



## Rockets, Missiles, and Space

### Panelists:

- Moderator: Emmanuelle Maitre (FRS)
- Presenter: Paul Meyer (Simon Fraser University)
- Respondent: Dmitry Stefanovich (Russian Academy of Sciences)

**Emmanuelle Maitre:** Welcome to this third session of "The Launch Pad." My name is Emmanuelle Maitre. I'm your research fellow at the Fondation pour la recherche stratégique, Foundation for Strategic Research in Paris. I'm delighted to be hosting this third episode, especially since the first two were in a great success.

For those who are joining us today for the first time that, so this series was created by UNIDIR, to make sure that despite the very peculiar circumstances of the Spring 2020, we would still have a forum to discuss security issues.

It's been a very good idea, because the large attendance of the first two webinars has proved that there was indeed a demand for such an event.

I would like to congratulate and thank UNIDIR, right here at this stage for setting up this very typical series in such a compressed time, as well as of course, the Secure World Foundation. We are delighted at the foundation, if you're asked to be working again together this year on these topics.

We would also like to thank the European Union and the Swiss government for their support, as well as the governments of New Zealand, Russia, and Sweden.

Before we go on, just a couple of logistical points for this event, especially once more for those who are joining us for the first time. Today's meeting is going to be in English only. It will be recorded and available in a couple of days on UNIDIR website.

For the good functioning of the event, of course, it's best if everybody keep their microphone muted and camera off when you're not using them. For the audience, as you may have seen already, you have a Q&A box on the right of your screen where you can, as for now, ask questions to our panelists.

You also have a multimedia keyword that you can use, and I encourage you to do it because as much as you want to hear from us, we want to hear it from you. There was already a question on the screen that you are, of course, welcome to an answer. We will submit more questions during the duration of this session.

If you're a multimedia viewer or Q&A boxes are not open yet, you can do it by clicking below the video. You should have three dots that you can click on, and then click on the little blue box that says, "Q&A," or "Multimedia Viewer."

A couple of other general points, UNIDIR will be sending out a link for you to give feedback on these events or [inaudible 2:52] to submit also feedback. These webinars, these events are still quite new. Of course, the more we hear about the viewers, the best ways to improve the way they are, read it.

Now, if we go into our subject, our meeting today is called Rockets, Missiles, and Space -- Lessons from The Hague Code of Conduct and Beyond. I'm sure that we are going to go much beyond and explore a range of topics today.

But before we start this discussion, I would like to note that for the two previous years, FRS and UNIDIR have worked together during this spring meetings on space security, connections and the links between launching technologies, and especially space launch vehicles and ballistic missiles.

As we have done that, we have explored the role of the Hague Code of Conduct against the proliferation of ballistic missiles. For those who do not know well this instrument, it was adopted in 2002.

It is an interesting instrument as it is the only one that calls for the same transparency measures for space launch vehicles and for ballistic missiles, though it really thinks about the proximity for both civilian activities and military activities.

It's especially interesting to compare the development of both sectors, and to understand what extends confidence-building measures such as this Code of Conduct can promote the peaceful uses of space and address the questions of use technologies.

To finish this long introduction, I would like to note that today is a special day for the Hague Code of Conduct because today, Norway is handing over the rotating chairmanship of the code to Switzerland. It has been a very successful chairmanship for Norway. We have had three new subscribing states in early 2020.

Now, they are 143 subscribing states. It's a great and excited challenge for Switzerland to take up the chairmanship today.

I am going to start the panel with a pre-recorded presentation by Paul Meyer. Paul Meyer is a fellow in International Security and adjunct professor of International Studies at Simon Fraser University. He's a former career diplomat from Canada.

Paul Meyer is going to present ideas from an upcoming paper for UNIDIR on the interrelations between offensive missiles, missile defense, and outer space weaponization. He will conclude with proposition to reduce the risks in Israel.

Once again, it's a pre-recorded presentation, so unfortunately, it won't be possible to ask questions directly to Paul, but we will then have responses by two distinguished experts. I'm sure it's going to be a very lively conversation after on these points.

**Paul Meyer:** First, greetings to all of those who are participating in today's event. I'm sorry, I can't join, but I would say that's when John and Daniel first approached me about the idea of a paper on the interrelationship between ballistic missile defense and outer space.

I was quite intrigued as these are two salient themes for the narrative on international security since the Second World War. Particularly the interfaced between the terrestrial and space realms. From the advent of the space age with the launch of Sputnik in 1957, this has been a story with two conflicting elements.

