We'll have some opening comments, and then we'll have a discussion among us. And Steve, thanks for kicking it off.

STEVEN KWAST: Well, thank you very much. And thank you all for taking the time to be here. And as Peter Garretson pointed out earlier this morning that I think it's worth reiterating, it's nice to see such young faces in the audience because this is really a journey for the next generation. And I'm glad that you are all so young and vibrant and creative. We always say that if a group

doesn't have anybody under the age of 30, there's no creativity in the room, so I'm glad you're all under the age of 30. Good job.

KWAST: I would say, you know, as we focus on Indo-Pacific, it's worthy of just stepping back one more step and realizing that as the human race started discovering technology and how technology could change their life, the things they need - shelter, food, a sense of belonging and a sense of securing that food and shelter, the - you would invent a ship, and the ship would sail across the oceans, and it would open up new marketplaces. And geography shaped culture. It shaped civilizations. And then the ship changed that a little bit. Geography was not as profoundly restrictive to a tribe or a culture to connect and interconnect. And then the airplane - and oh, my word, how that changed geography again, which clashes against our culture. And it opened up a whole new highway to new marketplaces with a temporal dimension of speed and range. Space, I would argue, is going to make geography irrelevant to some degree because of the global nature, that space can range with speed to any point on planet earth and then the solar system.

And so we all get stuck as a culture into the paradigms of the past. And we're stuck in this culture of, space is putting somebody on the moon and satellites to give us GPS and imagery. And we forget sometimes how profoundly this will change the human condition and our ability to potentially uplift the human condition or denigrate the human condition, depending on how we manage it. So as a national security professional, just like you are, our ultimate job is not to fight wars. It is to be peacemakers because we designed such clever strategies that nobody would ever contest it. And whenever there's a new marketplace, whenever there is new resources, if there is not a joining journey of predictability, and the ability to hold people to a rule of law and to a set of agreements between different civilizations that have different values, if you don't have that component of predictability and security, violence will ensue. And it's not because we want violence, but it's because the human condition has historically proven that somebody will act with evil intent. Somebody will steal what good men and women have built if there is not some sense of security. That's intuitive to most human beings, most civilizations. And that is the whole purpose for our government.

So my view on space is broader than just the Indo-Pacific. Indo-Pacific gives us all of the realities of speed and range. But ultimately, if we as countries that believe in common values of respect for all other human beings, and hard work and this sense that you have an individual responsibility to contribute to the team, to the tribe, to the culture that you belong to, that if we collectively come together and focus on some of the fundamentals of this new environment, we can build it. But we are trapped. So think about the four industries that space will transform. And think about it in the Indo-Pacific region with the speed and range required. Transportation, we've talked about. Peter Garretson discussed that. So did John. But it's going to be energy. John talked about that. It's going to be not just energy and transportation, but information. Look at the satellites that Elon Musk is throwing up, where you're going to have Wi-Fi from space. Soon, you'll not just have Wi-Fi from space, but you'll be able to trickle charge your phone from space, and you never have to plug it into a wall. You can see how this starts transforming.

But right now, I would argue that our Congress and our countries are going into space like a bunch of kids on a soccer field all chasing the ball, OK? And we're building stuff. We're building satellites. We're building this to do information. We're doing this to build transportation. And we are not keeping up with China's larger view of what they are doing. And what they're doing is what we did when we built a Navy in America or we built an aerospace industry in America. We

didn't build a Navy because we liked ships. We built a Navy and a merchant marine a shipbuilding industry because we knew the economy of global commerce on the open oceans would change world commerce; it would uplift all civilizations. And so we invested in the foundation. We went from wooden ships and sails to iron ships and steam and coal. And that was hard for our culture to change because, man, those people that built wooden ships and sails, they were good. They had a whole industry. We did the same with mechanization. Boy, we had a whole industry of horses and horse feeders, horse stalls, horse breeders for an army full of horses.

And when mechanization came in, that was disruptive to change everything. Aerospace - when the airplane first came about, America kind of ignored it until the Brits and the French started showing what the airplane could do. And then the government got involved with Pan American, and we built an aerospace industry. That has not yet happened in space. Yet space is going to transform more than the Navy was able to transform or an Air Force was able to transform by blending economics with national security, because space will dominate transportation, information, energy and manufacturing and be able to deliver it to any point on planet earth at pennies on the dollar of what you can do using a terrestrial model. Space has the network power that we haven't even tapped into. So as countries in the Indo-Pacific, if we partner on the foundation - not the low-hanging fruit of this satellite, that satellite or putting somebody on the moon - that's not what I'm talking about - the foundations of transportation, energy, building an ecosystem in cislunar space that gets after the ability to maneuver faster than any other competition, to be able to communicate more rapidly and more cleverly and - than your competition, and to be able to bring power to bear so that if somebody behaves badly or inconsistent with our values, we can hold them accountable.

If thugs, thieves and pirates start stealing what good women and men build in space, there is some entity that brings justice to bear. If we don't focus on that first, China will be able to outmaneuver all of us. And we will find ourselves like a nation that sees somebody else building a navy, an air force and the Panama Canal, and we continue refining how well we build the horse. Thank you.

(APPLAUSE)

KWAST: Thanks, Steve. Thank you.

(APPLAUSE)

MCMMASTER: Masashi, I was going to ask you to maybe - for your comments, and I imagine you're going to share with us what are Japans priorities in space as well.

MASASHI MURANO: Yes. So thank you very much for - first, just thank you very much for joining us. My name is Masashi Murano. I am responsible for the U.S.-Japan defense cooperation program as the Japan chair fellow. So - and the - my original specific field is deterrence strategy and policy, so from - today's (ph) I would like to talk about Japan's space security policy from that perspective, and how do we deal with the great power competition between U.S.-China? So let me start the other initial remarks, the - let me start comparing with the situation of the United States.

The history of the space development of the United States and Japan's history of space development and its application is very different. History of the U.S. space development was the

four decades linkage to the strategic competition between U.S. and the Soviet Unions. While - as we know, that while nuclear war did not break out, but those technologies developed during that period - for instance the early warning sensors and precision-guided munitions that fully applied to the SCUD-hunting at the Operation Desert Storm - these capabilities becoming the foundation for the tactical war fighting in this realms for - by the United States force since the first Gulf War. But on the other hand, the Japan space development and operations has been conceptualizing in a different way. We have - our space policy has been led by the MEST - Ministry of Education, Science and Technologies - and JAXA - Japan Aerospace Exploration Agency, not the ministry of defense and self-defense forces. For Japan, its peace constitution and a strong public consensus for pacifism have created an aversion to bringing defense issues to space development.

So in that sense, the Japanese have tended to view the space as the positive futuristic frontier for exploration and or technological development rather than conceptualizing it from the national security standpoint. However, Japan's latest National Defense Program Guideline, which is the capstone document of our defense strategy - it's reviewed at the end of the last year - it positions the space domain as an important area of the defense investment along with cyber and electromagnetic spectrum. So Japan made such a decision not only because of the current United States Air Force and the Trump administrations but also concerns about China's rapidly developing the counter space capabilities. So these capabilities includes not only kinetic assets - such rich asset in 2007 - but also non-kinetic counter space systems, such as the laser dazzling against optical sensors and uplink and downlink jamming. So in particular, the characteristics of the non-kinetic the counter space capabilities will complicate our escalation control.

So for instance, the first - even if it is used, that it cannot be recognized by humans basically. And second, in the current space situational awareness capabilities, it's difficult to recognize in real time whether a problem with the satellite systems is intentional or accidental. There's certain characteristics in the space. It's difficult to identify attackers' attribution in real time, with some exceptions, and the first characteristics is reversibility. In other words, if some jamming attack stops the satellite function, maybe restored. And first, these technology have already proliferated and lead the available. So in that, these factors make that difficulty to determine by punishment. So in other words, the lack of the space situational awareness and its ambiguity has created some gray zone situation that has likely occurred. Furthermore, let me think about - our satellite systems was hit by China or some other opponents satellite in the peace time. So in that sense, in that situation, can we immediately recognize whether it is accident - accidental or intentional? So if - some more specific situation, if China apologize, it was just accident, what is the appropriate response? So this situation is very difficult for our decision making to delay some appropriate decision making based on the - caused by the ambiguity of the space situational awareness.

And the reversible counter space capabilities, such as jamming that have a low threshold for use and harder to deter the reversible attacks - irreversible attacks. So therefore, it is important to not only strengthening our resiliency of the space systems, but also how our offensive and defensive space - counter space capabilities for escalation control. So therefore, in the latest version - in 2018 version - the National Defense Program guideline - Japan decided to research and study of disruptive measures on opponents' C4I in collaboration with electromagnetic domains. And moreover, the most likely targeting - targets of the jamming for positioning signals

and communications signals and image information acquired about the synthetic aperture later. So for these reasons, Japan's space security policy priorities as follows - the first is to improve the space situational awareness capabilities. According to the current program, the Ministry of Defense and JAXA are working together to build optical and laser observation facilities.

They plan to build the space situational awareness systems by the fiscal year 2022. In addition, the Ministry of Defense will aggregate the SSA information in Japan and share it in the combined Space Operations Center with the United States, which has the global SSA network. So - and the second is to improve the resiliency and the confidentiality of the communication satellites. And third is ensure the resiliency of the positioning of signal. And fourth, the capability to intelligence, including the early warning and the maritime domain awareness, should be included. In these areas, the Ministry of Defense plans to start the demonstration of the satellite's integrated durable infrared sensors in 2020 - next year. This is the initial study of the space-based early warning sensor of Japan. So finally, I would like to point out some policy recommendation for the further cooperation between allies. The first in the multi-domain strategic competitions that we must identify our advantages and disadvantages and compete with China in the favorable domain where we have advantages. So I think that our advantage is - one of our advantages is the alliance network.