On one hand, there is the space as the new environment for effecting impressive cooperation between the superpowers. This is the domain of the Outer Space Treaty with its commitment for using space for peaceful purposes, with its prohibition on weapons of mass destruction in orbit, the militarization of celestial bodies.

It's quite strong affirmation and deep celebration of scientific and exploratory cooperation for the benefits of all countries in this unique province of all mankind and the terms of the treaty. Of course, that cooperation has continued over the decades in most notably body in the International Space Station.

Yet, on the other hand, [laughs] and simultaneously to this first narration, if you wish. There's also been a constant effort to exploit space for military gain.

We've had the efforts of be it initially and nuclear explosive tests in orbits, to the development and testing of anti-satellite weapons, to plans for more exotic outer space weaponry like its space-based ballistic missile defense. All of these have characterized a relentless effort to exploit space for strategic gain.

At the same time, the risks of certain military activity in space, leading to major adverse consequences for all users, be it from electromagnetic pulses generated by nuclear explosions to physical debris as a result of destructive anti-satellite weapon tests. All have instilled a certain restraint in the military actions of space faring states.

Now, for decades, the common ground between the rival superpowers has been strategic stability. Understood as both sustaining a mutual vulnerability to nuclear attack, but also to preclude incentives for any first strike. All of this via cooperative arms control.

The common understanding and commitment to strategic stability is now in doubt, however, and recent developments, be they in ballistic missile defense, counterspace capabilities, and the dismantlement of existing arms control agreements have raised serious concerns for the future.

Beyond the current great power confrontations, there is a strong consensus, however, on the part of the international community in favor of reinforcing not demolishing the existing legal regime for the prevention of an arms race in outer space and its weaponization.

This strong sentiment finds expression in the annual PAROS, Prevention of an Arms Race in Outer Space resolution adopted by the UN General Assembly with near-universal support.

For me, a key question has been, why greater diplomatic efforts have not been made to transform the clear PAROS resolution call for "additional measures" into purposeful action?

My paper briefly recounts the fate of a handful of initiatives that were aiming to do just this, none of which, alas, have been brought to fruition.

Part of the reason for this is what I termed the Devil's Triangle of offensive nuclear missiles, ballistic missile defense, and outer space weaponization, and their acute interrelationships and the potential for destabilizing that strategic balance.

All of which makes achieving progress in terms of arms control on any single element extremely difficult. Particularly, any deployment of space-based ballistic missile defense represents the crossing of a critical red line in this regard.

Still, even in these challenging circumstances, I see the possibility for creative diplomacy to achieve progress, and I suggest in the paper three initiatives to this end, which I believe are both feasible and could be undertaken in the near term.

First would be to conclude a protocol to the Outer Space Treaty. This would give legal expression to the refrain from the PAROS resolution to stop the weaponization of outer space by extending the current prohibition on WMD to all forms of weaponry. It will also have the advantage of not requiring the opening up of the Outer Space Treaty itself.

The second idea would be a resumption of negotiations on the draft international code of conduct, this time under UN auspices.

I think there were many positive aspects of the EU original, which could be salvaged and indeed possibly enhance through such a process. I was particularly taken by the innovative ideas for providing institutional support and ongoing monitoring of the norms contained in that international code of conduct.

The third idea is a negotiation on the ban on destructive anti-satellite tests. This is a perennial candidate for space arms control. It has growing appeal due to the recent proliferation of anti-satellite tests, and that it will also afford some opportunity of trying to preclude such tests extending into high orbits.

Those are my top candidates for advancing space security through diplomacy. They would need concerned states and other stakeholders, and we're very conscious with Saturday's

accomplishment by SpaceX, how the private sector's involvement in space affairs is growing by leaps and bounds.

We need some champions for these ideas for them to see the light of day and advance in a purposeful manner. I do hope, sincerely, that some champions will come forward before too long. I thank you very much for your attention. Goodbye.

**Emmanuelle:** Excellent. I think it is now time to go a little bit deeper into this Devil's Triangle that Paul Meyer was alluding to just now and to talk a little bit about these connections between offensive capabilities, missile defense capacities, and space weaponization.

To do that, we are going to turn right now to our first respondent, Dmitry Stefanovich, who's going to comment on what we've just heard, of course, but also maybe insistently more about offensive capabilities, and especially the risk that goes in terms of access to a secured space.

Knowing that our audience has also been asked in the beginning of the session, whether having a rocket amounted to having missile capabilities. That's exactly this kind of connection that Dmitry is going to address.