So in that context, the last year Vice President Pence and the Prime Minister Abe agreed to implement the Hosted Payload Program as a new area of cooperation between Japan and the United States. This plan, in 2023, the U.S. SSA sensor will be installed on Japanese positioning satellites. And I think that Hosted Payload could complicate that deterrence convocation and increase the threshold at which our potential adversaries could use the counter space capabilities. For instance, if China were to launch an attack on our satellite systems in the Taiwan crisis scenario, if it was equipped with the Australian or NATO's mission module and the same satellites module - another example is in Baltic invasion scenario by Russia. If the NATO satellite was equipped with Japan's mission module or U.S. mission module, an attack of them would cause horizontal escalations.

So I think that this is the cross-regional deterrent effect and the political - increasing the political resilience. In other words, not only Japan and the United States, but also Japan-Australia, Japan-NATO, or Japan - U.S.-NATO and U.S.-Australia and the other countries like India should be considered as the possible combination for the Hosted Payload Program. And moreover, China does not have the alliance network like ours, and it's trying to develop their satellite systems. This is both their advantages and weakness, which means that if we needed to get space control, we can attack the Chinese satellite system without worrying about the horizontal escalation, at least at this moment. So - and second point is today's joint operation needs to be sort of connecting all domains in the actual warfighting situation, as well as the intelligence analysis in peacetime. If we focus on the one phenomena that occurs the single domain, we may overlook the fact the small phenomena work with another behavior in other domains. So therefore, before the multi-domain operations, I think that more - the multi-domain intelligence analysis is more important.

In this point, I think that we should pay attention to the strategic collaboration between China and Russia. Last July, China and Russian strategic bombers joined and flew nearby Takashima, where is the disputed territory between Japan and South Korea, and Senkaku Island. I think that that action was a classic probing into Japan, who work with the United States and South Korea, in politically sensitive area. And in addition to that, it also aimed to provoke the further friction

between China, Japan and South Korea, which have been deteriorating and to promote further decoupling between two countries. So we should consider the possibility that strategic collaboration between China and Russia and extend it to the space domain, which means that if China and Russia implemented the Hosted Payload like us, our strategic cooperation will be more complex. So let me stop.

MCMMASTER: Thank you, Mr. Murano. Thank you.

: (APPLAUSE)

MCMMASTER: Dr. Goswami.

NAMRATA GOSWAMI: Thank you, General McMaster. It's my pleasure to be here today - it's my pleasure to be here today, and I think I got the arctic chill from Alabama to D.C. So in terms of the topic that has been given to me, I was asked to talk about - a bit about India's and the U.S. space cooperation, and also what are the future avenues that are possible in terms of this domain. So what I thought would be useful is to see what space means in general terms, and also for India in terms of a strategic outlook. So I would argue that space is one of the most important factors in how a nation articulates its grand strategy and also in terms of its comprehensive national power. And so it's useful to put it within that particular framework and not look at it as a domain by itself. So in that context, I argue that the Apollo era of flags and footprints where you go to space, show off a particular technology and then come back to earth has changed. So today we are actually in the Chunger (ph) era of permanent presence.

So if you look at China's conceptualization of space and their space goals in the next 20, 30 years, they argue that their goal is to establish a permanent, sustainable presence on the lunar surface and dominate cislunar, which is what was mentioned by John and by Peter and General Kwast as the most important domain. So in that context, where the discourse about space has changed since December 2018, I argue that space cooperation between democracies like the United States and India takes a particular significant role. Now, in terms of strategic background, just a bit of history - so India, as you know, has historically been non-aligned and did not want to have any kind of alignment with any great power, especially in the Cold War. But today that context has changed, and that change happened when President Bill Clinton visited India in 2000, followed by one of the most landmark agreements between India and the U.S., as you know, and thus the civil nuclear deal. So I remember being in India and how important that was in terms of the change in strategic outlook for India's political regime. Now, in that context, some of the agreements that I think will be useful to understand where India-U.S. space cooperation could go is one is the next step in strategic partnership, which was signed in 2004, looking at a long-term, 10-year relationship between India and the U.S. in the defense sector, which was renewed in 2015.

The second framework which I think is important is the 2012 Defense Technology and Trade Initiative, which fosters for sophisticated science and technology cooperation. And mind you, this is very important from the Indian perspective, all while ensuring that bureaucratic processes and procedures do not stand in the way of cooperation. And so that's important that they outline that important process - step. I would argue that, for space, what India and the U.S. would require is a similar vision as we saw in 2015, and that's the vision for the Asia-Pacific. This was game-changing for India. As you know, India historically has been non-aligned, has shied away from making statements that could be seen as adversarial from China. But if you look at the joint vision of the Asia-Pacific, it was very clearly stated between President Obama and Prime

Minister Modi that freedom of navigation in the South China Sea is one of the priorities. And so you can see from that particular statement that the strategic context has changed. Now, under the Trump administration, I think one of the factors which has come out very clearly is that India is seen as a key strategic partner.

There are several military logistical agreements that are in place and are going to be signed. One example is, of course, the Logistics Exchange Memorandum Of Agreement, the very basic foundational agreement between the militaries. And so I point that out not because I've forgotten space but because such foundational agreements strategically create the environment for a deeper India-U.S. space cooperation, including in the military sphere. Now, I don't know how many of you actually witnessed the Howdy Modi event, which happened where President Trump was present, and so was the leader of the House majority - for instance the Democratic leader was present. And so in that particular meeting, it's very interesting. So President Trump mentioned that, here in America, we are creating the United States Space Force, and we are working closely with India to enhance space cooperation. We will pioneer new frontiers in space, working together, raising the sights of humanity.

We will uphold our values, defend our liberty and control our destiny - very similar to what Peter and General Kwast talked about. So based on this particular framework, I'm going to come to space now. So for instance, India-U.S. space cooperation is not new. In the 1970s, the Indian Space Research Organization and NASA conducted the Satellite Institutional Television Experiment utilizing NASA's first direct broadcasting satellite. And based on that, actually, ISRO developed its own Indian national satellite that enabled my family, who did not have television access in a very remote area in northeast India, to have access. And people don't forget that - that kind of cooperation that enabled India's ability to be able to see television. And in fact, what is so fascinating is that most of the satellites at that time were launched on U.S. launch systems, which people don't realize. So addition to liberty, freedom, freedom of press, information. Now, coming to India's strategic culture, I hear a lot of complaints when I was here in D.C. as a USIP Senior Fellow - 2012, 2013 - that India's strategic culture is very non-committal in terms of building alliances or working closely with the United States. So I argue that there are four different strategic cultures in India.

In the 1950s and '60s, it was the Nehruvian strategic culture determined by India's first prime minister, which was against any kind of great power alliance. And that's where the non-alignment movement started. Nehru's fear was that, if India joined any kind of alliance system at that time, India would lose its place in the world. The second strategic culture is, of course, Gandhian. So Gandhi does not believe in the modern state system. He argues that we need to focus on very communitarian approaches. India also has the Marxian approach, which looks at any investment in space as countering or contradictory to India's hope for poverty alleviation. And so Indian Space Research Organization's Mars orbiter, for instance, was very heavily criticized within India for its expense. Today, actually, is a fascinating context to look at India-U.S. space cooperation. So the context of today's strategic culture is not neo-liberal, as Manmohan Singh was - open economy, global institutional structures - but more realist, I would argue. So if you see how the Narendra Modi government is functioning, it's based on accumulating economic and military power. And it's also hyper-nationalist, so it's India first. So it's a combination of both, not very different from what President Trump is articulating.

And actually, both of them, when they had that conversation indicated to that particular potential. In that context, Modi has actually highlighted the importance of India-U.S. space

cooperation. And in that context, I would identify eight future areas that can be looked into in terms of U.S.-India joint space cooperation. One is that I would argue that the United States and India can sign a shared vision of industrial space development and security of commerce. This vision should be explored through a diversity of tabletop exercises involving representatives from NASA and the Indian Space Research Organization, the U.S. Space Force, and as you know, India has constituted a very, very new Indian defense space agency looking at space from a military perspective - again, a great shift in India's strategic culture, where there was a shyness to argue for military space.

So what I would argue is that in that particular tabletop exercise, it's very important to have a consensus on broad global regimes governing economic development of space, which is the focus of both countries today. The second issue that there could be cooperation is space situational awareness. So I would argue that signed agreements between the United States Space Command and the newly established Indian Defense Space Agency for Space Situational Awareness - this must be followed by a change of space personnel at the highest levels of strategy and policy for military space, space intelligence, civil space agencies. And this I say in the context that such cooperation is missing today. We actually don't have that level of cooperation.

So that could be an area of focus. And this sort of mechanism will allow easier cooperative planning and make it easier to harmonize legislation, investment and mutual activities. The third important area of cooperation could be to establish a joint vision for earth observation, environmental surveillance, remote sensing broadband and maritime domain awareness, especially in the region we are talking about - the Indo-Pacific. And this can be actually built upon the already existing frameworks like the India-U.S. nuclear agreement and the 10-year U.S.-India defense framework agreement. And what is very interesting - and this is something that needs to be highlighted - is that when you look at the India-U.S. defense framework or the next step in strategic partnership, it's already identified that India and the U.S. should work to build space cooperation. So you already have the frameworks in existence. It's already passed through the bureaucratic hurdles and has been signed. So you have the frameworks. You just need to develop more deeper detail cooperation possibility. The fourth area of cooperation could be joint robotic mission to the moon. As you know, in 2008, Chandrayaan-1 carried NASA's Moon Mineralogy Mapper, which discovered water ice and actually provided us the first mineralogical map of the moon. You know that this year, India tried to land very close to the south pole and failed in the very last seconds. And that was a big disappointment for Modi and the Indian Space Research Organization.

So I would argue that, given NASA's capability in that domain, this is a great area for cooperation. And again, it already is signed between both the countries to have that kind of moon cooperation. So as we know, NASA just recently announced that it is planning to send a robotic rover to the moon by 2022 to prospect for ice. Guess which two other countries have a similar cooperation? India and Japan. So India and Japan just signed an agreement in which they are both going to send a resource prospector to the moon by the same date. So I would argue that this is a great area where you can cooperate - a trilateral cooperation possibly - between India, Japan and the United States. The other fifth area of cooperation is the joint exploration of Mars. As we know, in September 2014 NASA's MAVEN and India's Mangalyaan actually arrived at the Martian surface very close to each other - just four days. And it is fascinating that - and not known - that the jet propulsion laboratory that does contract work for

NASA through Caltech actually provided the navigation and communications support for the Mars Orbiter Mission for India. So that's a great area to cooperate given that both countries are focused on Mars exploration and development to an extent.

And what is interesting is that the working group for Mars already exists between India and the U.S. So all that is needed to be done is to work within that group and look towards Mars in the next 20, 30 years. The sixth area of cooperation could be within the NISAR - that is the NASA ISRO Synthetic Aperture Radar project, which aims to actually send up a joint satellite through India's geosynchronous satellite launch vehicle in 2021. Now, this is very interesting, these kind of developments, because this particular mission will improve scientists' understanding of climate change and natural hazard and plans to have one of the best imaging of the earth's surface. So you can see that there is also the context of scientific cooperation.

Now, coming to space nuclear propulsion and technology - we know that China has already announced a goal to establish nuclear propulsion technology by 2040. So if you look at China Academy of Space Technology, their mapping is that the importance of a nuclear powered space shuttle is because it will enable you to go faster to Mars and also enable asteroid exploration. If you look at their white paper, they have been talking about it, and so already established a program. So within that context, given that India, like the United States, has significant expertise in small nuclear reactors, this is a great area to cooperate between the U.S. and India in the long term. The final area of cooperation I would argue is what John Mankins and Peter talked about, and that is orbital power stations. As remarked by President Trump, energy security is at the heart of the U.S.-India relationship. Already China has started a program to build solar power satellites, a technology that could alter the entire balance of global power. They established it this year in Chongqing, and it is funded up to the tune of \$30 million. So I would argue that one of the visionaries of India, who is the former President Abdul Kalam - actually was the first head of state to talk about space based solar power and he urged that India and the U.S. should actually not miss the opportunity to cooperate in this area of technology that's going to be so beneficial to their citizens.

So that's an area of cooperation that I can think of. Finally, the way forward - I would argue that to identify space as a key area of strategic cooperation based on a shared vision is extremely important. I haven't seen that vision yet. You see a lot of speeches. You see a lot of bureaucratic coming together. But I don't see that shared vision of what should be the focus of India-U.S. space cooperation today. Maybe Hudson can actually publish a report based on such a common vision. Second, utilize the framework that already exists like the next step in strategic partnership, the defense frameworks that are getting much closer to enable such cooperation. I would argue that it's really significant to establish a joint military threat perceptions, which does not exist. We talked about interoperability. You talk about it, but if you look at the existing structures - for instance the Pentagon or NASA - you do not find Indian military officers present there. So unless you have that kind of deep, detailed cooperation, it's not easy to come to a common threat perception. Build - and this is extremely important, since I worked at the Indian Institute of Defense Studies for 10 years - one of the beefs that was mentioned, and you should really know this, is that Indians thought that when the Americans approached the Indians, the relationship is very transactional.

So what do I have and what do you have to offer? I would argue that we should work towards building a transformation of relationship based on what is the goal that we - both countries want to go for. And I think that it's a difference. It's about building a relationship. There'll be

frustrations, but as you know, India's bureaucratic and organizational culture is very different from the United States. And this is a point I cannot harbor more, and that is just because both countries are democracies, their strategic organizational cultures are not similar. You have a presidential system. India has a parliamentary system. If you see the problems the former Prime Minister Manmohan Singh had to boss the Indian and the U.S. civil nuclear deal - it's amazing that the kind of opposition that was there from the bureaucracy. So I would argue - I would end by arguing that today's context is that you have a government in India under Prime Minister Modi, which has a unique advantage, and that is he has majority in the lower house of Parliament, which is very important for passing legislation, and is going to have majority in the upper house by next year depending on the states that are going to be represented. So in this context to forward a U.S.-India space relationship based on a common vision for space industrial development is not going to be difficult for him to get through in this legislature, unlike the U.S.-India nuclear deal. So the time is now. You cannot wait. Thank you.

: (APPLAUSE)

MCMASTER: Thank you, Dr. Goswami. And then Richard, if you wrap this up for us in terms of the opening comments, and then I have a few questions for all of you.

RICHARD LAWLESS: Thank you. Well, first of all, I'd like to begin by referencing Peter's - one of the diagrams that was projected today and. It showed the five or six necessary columns, or pillars, if you will, of the structure that we're going to have to have to develop and deploy and compete the way we need to compete in space. And with that regard, a lot of the discussion today has touched upon other players in the region, but certainly it's come down to, with due respect to India, the fact that we're really focused on the rise of China and China's policies. And in that context, what I'd like to do is look a little bit at what I think has to be done with regard to Japan. And my perspective is one of not only an intelligence collection perspective, but more importantly is a policy perspective, particularly in the last decade or so. And I think I will recall, for those of you in the audience that are under 30 or at 30, 35 years ago when I arrived at the U.S. Embassy in Tokyo and was the science and technology attache, I had two portfolios. One was nuclear energy, and the other was the Japanese space program. And at that time, we regarded Japan as a near-peer competitor.

And a lot of attention was focused on where was Japan going with its technology? Where was it going not in semiconductors but in every single field that was judged to be in competition with the United States? Well, quite obviously, times have changed. And so what I'd like to do is very briefly recap today where, again, from an American perspective, where I think Japan has been in national space policy, where it is now and where it must go to remain relevant, and relevance in the sense of not only the alliance between the U.S. and Japan but relevant in the context of just Japan's national interests. So with that, let me just remark that I think looking back over the 50-year history of, until very recently, Japan's space policy, there are a number of key points. I think cooperation, above all, among the various ministries, the silent ministries, Ministry of Education, METI, the private sector was exceptional in Japan. Second, goals were set, priorities were established, budget issues were resolved consistently. There were setbacks. The setbacks were absorbed and mastered by Japan. It was a record of success, albeit in a research-and-development-oriented program set, that is extremely respected.

And I think just yesterday, or at least within the last 24 hours - my Japanese colleagues may correct me here, but I believe a manifestation of that focus on quality, the Hayabusa2

spacecraft, lifted off an asteroid about 16 hours ago and has begun its return to the world, an 800 million kilometer journey that will end next November, December, I believe, and deposit a container onto a desert in Australia with samples from that asteroid. It's a major achievement. Of course, we'll see what happens in November. But this, to me, underlines the ability of Japan to drill down and focus and develop a spacecraft and a system that is successful.

There is incredible potential there. So where are we now, and where are we going? I think in Japan, we have reached a very important point of inflection. That point of inflection - it could be characterized by the fact that as we meet here today, there is a team assembled under the Cabinet Office that is writing the next space policy plan. This is a plan that is issued every five years. It essentially updates a 10-year to 20-year program for Japan's space development. And the evolution of that plan began with the last plan five years ago. But this plan is going to be very important. We'll probably see it in draft in about January, and it will be reviewed and approved by the Cabinet Office, heavy hand of the Prime Minister Abe, certainly by next February so that it can be an operation and begin establishing priorities and programs in JFY 2020, which means 1 April 2020. I think we need to be focused on that because we need to - we need to appreciate what's going into it. But that plan, as it's articulated and overviews the entire range of everything related to space policy development in Japan, is going to indicate the tempo, the degree of prioritization that Japan as a nation is assigning to space.

And one subset of that, of course, will be the degree to which the United States and Japan are cooperating and have found common areas to cooperate. I would suggest that the evolution of this plan as it has evolved in the last five years but especially in the future is going to have a much heavier influence, a much heavier focus on national interest and particularly in evolution related to national security interests being integrated into and perhaps even pacing the entire theme of that space plan. National security in the context of Japan itself, i.e., concern some of us have here on Chinese programs, but also in the context of U.S.-Japan cooperation in space, both in national security and in civil programs. The degree to which Japan will participate in our return to the moon - are they an also-ran or are they a lead partner for us going forward? These things must be determined and decided literally within the next three to four months.

So when we see what the product of that plan is, it'll be able to - we'll be able to discern much more clearly where Japan thinks it's going, wants to go and perhaps has to go. So my argument is that to remain relevant, to remain involved for Japan's national interests but also in the context of the alliance and in the context of the pillars that Peter previously identified, that plan is going to be very important. And make no mistake about it, the way that Japan has evolved and organized itself to create national space policy in the last five years in particular, the hand on this is Prime Minister Abe. And for that reason, you're going to have a very proactive Cabinet Office and a very proactive president - excuse me - Prime Minister Abe as that plan is reviewed, approved and then approved by the Cabinet itself in that February timeframe. So with those comments, I think I'll stop and turn it back over. Thank you, sir.

MCMMASTER: Thank you, Richard. Thank you so much. Thanks to all of you. Well, I'd like to pick up on a theme to cut across all of your presentations, which is that, really, economic security is national and international security for all of us. Dr. Goswami mentioned the need for commercial cooperation across our countries and how that relates to national security. And then, of course, we recognize the importance of the interconnected nature of space relevant to energy and environment and, of course, what we want to achieve from a defense perspective. We have the opportunity, I think, to cooperate across our nations and then also to foster

cooperation between the public and private sectors. China doesn't really have much of a challenge in doing that, however. Under their military-civilian fusion, they can really direct from the top the efforts of a so-called private sector and what they're doing within the government and in the People's Liberation Army.