Dmitry Stefanovich is a research fellow with the Center for International Security of IMEMO in Moscow, but also non-resident fellow at the IFSH in Hamburg, researching, especially on new technologies, strategic stability, and global security retreat. Dmitry, over to you.

**Dmitry Stefanovich:** Hello, everyone. It's an honor to join you here. It's hard to add anything to what has been said. All the painful points have been pushed.

I'd start with saying just a few words about HCOC, the Hague Code of Conduct. We must understand what it does and what it does not. It is huge. It covers a lot of countries, but it doesn't provide any limits. It just asks for transparency and for responsible behavior in terms of [inaudible 16:41]. Still, it is extremely important, and there is room to enhance this stuff.

Of course, if we launch stuff in space, maybe the long-range ballistic missiles or space launch vehicles, they will be detected one way or other by national technical means or some other way.

But at the same time, if we provide information about this and this or that country, provide information in advance, provide information after some period of time, it shows that it cares. It cares about what is being done by different countries, and it cares what other country think about it.

Now, about links between space launch vehicles and ballistic missiles. Back in the day, probably many of you know, actually, the first ICBM was also the first space launch vehicle that launched their payloads into space. The R-7, Sputnik, all these nice things.

Since then, after this, many Russian Soviet designed rockets were key in to have style universal rocket that can be used for both. There are also missiles called Universal Rockets, UR-100, and so on, that received different designators in NATO and the US.

If you're interested, you can search for SS-10, SS-17, all the way through SS-19. The idea was to use same boosters both to launch things into space and to be able to be [inaudible 18:27] warheads today and adversary.

However, in the end, there was a clear understanding that it's complicated to have the best of both worlds because the ICBMs, the offensive missiles, they need protected better. They need to have complicated fueling technologies to keep it ready for start and so on.

Of course, their silos, their launch positions have to be protected. It's not the same for the space launch vehicles obviously. Still, in the end, old Soviet ICBMs were used for space launches. There was different projects. Almost all of those to deliver payloads to space, but it seems that it is not the perfect option anyway.

What I have to underline here is that some of these projects -- especially run by [inaudible 19:33], the famous designer -- actually linked the space infrastructure and the land-based strike systems, the monitoring, and so on. The idea was to have a single launch vehicle for other things. You need to be in space to give targeting to the weapons you'll launch from the earth.

It didn't work actually as intended., but there is one very interesting example that is currently all over the news. You heard probably about the Avangard missile system with hypersonic glide vehicle, or wind-gliding battle payload as we say in Russian.

It is precisely linked to a number of technologies researched of spaceflight of so-called rocket planes and the Strela-based launch vehicle based on the same SS-19 ICBM booster. The connection is still there.

What is most important in that regard is the reason to invest in such expensive technologies, not for any civilian purpose, but to deliver a nuclear warhead to intercontinental distances is the development of missile defenses, including those based in space, so here's an explicit link.

If we go to other countries, like Iran or North Korea, many people often argue that as long as they develop space launch vehicles, they also have the capability for long-range strike missiles.

It is not that simple to put it mildly. As I've said earlier, it is hard to have a survivable nuclear or just a conventional deterrent. If you have your huge space launch vehicle sitting on a launch pad, you need different dimensions. You need different operations, all this stuff.

But at the same time, you can test different stages. You can test different fuels. You can test targeting, and in the end, you need a space launch capability to ensure that your strike missile capability will have required targeting, required permission.

That's why, back to HCoC, it's a great that this regime - you might call it regime -- uses both. It covers both the space rockets and ballistic missiles. It would be great. It was more universal.

Personally, as an expert, I'd love to see the reports being delivered by different countries. I understand that there are different interests with that regard.

My last point, it would be also a great idea to invest in some international early warning capability, just land-based radars or satellites operated by some joint team, and gathering data available for everyone on space launch and the launch of ballistic missiles.

I think it is possible because even countries who are not currently within the HCoC, for example China, as a different process that provides for sharing of such information. For example, Russia and China has a standing treaty on exchange of notifications on space launches and ballistic missile launches.

After that I will probably stop. Thank you for your attention.

**Emmanuelle:** Thank you very much, Dmitry. Thank you for allowing us to go a step further, I would say, in understanding the ways we can think about those [inaudible 23:33] use technologies, the potential links between rockets launches, but also the interests of trying to cover both into confidence-building measures.

I would like now to turn to Laura Grego. Laura Grego is a senior scientist in the Union of Concerned Scientists, Global Security Program. She's an expert on space security issues as well as ballistic missile defense.