So what I'd like to do is - are there ideas that you have about the relative strength and weaknesses of our two systems, a closed authoritarian system and our free and open systems? And how can we take advantage of what we see as our relative advantages to China? And how can we compensate maybe for disadvantages associated with the way China can integrate military and civilian? And so I'd like just open it up to see who wants to go first and ask each of you maybe to comment on that.

LAWLESS: This is Richard, quick comment to begin with. This puts me in mind of a trip that we made with, I believe, Secretary of Defense Rumsfeld in 2005. And one of the preconditions of us going to China at that time or accepting their invitation to come was we wanted access to the people who are developing the space program. At that point, they had orbited, I believe - had an initial orbiting of three cosmonauts or whatever. And one of the discussions we had - and it was over dinner - it was the Chinese were very proud of what they'd accomplished, obviously. But one of the issues that they put to us was the efficiency with which they were able to launch into space, the benefits they had received, not only one from the Soviet - excuse me - former Soviet Union technology, but - excuse me - the technology they'd managed to induce from other sources, namely the United States. And the fact that they calculated that probably something like they had spent somewhere between 20% to 25% percent of what we had spent to arrive at the same point in space.

So they felt that they had an inherent competitive advantage that would extend out for decades. I think what's turned all that on its head is the degree to which the private sector has come into the issue. It's created an entirely new dynamic and a new challenge for any space competitor, including China. And I don't know how they're going to possibly compete with the innovation, the resource base financially and just the innovation of our private sector. So I think this is a huge change for us that probably no one even saw five years ago. So I refer back to the original opening comments. But I think this is a new deal, a new dynamic. And I think we have to take maximum advantage of it.

MCMASTER: Thanks. Thank you. Dr. Goswami.

GOSWAMI: I think you make a very important point because one of my other research project is looking at China's long-term space ambitions. And so I agree with you that there are three things that gives advantage to China's long-term strategy. One is that they do not have the change of regimes like democracies. For instance, President Trump might not be there next year. He might be there. There's a focus on the moon today, there might not be a focus. For China, the strategy is determined by President Xi, was argued for the China Dream. And within it is the China space dream. And he's president for life. And the important point is that institutionally he has done something very clever. And that is in 2017, there was a revision of the Communist Party of China Constitution where China Dream is now inscribed into it. So there's continuity.

No. 2 is what you said, civil-military integration strategy. So last year, the politburo established a unit for the first time which is the civil-military integration unit. So President Xi has dictated his important speech, the Strategic Support Force and the China space agencies, including the

private sector, is that whatever innovation you do has to be within civilian-military integration strategy. Now, that's the advantage. The disadvantage, I would argue, is that what happens if there is an economic downturn? What happens if funding is not there? There as per open source, China's space funding today is about \$7 billion. The United States spends about \$19 billion just on NASA. India spends about 1.2 billion. But I argue that that should not make either the U.S. or its funding very confident because the turnover from Chinese investment is higher, given the cost is lower. For instance, a Chinese space scientist makes about \$2,000 a month. A NASA scientist makes about \$10,000 a month. But the return is not - could be similar. That's an important point. Now, in terms of what are the advantages democracies have or as you - the private sector was mentioned, I agree that the U.S. private sector is bursting out in innovation, reusability.

But I am concerned that within China too there is this huge growth of private space startups. For instance, last year, as you know, iSpace launched into orbit. I think OneSpace launched into orbit. iSpace actually has revealed the Hyperbola-2, which is a reusable rocket that they aim to launch by 2021. So they are kind of getting inspired by what happens with Elon Musk. When I was in Beijing interviewing space policymakers and their academia, their argument was that do not be surprised that our private space sector will catch up in the next five years.

If you look at the data of investment on their private sector, in just the last two years, they have got funding of up to \$2 billion, which was what the U.S. space sector succeeded in about five years. So the time scale is also very different. So those are some of the things we should be concerned about. And I think one of the ways we can undercut the Chinese confidence of long term-strategy is to establish institutional frameworks signed by one administration and followed on by the other. For instance, I give you the example of the Next Steps in Strategic Partnership. And it continues to today. So such mechanisms are important between democracies.

MCMMASTER: Great. I just want to make a quick point and continue with these comments. Safeguarding technologies is going to be immensely important. I wonder how much of the funding for the so-called Chinese private sector space endeavors came from U.S. venture capital firms, for example, or how much of the technology that they're applying is based on investments they've made in U.S. companies or have stolen or forced the transfer of that technology - our developed technologies - into companies. Thank you. Great comments.

KWAST: Well, I would argue that we do have an advantage in the fact that we have an open society and a free market, therefore diversity of ideas create more innovation. So that's all fine and good. And that is a great hope for our competitive advantage. China's competitive advantage has always been the focus of money and vision and effort towards one goal unwavering. And the two problems we - I have with this, though, what's going on right now is, one, China is doing exactly what you alluded to. They steal, duplicate and then dominate the market. OK. And if you want evidence, just look at 5G. 5G was China stealing every fucking thing from Lucent Technologies, Nortel and Motorola in the 2000s, bankrupting those three companies and building Huawei out of it. And they dominate 5G in a way nobody competes with right now. America has no answer.

So in one decade, they totally - they took a market where we said, hey, we're more creative, we're more innovative. And we are failing as a society at competing at 5G. So that's one change that we have to be mindful of is that they are doing the same thing with the space industry right now. If you're a small space company, you have some white-faced American like me coming in

and saying, hey, here's a billion dollars if I can be on your board. But if you follow that money, it's coming from China. The insidious way that they are influencing boards and investors in these companies to steal proprietary information and intellectual property is astounding. It's strategic. It's long-term. But they have their eye on stealing technology on the new space industry, duplicating it and then flooding the market. If you're a German company right now that wants to launch something into space, China will give you that launch for free if you buy their satellite. And they'll give you the satellite at 90% off, well under what any market competitor could provide. That's what they did with technology.

For example, 2006 - Vietnam looking for somebody to build their telecommunication infrastructure. So everybody puts out their bids. Lucent Technology put out their bid, Motorola, Nortel. Guess what Huawei's bid was? And back then they were still a small company. Their bid to build Vietnam's telecommunication market was zero. We'll do it for free. But then when the terms came due, China owns their entire communication markets and their data, which is really the threat here. So that's one point. The second point, though, is speed matters. Space and its network potential to deliver power with speed and range so dominantly, so fast that whoever gets there first will have a determinant advantage because from space with the right network of satellites, you will be able to see and kill anything that flies above the trees. You will be able to paralyze the energy market anywhere on the planet for any society on the planet using solar power and directed energy in a malicious way, not in a way that uplifts the human condition.

And third, you can prevent anybody else from getting up there to try to contest you at pennies on the dollar what it would cost us. So if we do not get to space first, this industrialization of space, to deliver energy, transportation, information and manufacturing before China, we will have to subjugate our will and our values to their will and their value because the first mover to a new marketplace, especially this dominant, defines the values. And that will be the values that bankrupted technology companies like Lucent and built Huawei and 5G. So speed is the essential variable here. When we saw Germany trying to build the nuclear bomb, it was intuitive to Americans that we had to get the bomb first or we would be speaking German. We knew it. So we didn't turn to the bureaucracy and say, hey, Army, build me a bomb, because we knew a bureaucracy, a big organization will always move too slow. Instead, President Roosevelt turned to Oppenheimer, the right man - or woman in this case, potentially - and said, here's some money; here's some freedom outside the bureaucracy; when?

Right now, our government is turning to our bureaucracy and saying, build me a space industrial base. And it will take 50 years because of the statutory and regulatory environments that build up around a certain way of doing things - like, we did in the '60s, going to the moon - traps you from doing it differently. This is why Elon Musk is so fed up with the bureaucracy. He has to spend \$13 million to the Air Force to launch out of Vandenberg for no reason. It's just in case something might go wrong. And that's nonrefundable. Thirteen million dollars, everything goes good, and he's got to pay that tax. Why? Because the government is so risk-averse, it won't let a free-market entrepreneur like Elon Musk move at the speed of relevance. So if we as nations rely on our bureaucracies and our governments, even though we have the perfect constellation of leaders in India and Japan and America that see this and want it, if we turn to our bureaucracies, we're not going to move fast. So that's why I think this president needs to charter a Manhattan-type project with a right leader. Find the right woman, like a Gwynne Shotwell at SpaceX, or the right man, like Elon Musk at SpaceX - just as two examples.

: (LAUGHTER)

KWAST: And let them move fast outside of the bureaucratic statutory, regulatory environment of risk aversion where no risk can be taken that has built up since the '60s till now. Or what will happen is, we will be more innovative, but China will steal it faster, duplicate it more quickly and flood the market with our inventions, and they will be the winners at the top of the heap in 10 years.

MCMASTER: Another example's advanced batteries, you know, and what - that Tesla opened the initial factory in China. China duplicated that technology, created their own companies, and then shut out all competitors and have cornered the market for themselves there. Thank you. Mr. Murano.

MURANO: Well, I'm not sure that it is a clear answer for your questions. But to think about the appropriate relationship between the commercial sector and the national security sector, or to - how do we deal with the combination of those kind of - between the national - the current trends, policy trends into (ph) national economic security is a part of the national securities? It is not a specific policy recommendation. But in general, the - traditionally, a few years ago, actually, the Trump - President Obama in 2015 at Sunnylands talked to the summit meeting with President Xi. The President Obama explained that the difference is the traditional security related - national security related to traditional espionage and - between the difference of the economic espionage to the U.S. - their public sectors. That - in that expressions is those activities, traditional espionage and cyber (unintelligible) against the private sector, is completely different. So they need to distinguish that those kinds of activities.

But when we focus - when we see the current, actual situation, what happened in these realms, that - or was it China? - they continue to do those kinds of activities between the - combined with the commercial sectors and the military applications and developing their capabilities. I think that this assumption is basically that the U.S. is technological leaders. So China has incentive to (unintelligible) to those kind of the information or sensitive data for this (ph) in several ways, including to the cyber side (ph). So I would like to credit (ph) my - what I say. It is a general expression. It is not a specific policy recommendation. But if China has some technological advantages, such as specific areas, for instance, the quantum technologies or other space-related technologies, U.S. and allied side, don't you have that same incentive to (unintelligible) those kind of activities against China's? This is just the intelligence operations, so it is not - I'm not sure that it is appropriate topic to talk about the unclassified environment. But just theoretically - and the hypothesis that we need to think about those kind of possibility - how do we deal with those kind of connection between those kind of those areas - commercial and specific focus in the strategic (ph) area?

MCMASTER: Great. Thank you. I'd like to shift from how do we maintain our competitive advantages, how do we compete effectively in China in terms of developing space capabilities, to, again, ensure our security and our freedom and our prosperity, and talk a little bit about deterrence. All of you touched on deterrence. And I think some of the themes we heard from each of your presentations was that deterrence can really be of two kinds - right? - deterrence by denial - convincing your adversary that your adversary cannot accomplish his objectives through the use of force in space in this case - or deterrence by the threat of punitive action later.

Mr. Murano mentioned the degree to which adversaries could use ambiguity to their advantage the way that China uses maritime militias, for example, in the Senkakus. And that's a particular

challenge in space. And then Dr. Goswami mentioned the importance of awareness, resiliency. And I think our discussion has also touched on alliance networks and how, if we have alliances and partners working together, that might inherently increase deterrence because you're bringing other parties into a potential conflict, and multiple parties can maybe impose more costs on an adversary. But as we look at evolving our understanding of how to deter conflict in space, I just wonder what thoughts you have on how well we're thinking about that today, and if there are gaps in our thinking and what you might recommend in terms of thinking differently about how to deter conflict in space. I'll open up to - who wants to - anyone who wants to start.

KWAST: Sure. I'll start this one, and I'll keep it short because deterrence is nothing new, you know? The caveman that had a bigger club deterred the caveman that had a smaller club, and so on down the line throughout history. Deterrence is nothing more than being able to strike fear in the heart of somebody who would try to hurt you or steal away your - the things you have built for your family, for your tribe or to force you to do their will - in other words, have you believe in their values. So deterrence is nothing more than striking fear in the heart of somebody who would try to usurp your liberty. And that same ability to strike fear in the heart of your enemy is to strike reassurance in the heart of your friends, the people that believe in the same values.

And for America, that's the respect for every human being, that every human being is equally loved by their mothers and fathers, their brothers and sisters, and they have an equal right to believe what they want to believe and live as they want to live, as long as they do not impose their will on somebody else corrosively. So I set it up that way because space is going to be the geography from which you can drive great fear into the hearts of anybody on planet earth at very cheap price points. It goes back to the fact that all national security is economic. And if there is a blanket of capability over your head no matter where you're at on planet earth and that is owned by China - and they can do anything from that. They can see you, and they can touch you with directed energy, with kinetic energy, if - with anything they want. When they dominate the electromagnetic spectrum and they can dominate information, they can see and they can manipulate your perception of truth, your perception of reality if they own your data and they own your device. So imagine a blanket over your head 60 miles up there in space owned by China. They can see and manipulate everything you see, think, perceive and stop you anytime they want. They can paralyze you. They can paralyze our military.

Talk about the deterrence there. We as a world community, especially those nations that believe in the same dignity of every human being, have to get together and rethink deterrence in the 21st century because the first civilization that gets to space will redefine deterrence in a way that will slowly start making ICBMs essentially antiques of the past because anything that lifts off the ground can be shot down by China with the network from space, as an example. So we better get busy here because we are still refining a deterrence theory and model based on a World War II model that is not mindful of the information age, the interconnectivity of our markets and our peoples and our cultures, and the power of space to transform the price point by which you can deliver power and take away the goodness of any other civilization in their energy markets, electricity and information.

MCMMASTER: Thank you. Yes, please.

GOSWAMI: So I think your question - and my mind was racing as to what to put forward. But I don't know how many of you have read the book "The China Dream" by Liu Mingfu, colonel - retired now. So one thing that he pointed out, which is very interesting based on your question

of deterrence, is that he argued that for China, war is the breakdown of a civilization and grand strategy. So if you can win influence and build alliances by using your economic power without having to use violence, you are a superior civilization. The moment you descend to war, you're no more that. So I make that point with seriousness because if you look at what China's doing in space, there are three things that it's hoping to achieve by 2049. And this has been articulated and pointed out by President Xi in his speech to the PLA Strategic Support Force when it was constituted in 2015. And that is one, China has to be in the lead position by 2045 to be able to constitute the norms, constitute norms and standards of behavior, insist lunar up to the moon and beyond. So it's fascinating that they're already visualizing a world which is not led by a Western alliance, given the fact that they see that as a disadvantage in their perspective. The second important thing is that he argued that to achieve that future is very important to achieve military capability in space and which is counter space weapons. That's why they actually demonstrated their 2007 ASAT capability. It's not because they've been wanting to use it but actually to ensure that the United States military, which in their perspective from a paper that came out from the Academy of Military Sciences in 2005, is very vulnerable because of its dependence in space for command and control, for reconnaissance, for everything almost.

And so if you can make that particular domain vulnerable, it deters the United States by extension. And it's fascinating that they actually argued that out and then went about doing it. Now, in terms of how can we build deterrence based on that scenario, I think one way is to understand what China's doing in terms of building countervailing alliances itself. For instance, as you know, space is a very important component of the Belt and Road Initiative. It's called the Belt and Road Information Corridor. And mind you, there are 17 nations that have joined the BRI. And some of the countries that have joined are actually Western allies. New Zealand, which is join the Asian Infrastructure Investment Bank, is a Five Eyes member. And so economy - and if you look at the New Zealand discourse, which I've been following the argument is that they'll be able to handle China's influence so they can join. But you can see the discrepancy there. What is fascinating from the perspective of space is that this year, China does something, which is extraordinary. It's signed an MOU with the country that has the most forward-looking legislation with regard to space resources, Luxembourg. So China's just signed a MOU with Luxembourg. And guess what Luxembourg got in return? A 500 million BRI bond that was invested in their stock exchange.

So it's fascinating how the game is. So based on that, I think for deterrence purposes, it is very important that countries, like India, the United States, Japan, come together. Now, if you look at - and I'll end here - is that when you talk from the deterrence perspective, even in terms of counter weapons perspective. For instance, we all know that India for the first time tested an ASAT weapon in March of this year, in LEO. And so if you look at the Indian argument and justification for that, it was not just counter weapons in space, it was controversial. So what was fascinating from that perspective is that the Indian argument was that China's space capabilities threatening India's critical infrastructure. By this, I mean telecommunication, ATM facilities, you know, television, medicine, everything which is dependent on state, weather forecasting. So what India wanted to demonstrate to China as a way of - it didn't mention China, the country but it mentioned the reason why it's doing this, is that it wants to make sure that an advisory nation does not counter its critical infrastructure. So ASAT was seen as demonstrating that. And that's why I say India has changed.

And I'll end here, is that had it been Manmohan Singh or the Congress Party, which is very careful of India's reputation internationally, an ASAT that weapon would have never been tested. But because if you see how the Narendra Modi government, as I mentioned has changed, it's about showcasing India's power, not shy of international condemnation. For instance, India got flak for creating space debris. But Modi's argument was that so what, it makes us more secure as Indian citizens. Who else is going to look after us? So - but then in that context, he also - when he came to the U.S. - and he has developed very deep relationship with Shinzo Abe of Japan - is that we need countries like India, U.S., Vietnam, Japan - Philippine needs to come together given this great rise of China and its capability to use its influence without using military power. And so I think that's something that needs to be understood.

MCMMASTER: Thank you. Thank you. Richard.

LAWLESS: Yes, briefly. If I could, the question you posed was deterrence. And I think deterrence is about imposing costs. Deterrence is making the person that is making the entity, that is thinking of creating a hostile act make a decision whether or not that is going - they're really going to have to pay the cost of that. So there's two dynamics here. One is the fact that space just by definition is a huge gray area. It's a playground for very ambiguous, hostile activities against other parties. We have seen in the past that, one country in particular, China defines hostile acts as anything short of war. And there is a whole range, the escalatory ladder is essentially endless and the options are endless, particularly for the ability to inflict pain and damage on another party.

So I think if we don't begin defining what it is we consider to be acts of war or hostile acts, anything can happen. So deterrence is all about dissuading the other party from doing something that you have already called them out on and made it very clear that you're not going to tolerate. The second component of this, I think, is the ability and the cost of action category. If you have redundancy in a given system and here we come into the ability, to have multilateral cooperation among like minded nations, if you have redundancy, whether it's U.S. Japan, whether it's Japan, India whatever else it is, the price that that country is going to pay for a hostile act is arguably much greater because you're not going to end up with the desired end, with that hostile act that you had intended. So this is a whole policy area. I don't think that's been explored. But given what's going on in space, everything that's going to be up there in space and most importantly the capabilities that we're talking about, the options here for hostile activity are endless. And we just have to think what is the deterrence structure that we're going to create among ourselves and then hopefully enforce.

MCMMASTER: And, of course, we've been focusing on China in this discussion. But, of course, there are other actors who could be hostile to us as well.

LAWLESS: Absolutely.

MCMMASTER: Rogue actors and so forth as well as other, there's other hostile - as well as hostile states. Mr. Murano.