I think Laura is going to bounce back on the points that were made also by Paul Meyer, specifically on missile defense, the commonalities maybe between interceptors and satellite weapons, but also the risk of space-based missile defense interceptors.

As you comment, I would like to announce the next question we are going to ask to our audience, which is precisely going to address this topic. When you have missile defense capabilities, you also have anti-satellite capabilities. That's going to be the next question. I think, Laura, your presentation is going to provide us insights on this aspect as well.

**Laura Grego:** Hi. Good morning. Hi, can you hear me? Great. Thanks. I know things are very difficult for many of us right now. I hope that this finds you all safe, healthy, and thriving. Could I have the first slide, please?

As Emmanuelle mentioned, I'm going to be diving into two vertices of what Paul called the devil's triangle, the ballistic missile defenses and anti-satellite weapons. They have a long history of close association.

During the years that the Anti-Ballistic Missile Treaty was in effect, states might have preferred to describe missile defense technology developments as anti-satellite weapons research because the former was heavily restricted by treaty.

Today, missile defenses are not formally restricted by treaty, and states are increasingly uneasy about anti-satellite weapons. Many of the technologies are relevant to both missions. It will be hard to find solutions without considering both at the same time and perhaps, as Paul mentioned, all three in the devil's triangle.

By this discussion, I do want to convey that not all ballistic missile defenses have inherent anti-satellite capability. This is a cartoon [laughs] Venn diagram, but as a way to convey that, theater and regional systems have much less, strategic systems have much more. These capabilities could be clearly distinguishable, technically, should we decide, again, that limits are in our interests.

The converse is not true. There's a wide range of technologies that hold satellites at risk that have no uses against ballistic missiles. Could I have the next slide, please?

The close association is because long-range ballistic missiles travel at speeds and altitudes comparable of those low-Earth orbiting satellites. What you see here is a light blue circle. It's a circular low-Earth orbit at 1,000 kilometers altitude.

In yellow is a ballistic missile launch trajectory of around 11,000 kilometers range. At its highest point it reaches around 1,250 kilometers. Both of these are traveling at a bit over seven kilometers a second, about 30 times the speed of a jet plane.

In fact, while technologies being developed for long-range ballistic missile defenses might not prove very effective against missiles for many reasons, which I won't discuss here for the moment. They could be far more effective against satellites, and there are a few reasons for this.

One is that the launch of the ballistic missile may occur with little or no notice. It takes 30 to 40 minutes from launch to landing. However, satellites travel, repeated predictable orbits, and observations of the satellite can be used to predict its future position.

An anti-satellite attack could be planned in advance, has less restrictive sensor requirements. It could be conducted under the most convenient conditions and the attacker can try multiple times if the first try fails.

While an adversary launching of ballistic missile might take advantage of the short duration of the flight to introduce decoys or other countermeasures, those are less effective in a satellite frame.

This is something I'm going to talk about. I just have a few minutes here. Our kinetic energy interceptors, which basically are a projectile that destroys its target by the force of impact. You could imagine that could be used both against a boosting missile body or the warhead itself in the mid-course phase, or against a satellite.

There's also ideas for missile defenses that include directed energy, which generally means high-powered lasers that would compromise an object structurally by heating it up.



You might note that a warhead that's meant to withstand the rigors of re-entry would be more robust to that type of interference than a satellite which is generally has more delicate parts. But of these systems, the only strategic missile defense systems that have actually been fielded are ground-based kinetic energy missile defenses and ground-based interceptors with nuclear warheads.

Though, there continue to be researched projects on directed energy and in space-based options, and there are some plans to use regional sea-based kinetic energy, missile defenses as part of the strategic system.

The US has a deployed system. China and India have demonstrated examples of exo-atmospheric destruction of satellites with these direct descendant kinetic energy interceptors. The US was explicitly with its missile defense interceptor in the most recent test.

The primary limit to whether a missile defense system can be used to target satellites is whether that interceptor can actually reach the satellites.

We expect that once a kill vehicle, the actual thing that hits it is perfected. It just needs to get to the right place and be able to be in the right place and the right time. Remember that ICBMs' highest points are still in low-Earth orbit. That's generally what we're talking about. For most of this, we're not talking about medium-Earth orbits or geosynchronous.

The interceptor ranges. The ability of these is closely related to what is called the speed of the interceptor. It's a useful way to think about them because as the speed increases, so does its ability to reach vertically up to satellites or laterally to get satellites that are not passing directly overhead. This also starts to show where useful limits on ranges to missile offense interceptors might be.