MURANO: Well, also as Mr. Lawless pointed, as pointed out that there are some, several fundamentals for what we are considering about the deterrence in the space domain. The first is that the - the deterrence by punishment is relatively difficult to the - in the space domain. The second is the ability to seek to some specific posture, which mean that physically dispersed or

distributed but operationally integrated. From that context, I - I've already pointed out that the importance of the whole state payload program between each allies. So in addition, I - from Japan's perspectives, I have some several policy recommendation, for instance, to strengthening our resilience and reducing the incentive to potential adversaries to strengthen our launch sites or launch capabilities. If Japan's satellites are a part of launch vehicle to the previously restored in the U.S. at some contingencies or crisis happens, it could be launched from the U.S. territory, such as the Cape Canaveral or Vandenberg. Those capabilities is not a cheap, it's just the one of option but it could be some redundant or could strengthen our resiliency and to show the willingness the cooperation between a tie, strings in type between the U.S. and Japan. That is one of the example to upgrade into our cooperation.

MCMMASTER: Great. Thank you. Well, we have about six minutes left, I think, before - or we're going to take a break, I think, after this - right? - before the presentation, short break. So what I'd like to do, rather than to continue to ask questions, is ask each of you maybe to summarize what you'd like to leave this group with or to say as we conclude the panel. I know all of us have benefited tremendously already from your expertise and the comments you've made. But I thought maybe we'll go in the initial order and start with General Kwast and then ask you to just quickly maybe summarize - really, we'd like to summarize or you're - really, share with us your final thoughts.

KWAST: Well, thank you. So I think that we, at least in America, have been stuck in a paradigm that was created in World War II to create an international security system that was stable and allowed free markets and prosperity to grow globally. That - and that same statutory and regulatory environment, at least within our government, is preventing us from doing the same thing with space that we are, we are moving. We are looking, we are considering, but we're moving too slow. And we're moving too slow, not because we couldn't move faster, we're moving too slow in relation to our competition. And our competition is China and Russia to some extent or any country. You know, it doesn't matter how big the country is. When Spain, a small country, or Portugal, small country, figured out deep sea navigation and sail and wooden ships, they dominated the global economy - and so did England, a very small country. So it's not about the size. It's about the strategy.

And here we are moving into a new realm that will be more powerful than the invention of the airplane, the ship and the nuclear weapon combined. And we are tinkering around with it and just moving at a pace of the market. And China will beat us to that because China is building a navy in space with the equivalent of battleships and aircraft carriers that can shoot to kill and can maneuver faster and do it all cheaper because of the economics of the network of space. And we are building buoys and lighthouses that can see what's going on but will not be able to compete with the firepower, the maneuver and the ubiquitous communication and economic profit that China will gain, trillion-dollar markets globally in information, in energy, manufacturing and transportation. They will profit from that. They will use that to build their dominance economically. And they will own this geography. We have to move fast. And right now, we are not moving fast enough. Thank you.

MCMMASTER: Thank you. Thank you very much. Dr. Goswami. Thank you.

GOSWAMI: I think my three points based on summarizing is that, one, as I mentioned earlier when I started is that the context of space and how we view it has changed. It's no more about humanity going there and coming back. It's become more about establishing sustainable

presence. And so that's something that has to be considered and understood. And based on that, I think what an alliance structure could actually do is to establish a common industrial and development concept of where space needs to go. I think the final point is that if you look at how - and this is something important because, first, division, second, the understanding that space is no more about showing off your technology during the Cold War and coming back, but about being present permanently and using space for your economic development - as China articulates, national rejuvenation and revival. And so - and the final point I would make is that - and this is something that I see as an example in the South China Sea - is that for China's strategic culture, if you establish presence somewhere first, you'll have first presence entitlement to that particular territory.

For instance, in - for the disputed islands in the South China Sea, the Chinese argument is that because our fishermen and our people historically have been there first, it belongs to us. Tibet - you know, the Dalai Lama is an exile in India - Tibet, the same discourse. So what; they were having suzerainty, but we had first presence because of the resources there, too. And I think that's something very important. And then when we talk about deterrence, I mean, if you look at China's ability to build artificial islands in the South China Sea and have no cost for it till today, I think that's something that we'll have to consider once China establishes a presence on the lunar South Pole, which they aim to do by 2036.

MCMASTER: Thank you very much. Right - Mr. Murano.

MURANO: Oh, well.

MCMASTER: Richard, I'll go to you to clean up again. Thanks.

MURANO: Yes. So I already there pointed out the importance of the - what is the - our priorities for our space security policies. But in this, for maybe some number of the peoples or some number of the persons actually involved to the some actual policy planning or strategy planning process, I think that today, we are already - we are showing to the (unintelligible), what is the challenges, what is the important point to, how do we deal with those kind of challenges and coordinate with each other? I think that capping (ph) some - the challenges and some specific policy is relatively easy. The difficulty is the prioritizations. Prioritization is the - one of the core element of the strategic planning and creating the strategy. So actually, that, General McMaster, are well known (ph) about those kind of difficulties - how do we coordinate with the - using limited resources and applying (ph) to prioritize, how do we cut out the more - less-prioritized areas. So in the sense that we needed to - we means the U.S. and its allies and partners - should start to the - to (unintelligible) to the space domains, how do we deal with - how do we prioritize? What kind of the area is more important for each countries? How do we adjusting (ph) to our policy priorities using their limited resources? I think that is one more important discussion - for discussing further about some opportunities.

MCMASTER: Thank you. Richard.

LAWLESS: Yeah. Very briefly, I think the net I take away from this today is that given the magnitude of the opportunities that are out there, and given the range of challenges and obstacles and hurdles we face, this is, again, something the United States, even if we take the handcuffs off the private sector, can't do alone. We just can't. There's too much involved out there, and the journey is going to be very long, and it's going to be very difficult if we're going to dominate or at least co-dominate - hopefully not - space. So to do that, I think each of the world

leaders that are involved have to ask one another - they have to decide, first of all, what they want out of this, but then they have to ask their counterpart, their peer, what are you going to do about this?

And we have to ask - we don't have to wait and be very tentative about this. If we see something that an India or a Japan or another country can contribute, we have to say to them, we need this and we need it now; we don't need it eight years from now. And if they see something that they believe they need - redundancy, a hosted payload, whatever it is - they have to be up front about it, ask about it and press us. It's sort of like, no more Mr. Nice Guy among the guys in the band. Everybody has to say what they need, what they want because bottom line, I don't think we can do it alone.

MCMASTER: Thank you. Well, just in summary, what I would like to do is, first of all, thank all of you for tremendous presentations and insights. And I'll just say that during my time here in Washington, I was very proud of one of our accomplishments, which was the development of the space strategy - a classified as well as a public-facing space strategy that I think integrated, to an unprecedented degree, our efforts in defense and across the commercial sector. And I think what we're seeing is a tremendous momentum based on, really, the focus of our mind on our competition, a wake-up maybe to the competition and how important it is going to be for us to compete effectively, to maintain, really, our security, our freedom and our prosperity in space.

And I can't thank all of you enough because I think we have an opportunity now to take the work that all of us have done - each of our nations have done - and in the context of the free and open Indo-Pacific, extend our cooperation in a even more full way. It's already happening - but even a more full way into space. And thank you for adding your thoughts, your insights. I think I'll just end with Mr. Murano's point on prioritization and then Mr. Lawless' point on, it's going to take all of us to do this. So I just encourage all of us in the audience here today to really have a hand in really focusing all our attention on our goal and then looking for opportunities that we can exploit, identifying better, what are the obstacles, what are the dangers? How do we overcome those obstacles and protect against those dangers? But please join me in a round of applause for our extraordinary panelists. Thank you so much.

: (APPLAUSE)

PATRICK CRONIN: Right. If we could take our seats please, we'd like to continue with the final portion of this program. Hello, everyone. I'm Patrick Cronin. I'm the Asia-Pacific security chair here at Hudson Institute, and it was a real delight working with our Japan Chair, H.R. McMaster. Ben Gillman, who is the assistant to the Japan chair with Riho Aizawa, with Masashi Murano and others here at Hudson to put on today's program. We've had just a fabulous list of speakers today, and really now they've shown us just how complex, how compressed, how competitive everything is in space. And how you develop space policy at this time is one of the most urgent matters for the U.S. government and for U.S. allies like Japan and partners like India. John Mankins started us off so well with the big question and really the thesis that everything we know in space is changing. He knows a lot more about space than I do. So when he says that, that's a profound statement.

And then we heard essentially a testament to that from each one of the following speakers, just how much is changing - Peter Garrettson, I think, calling very clearly for really new foundations, the quest for setting values and norms. General Kwast essentially repeated this - the first mover to space won't just be determining transportation, energy, manufacturing and information, but

really dominates and becomes preeminent economically and, because of that, militarily. We heard the importance from Dr. Goswami of - Namrata Goswami about the possibility of a vision with India, that this is something - a moment to be seized, the next stage of cooperation between the United States and India, just as we heard from Richard Lawless about the fact that Japan's new space plan is now a pivotal period for determining what Japan will do in space and therefore what the United States and Japan can do in national security and in space.

And so all of these speakers, and Murano-san here from Hudson talking about how profoundly deterrence and deterrence concepts are going to be changing and affected by thinking about space. These are issues for our allies, but how you work with the private sector and the multitude of actors working in the private sector, how we work with our allies, how we cooperate where possible with competitors and rivals, but also how we compete with them are critical questions of policy.

So with that introduction, it is a great pleasure to introduce Dr. Mir Sadat, who is first and foremost a naval officer. We've talked a lot about how freedom of the seas and how much free seas is something like the challenge in space - will it remain free or closed? And so very important to have that background. His tour's in Afghanistan. I mean, he is - been in conflict zones in ways that space is not yet becoming that quite a conflict zone but certainly more contested in clashing values. The building foundations thinking, deterrence - these are issues he's thought of from the ground up. He's been a professor and an expert on Afghanistan, Pakistan, Iran. And since the beginning of this year, he has been the director of defense policy and strategy at the National Security Council. General McMaster mentioned one of the things he was most proud of at the NSC was getting that Space Strategy codified by the Trump administration. And you are the man right now who is helping to shepherd that and herd all the cats here on space policy and strategy. So I hope I haven't built that up too much for you, Mira, but, you know, it is a great pleasure. Please welcome Dr. Amir Sadat.

: (APPLAUSE)

MIR SADAT: Thank you. Good morning or good afternoon. So the most controversial piece about this is not what you think it is. It's going to be Captain Kirk or Colonel Kirk, all right? Will space officers, like Army officers, Army generals and Air Force journals be issued guns in space? How will the uniform look like? Will it be a jumpsuit? What color? And what about the moniker of the service? And we know a couple of good distinguished scholars among us who have talked about that and are leading the debate, a very fruitful debate, a useful debate. So let me extend a thank-you for the invitation and for the opportunity to speak with you. Hopefully I will not rehash things you've already discussed. I've had the privilege of studying most of the people who've presented today, their works, General McMaster's works at the NSC.

This perspective that I'm going to give to you is going to be primarily a security focused lens, a lens that has informed the president of the United States on space for over 60 - for over six decades even before the October 1957 Sputnik shock - the world's first artificial satellite launched by the Soviet Union. Back then, the Soviet Union was a major driver of post-World War II alignment. The United States and its allies faced a single conventional enemy in the Cold War, after which the United States led the effort to globalize the international order. The United - America did not want a system disrupted by mainly the Soviet Union, the Eastern Bloc and China. Their thinking was if they're part of the system, they will not disrupt the so-called rules-based order. Then came the attacks of September 11, 2001. Many of us in uniform and civilians

have had firsthand encounters either here or in overseas contingency operations dealing with them. And that shifted the entire momentum of the 1990s push. It brought a new era of global security posture for the international community and also for global governance. This period of uncertainty that was caused was not caused by the hands of a state actor like Russia or China, but it was a nefarious non-state actor with global potential, al-Qaida.

Very soon, we also saw the effects of the '90s push for the interconnected global market coming to an end with the financial crisis of 2007, a time when our 401(k)s dwindled, our home prices plummeted and unemployment surged to almost 10%. Since then, the prospect of bringing Russia or China into the so-called world order in which we were the most powerful player has diminished. Global outsourcing and liberalization efforts backfired and resulted in unintended consequences. Globalization led to a loss of expertise and production of U.S. industrial goods, fueled the growth of counterfeiting of parts and components in many industries and even resulted in the compromise of sophisticated technologies and sensitive information - not just for the United States but for many of our allies. In the defense industry, counterfeit parts affects the safety operational readiness and critical nature of the U.S., especially as we continue to track and target violent jihadist terrorists. As we now focus more on existential threats, our foreign policy and export control communities today have heightened concerns about the U.S. supply chain integrity - the theft of American innovation and want to mitigate vulnerabilities in our technology service and critical infrastructures. The United States still advocates for a global marketplace that embraces fair and open competition, free trade and respects intellectual property rights. Our nation's free and open trade needs protection from threats undermining our strategic leadership role in the global marketplace and our dominance across the shared domains.

As it does during the last few years, these threats are addressed within the context of great power competition and national security strategy that my organization published in 2017 under General McMaster's leadership. When discussing great power competition, of course, we tend to focus on China and the disputes of the Indo-Pacific, such as the South China Sea. We also think about Russia, Europe, Eurasia and the fragmented fault lines across sections of the Middle East, Africa and South Asia, where great powers converge. But nowhere is great power competition as ambiguous and nebulous than in space. Great power competition in space is in some ways analogous to the great game of the 19th and 20th centuries between Great Britain and Russia, which competed over access and - access to resources and geostrategic positioning in Central and South Asia. Today, there's a similar great game brewing between China and other spacefaring nations led by the United States across - over access to potential cislunar resources and overall space dominance. This has major implications for our modern way of living, our national economic well-being, and the security of our nation and our allies.

Currently, our space systems provide strategic and tactical warning of impending threats, monitor to agricultural and industrial base, secure, timely financial transactions, give trustworthy positioning, navigation timing and weather forecasts and, of course, assure communications across all lines of efforts. Just imagine, in comparison to the 9/11 attacks or the market crash of 2007, what the magnitude of degradation, disruption, destruction of our overhead space-derived capabilities will have on our societies. Not surprisingly, the 2017 national security strategy says the United States considers unfettered access to and freedom to operate in space to be a vital interest. I interpret vital interest something for which you're going to fight for. The national security strategy further elaborates that any harmful interference with or attack upon critical

components of our space architecture that directly affects vital U.S. interests will be met with a deliberate response at any time, any place, any manner and in a domain of our choosing, whether land air, sea, cyber or space. The national security strategy calls for advancing space as a priority. With respect to space now, what does this mean for us on the National Security Council besides having to run last minute to the building here for being late in another meeting? So we in the National Security defense directorate and our peers, the newly reestablished National Space Council, hold coordination meetings and working groups to address current and future opportunities, as well as challenges to our national security, commercial and civil space lines of effort - three different effort lines.

In fact, a surgical rewrite of the 2010 National Space Policy has started through issuance of various SPDs, EOs and NSPMs - basically, presidential memorandum. Our space policy will not only catch us up to the realities of today. So in 2010, when the president last signed it, it was probably written sometime in 2008 and in coordination for about a year, right

So it's almost a decade-plus old. So this national security - National Space Policy that we will (unintelligible) will not only catch us up to the realities of today (ph), but to the imaginative realm of future - tomorrow. Two months ago, U.S. Space Command was resurrected as a combatant command. We now look to the Hill to authorize the creation and funding of a new military branch, the United States Space Force. Space Command and Space Force are two different things that are sometimes confused, but they are complementary and dependent initiatives. Space Command will focus on joint war-fighting operations in space, manned by assigned Navy, Army, Air Force, Marine, military and civilian personnel who will support the command with their terrestrial-focused capabilities. Therefore, without a unique space force focused primarily on space, there will be no one solely dedicated, responsible or accountable to recruit, train, develop doctrine or equip the nation's space warriors. The United States cannot wait for another 9/11 in space, and we definitely cannot wait for perhaps a full-on Pearl Harbor-style attack on American satellite constellations to convince our U.S. decision-makers that it is time to create a space force. That would be akin to waiting on World War II to convince leaders to build the U.S. Air Force, which was finally built in 1947.

Due to the Air Force's amazing success, no ground troops have been killed by enemy-manned aircraft attacks since the end of the Korean War in 1953. How many troops were lost in World War II because we focused on familiar land and sea domains and turned a blind eye to emerging threats and opportunities in space? Consider that it may have been better to have built the Air Force in 1927 or any other time prior to the beginning of World War II rather than 1947. How many troops, civilians and satellite assets will we lose if we in 2019 delay the creation of a service to think about space warfare until the next war? And therefore, the United States cannot afford to fight a World War II-style conflict knowing that the operational battle space has exponentially expanded to include space. Although our space systems support the terrestrial forces, actions in space also affect our future conflicts here on earth. Any opponent who controls space may hold our population centers and our deployed forces - Navy guy - at risk without ever taking a terrestrial action. In this new era of multidomain warfare, our competitive margin of dominance is shrinking, primarily because the bipolar environment upon which America's space enterprise was constructed - the Cold War strategic environment - no longer exists. And so the United States - and also the United States prefers space to remain free from conflict, but China and Russia have actively exhibited warfare capabilities in space.

The United States is merely rebuilding a set of capabilities that have atrophied over decades to strategically compete in the face of an - even more capable rivals.

For many years, states from Russia and China to North Korea and Iran have pursued weapons to jam, blind, disable our navigation and communication satellites via electronic attacks from the ground. China and Russia have both conducted highly sophisticated on-orbit activities that could enable them to maneuver their satellites into close proximity with ours, posing unprecedented new dangers to our space systems. In particular, these experiments entail orbital maneuvering of military spacecraft. Moreover, Chinese academics and foreign policy leaders have written an avalanche of papers going back to 2005, advocating for the placement of laser weapons in space. China and also Russia have developed, tested and fielded counter-space capabilities to deny the U.S., its allies and partners and the commercial sector the use of space-based systems during crisis and conflict. China will ultimately not only deploy laser weapons on the ground, but perhaps even in space. Russia has mirrored China's development of counter-space capabilities. I encourage you to consult a recently released DIA and NASIC space threat reports for more details on this.

Particularly to the Indo-Pacific, the multiple threats include Chinese space activities and their behavior in the South China Sea to an increased air and naval activity in and around Japan by Russia and China. North Korea's continued ballistic missile threat and the growing anti-satellite ASAT capabilities of other states. By no means will India be the last nation to test ASAT. Expect more in the future. This will likely increase the chance of mishap in space. Therefore, precautionary requirements are perhaps needed. To put that in perspective, in 2007, when China conducted a kinetic ASAT test on its dead weather satellite, it created a debris field of almost 3,400 pieces, more than half of which are expected to be still in orbit by 2027. So you see the assumption that space would have remained a sanctuary or uncontested is no longer valid. The United States and its allies do not necessarily have dominance over space. No amount of wishful thinking can make our adversaries, their capabilities, the evolving space environment or our shortcomings go away. Of course, military strength in any domain should be avoided through soft power such as diplomacy and the deterrence of hard power by making any attacks undesirable and costly.