There are other countries besides these. I haven't done the research yet, but I would locate the Chinese and Russia somewhere between the US Aegis systems.

In any case, as soon as you get beyond a theater-range system, you could reach some low-Earth-orbit satellites. A system that has a burnout velocity of three kilometers a second on the ground defends a few-hundred-kilometers' region. It could only reach the lowest satellites.

Once you build a system that's meant to defend thousands of kilometers, you can start to reach significantly up into low-Earth-orbit satellites. At higher speeds, systems such as the US Ground-based Midcourse Defense, which is the primary strategic missile defense, has very powerful interceptors. It's meant to defend the entire country from ICBMs.

Those could reach all of low-Earth-orbiting satellites as they pass overhead and have enough speed to reach out laterally to a large percentage of satellites that don't pass directly.

That's low-Earth-orbit. Beyond that, the next significant collections of satellites, of course. Most of the participants here know start in the tens of thousands of kilometers.

Those are generally not reachable by these ground-based systems unless they're very specifically designed that way. Space-based interceptors for missile defenses could use their orbital speed plus they're on board speed to reach up to geosynchronous. Next slide, please.

Of course, just because a system could do something, does not mean it will be used to do so. There are powerful incentives not to test or use these interceptors against satellites. Of course, one of these is the creation of persistent orbital debris. The collision of the satellite with even a marble-size piece of debris, in the 1 to 10-centimeter [inaudible 32:47] here, would cause catastrophic damage.

It's particularly dangerous because those small pieces are difficult or impossible to track. If you see a big object coming your way, you might be able to move, but you can't avoid something you can't see. The destruction of a single 10-ton satellite, and these are common, could possibly double the amount of debris in low-Earth orbit. Debris is not discriminant.

It would spread out over time, as you can see from this image here, and contaminate a large region. Those who have investments and aspirations in space want to avoid creating debris. Moving to the next slide.

Because [laughs] I'm going through this very quickly but not everyone is great at thinking in orbits and movements, me and my organization wanted to be able to communicate the unique challenges of space-based missile defenses, why making such a system would take enormous resources, and why even putting a set of test interceptors in space would be dangerous.

Please forgive the dramatic music. We are policy advocates, so this was focused in a US frame. I think the information will be useful.

[music]

**Emmanuelle:** All right. Thank you very much for the very clear remarks. Also, for this powerful argument and video. We have received a couple of questions at this stage. Audience, please do not hesitate to send your questions now. We have about 25 minutes to answer them. We'll try to pick as much as we can.

In the meantime, as I was announcing earlier, we have the question for you. Does having missile defense capabilities mean having anti-satellite capabilities too? I can see over here a number of people responding. We have quite balanced views here.

In the meantime, I have noticed that our panelists have not really picked up, carefully maybe, not picked up the recommendations of Paul Meyer on his diplomatic solutions to increase and to answer some of this challenge that he noted.

Optional protocol on the Outer Space Treaty, international code of conduct ban on ASAT test. I would love to have your views on those propositions.

Maybe also see what you would see as more realistic at this stage or more urgent, also, even the risks that you have outlined. Dmitry, you want to start?

**Dmitry:** I'll start. I hope everyone hears me. OK now?

Given the circumstances, it's quite hard to argue for any ban at all. What is possible though is to be more transparent about the actual missions and actual threat perception of these other countries just to explain why do you invest in this very technology and how this, at least in your view, does not destabilize stuff?

It might be complicated. It might lead to the blame game and to finger-pointing. At least there will be some reference statements, some official position that can be discussed.

We see that some country's developing something. We are not really sure why they are pursuing this technology, which is their intentions. We are afraid. We develop something else to overcome this problem.

My point is that it's impossible to ban anything now. Everyone will always say that their technology is stabilizing while everything being developed by other people is destabilizing.

If the countries and the governments become more clear on their intentions and on their reasons, it will make things at least easier to comprehend, easier to understand. Thanks.

**Emmanuelle:** Thank you. Laura, do you see any of those avenues as a potential diplomatic way to meet the risks that you emphasize on ASAT weapons or space-based interceptors?

**Laura:** Hi. Thanks. I definitely agree with Dmitry that these conversations at a high level should take place. I think there's a lot of mistrust and misperception.

We should make sure that those conversations happen at high levels. Some of that happens when you do start to negotiate or start to seriously discuss initiatives. Whether or not you can get to the very end of that initiative, those discussions are very important to have.