Nonetheless, history tends to be cyclical; maybe space too - right? - if you keep on going. We can either prepare and posture or do the right thing, or we can be unprepared when faced by conflict. So with each passing day, great power competition across all domains becomes even more the norm. And potential adversaries become more competent and capable in space. Like any land or maritime conflict, America will never go to war without its allies. And this is especially true in space. In space, we may partner with, protect and inform our allies, be they governments or organizations. In fact, in the civilian commercial sector, we can think about satellites as being hostile, friendly or noncombatants in a potential battle space. Recently, my colleague Dr. Scott Pace, speaking at the 70th International Astronautical Congress, explained that the United States promotes common values shared by international partners - protect U.S. national interests and enable commercial sector leadership and growth in space. If humanity is to have a future in space, it should be a future in which space is home of peoples and nations that share, at least, and respect similar values of rule of law, democracy, economic freedom and human rights. Those common values have evolved across the air, land and sea domains in which we have operated with partners, forging unique capabilities, authorities and talents to bear down on shared common threats.

These values will inform the shared acceptable norms and behavior, ensuring freedom of access and use of space, which China and Russia are challenging across all shared domains today. And the nations of the Indo-Pacific region are neither exempt or isolated from this trend. While space is not subject to claims of sovereignty or direct control like the other physical domains, we need to ensure that the rules governing space are created by responsible space-faring nations who share our values. That is why our partnerships are going to be a key element of our success in this era of great power competition. For example, Space Command has over a hundred space situational awareness agreements. About 80 are with commercial companies. There are about 22 with nations around the world. In addition, we hold the Schriever Wargames, which studies how future conflict extends into space. Schriever Wargames exhibits the growing security corporations with the Five Eye partners - France and Germany and Japan. The need to share space intelligence, operations and technology will drive a review of space classifications that may likely increase space technology transfers, coalition exercises and partnerships in space.

There may be also potential opportunities in future years, especially for partnerships with Indo-Pacific regional players, on furthering space situational and maritime domain awareness using both space and terrestrially based assets. Opportunities also exist for international cooperations in space to bring mitigation, operating standards and effective lines of communications for orbital operations. These are great potential opportunities for Indo-Pacific nations such as Japan, Australia and India. And, of course, these partnerships are even more likely to happen in our civil space sector, as we look to send humans to deep space again - first to the moon and then on to Mars.

In fact, NASA is seeking partnerships with U.S. industry and international partners for the nascent Artemis lunar project. The moon has never been more within reach. I come from Southern California, as the general knows - three-day commute by car. It's a three-day commute to the moon from earth, so probably safer (laughter). After we land the first American woman and next American man near the south pole of the moon, which is 25% larger than the surface of the African continent, the plan is to create a sustainable lunar presence, to include the crew rendezvous point, science laboratory and propellant people (ph) at NASA Gateway in high lunar orbit and lunar surface operations that will inform humanity's destination to Mars. For this journey, there may be potential to make use of lunar minerals, metals and water resources. Without going into the technical or project specifics, this effort represents tremendous partnerships and opportunities for the Indo-Pacific spacefaring nations. To put this in perspective, economic impact estimates project that the U.S. space economy will grow between three- to eightfold over the next few decades in a approximately \$2.7 trillion space economy. American efforts in the commercialization of space are vital.

Let me explain to you what vital means - to our national interest because it reflects U.S. security investments in space. The future space operating environment is expected to be exponentially more voluminous and diverse. Emerging commercial ventures such as satellite servicing, debris removal and space manufacturing, tourism and cutting-edge technologies enabling smallsat and expansive satellite constellations are outpacing efforts to develop and implement government policies and processes to address these new activities. As new state - as new space actors and capabilities emerge, there'll be a need for more work on the implementation of principles guided by the Outer Space Treaty and related guidelines in order to avoid risking the stability and security of the outer space environment. On the other hand, the Chinese are actively working to

undermine any such efforts and have laid out a 30-year cislunar economic plan that will supposedly generate \$10 trillion by 2050 - three times the size of our estimated economy. If true, we must create a collaborative, conscientious setting in which our nations - which other nations choose to align themselves and their space activities with us, the United States, as opposed to those without any regard to space - the space operating environment. We need to think about space before we lose space. Right now we have the competitive advantage, but that advantage is rapidly eroding as peer and near-peer competitors ascend to space without any regard for space, as they are aided by advanced technologies which they might have stolen from others.

A recent Air Force futures report claimed that by 2060 space will be a significant engine of national, political, economic and military power and that the United States must commit to having a military force structure that can defend this international space order and defend American space interests, to include American space settlements and commerce. It will be the U.S. Space Force which will provide the necessary expertise for the U.S. Space Command to ensure unfettered access to and the freedom to operate within space. U.S. Space Command will provide vital effects and capabilities to joint and coalition partners during peacetime and across the spectrum of conflict, just as the U.S. Navy - which is my Navy, right? - just as the U.S. Navy stands to watch to ensure that we freely navigate the world's seas, such as those in the Indo-Pacific.

America must now ensure the freedom to navigate through space. If we continue to delay the creation of a U.S. Space Force until it is too late, we jeopardize the comforts of our American life, the lifeline of our economy, the enabling of our national security assets and the execution of priorities, especially in the Indo-Pacific and elsewhere around the world. Let me conclude - I see no sleeping heads here, which is good - let me conclude by drawing your attention to the start of my talk. While the Cold War is over, great power competition is back, and the great game ensues for cislunar leadership. Spacefaring nations need to decide whether they want to be part of the same routine, boring thing in space, stranded on a Chinese space station. Or do they want to do something - I'm talking as if I'm talking to a kid here, right? I'm, like - I'm all energized. Or do they want to do something that's spectacular, amazing, exciting and explore the moon and Mars with us, United States? It would be nice to see one of our Indo-Pacific partners be the first Asian (ph) to walk on the moon. America has always been ready for a challenge, a good challenge, a tough challenge. We are natural explorers and innovators. We create; we don't steal. We have an American entrepreneurial spirit, scientific curiosity, a strong sense of patriotism and a belief and teamwork, which are the right ingredients for success in space. But to achieve this, the government's vision, our government's vision, our scientific community's rigor, inspiring entrepreneurs with cool rockets and our allies' comparative advantages must all synchronize. To win the great game in space, we must ensure our economy, innovative technology and national security are acquiring. Thank you.

CRONIN: Sorry, we'll take advantage. Since he's willing to take a couple of questions, sir, we're - you had your hand up first.

AUDIENCE MEMBER: Hello. Thank you. I was just wondering, like, you mentioned about the partnership in the Indo-Pacific region. And I was wondering, like, how does the decision of GSOMIA with South Korea and Japan implies on space cooperation in information sharing basis, not only on North Korean threat but also on the space initiative that U.S. is leading?

CRONIN: All right. We're talking about the intelligence-sharing agreement between Korea and Japan and the fact that...

MCMMASTER: I'm not speaking for the government, obviously. But it's bad, right? It's bad. And I think that, you know, as we look at the competition from China, really, our free and open societies, our countries, have to be close together, right? And when I had the privilege of working with our counterparts in Japan and in South Korea, we came to the agreement that every time that China was - would be aggressive - but, really, in connection with North Korea, as you're mentioning, every North Korean provocation ought to result in us being seen as even closer together - working even closer together because North Korea and China, from an adversarial perspective, will use divisions against us, right? So I think it's really time for us to remember the past - right? - and honor the memory of the past - difficult memories. But, really, we ought to base decisions today on the present and the future, right? And so I think it's a huge disadvantage to all of us if this agreement, you know, is approached.

CRONIN: And we've got very little time here. But I - this hand over here. So...

AUDIENCE MEMBER: You mentioned that one of the true marks of an advanced civilization is being able to avoid war at all costs. In terms of the U.S. space strategy, you also mentioned preventing 9/11 in space. How would the two go hand in hand?

SADAT: So one of the military priorities is always to avoid conflict if you can avoid conflict, so, you know, you will use diplomacy as much as you can, whether it's State Department diplomacy or mil to mil - military to military diplomacy. And also, you're going to make deterrence - which is the hard power of that - right? - not the soft power. You're going to make it costly for them, make it painful for them, whether it's economic, diplomatic, information-wise or military. You know, the last thing a military person wants to do is engage in a kinetic or physical confrontation, so that hard power piece is going to be - you're going to employ all the other national instruments of power before you...

If they have a bad intention to do a 9/11-style attack - if someone takes out our national, commercial and civil - the 800 or so satellites that we are mostly dependent on, then, you know, we're toast. We won't be able to have eyes, ears - nothing - in space or our troops on the ground and on land or those at sea. So that's the piece you want to look at. It's sort of like in the old wars, we had, you know, the Trojan horse. That would be the analogous piece to it.

CRONIN: Maybe we have time for one more question. And this lady right here.

AUDIENCE MEMBER: Hello. Is there any specific U.S. space strategy that deals with threats from North Korea?

SADAT: I can't necessarily comment on that, so...

(LAUGHTER)

SADAT: I can't comment on that. But I don't know if you saw Bloomberg two days ago. They had a good piece on the National Intelligence Council - the NIC and ODNI are revising the intelligence estimate. I would refer you to their public affairs office and ask that to them. They probably would be able to give you a better, succinct answer.

CRONIN: Mir, you reminded us how busy you are - and suggesting that, hopefully, there's a lot of progress going on in all those meetings that you're chairing and that you're leading. We

certainly hope so. We deeply appreciate you taking time away from the building to come over here to talk about U.S. space strategy. This is a very exciting issue. We're delighted that the administration is renewing our interest in securing space. It's more complex. It's more compressed. It's intense more than ever before. So good luck to you. Please thank Dr. Mir Sadat.

SADAT: Thank you.

CRONIN: Thank you very much. Ladies and gentlemen, that's our program. Thank you so much.