I was interested in Paul's suggestion to resume the space code of conduct under the UN auspices. I know that some of the objection to the European process was that it was more bad. It was an ad hoc process and that the preference of some states is to do things in the UN.

Although the consensus requirements there make things very difficult. I would note that, within that code of conduct, there was an agreement not to destroy satellites intentionally. That does encompass this ban on destroying satellite weapons. It encompasses his second and his third initiative.

It does seem like a long time ago. It seems almost radical to say that we could have a ban on those destructions. Countries did get pretty far in that agreement. Things are only more urgent right now. You see much more investment in commercial space.

It would be very interesting to include in this conversation, as Paul mentioned, the civil and commercial voices who also have a lot of investment in having a stable, safe, and secure space.

**Emmanuelle:** Thank you. That's great because it was one of the questions we just received about how to make sure that non-state actors are also included in this conversation and not just countries and governments.

Two questions we have received. One because we're speaking about the test of ICBMs, especially.

One question is, "Shall states also inform the culprits about those launches, those tests?" A question about The Hague Code of Conduct on what it does prevent actually. Here, maybe we can say at this stage that it doesn't prevent anything, any development, whether it is on missiles or on launching technologies. It requires transparency.

That's something we can elaborate a little bit on. Dmitry, do you want you take those?

**Dmitry:** It's fully clear that The Hague Code of Conduct does not prohibit anything. It just asks for transparency and responsibility as I've just said. It's an easy question. [laughs]

The question about informing on ICBM tests, it's interesting because actually when countries test ICBMs they are generally rather transparent but not intentionally.

They provide notifications to airmen and notifications to mariners. People who have the basic understanding on how missiles fly from point A to point B can rather easily dissect this information and understand what is being tested and when.

Probably it looks like an easy win for everyone if the countries who test ICBMs will not just say that they've tested this stuff and stop it. They can be more transparent about it.

Of course, I'm not sure how detailed the Chinese releases are on this topic. The Russian and American press releases, and to some extent French and the British but lesser, are rather clear. When something is launched, it is explained what was launched.

Sometimes they even add some comments like whether it is test of reliability, life extension process, or test of new types of payload. Probably it is not that hard for the countries to agree to provide this information in some unified format to an international body. It looks like a good initiative. Thanks.

**Emmanuelle:** Thank you. Two questions for Laura. I think the first one is political. "How does the current US administration [inaudible 43:46] into arms control affect forward momentum for these discussions?" Talked, of course, a lot of that arms control about offensive weapons these past few years.

Of course, the space where it was already extremely difficult to have any kind of agreement what has been the recent decisions I think in this. A question also because we've looked at

debris and collisions. We have a question about the launch of 5G satellites proposed in great numbers. Does it increase the consequences of secondary collisions and more debris in orbits?

Do you know if we have a research at this stage, which are highlighting this venture?

**Laura:** To the first one, how the antipathy is of the US government to arms control affects the prospects? Well, of course, it's very dim. It's unlikely while this administration is still in place. If the election in November brings in a different administration, almost certainly they'll have a more favorable interest in arms control.

The Obama Administration, the preferred approach was not legally binding arms control negotiations. It was the European Code of Conduct. That was its preference. I don't know if that would be the same for the next one. It might be a good place to start. It's starting small.

In general, the commercial space has not played a strong role in these conversations. It is in their interest. I don't know if generally they find it interesting to exert their pressure to encourage the government to take part in these discussions. I would love to see that.

As to the debris consequences of the great increase of satellite broadband constellations, I haven't performed that research. I'm quite sure that there is plenty of people concerned and looking at that from a debris perspective.

The regulatory system probably has not caught up to that and needs to be on top of that more than they have. That actually shouldn't be controversial. It probably is. I was an astronomer by profession before. The concern's about light and radio pollution. We need to catch up to all of that.

**Emmanuelle:** Thank you. We have another group of question. To launch them, it would be great before to get back to our audience and ask the last question we have prepared for you. The question is, "What lessons from The Hague Code of Conduct can be applied to space?" Here there are two aspects that we can look at.

The first one is the format of the code as a politically binding agreement. It aims at universality contrary to other [inaudible 47:24] regimes, which had been dealing with political diversion before. There is no specific verification mechanism with the code.

At the same time, since it's been in place, we have seen that more and more states have felt it was in their interests to actually provide pre-launch notifications to give the annual declarations. The instrument is working in a rather satisfactory fashion.

It's important also to note that there is an increasing number of states that are abiding to the code, subscribing to the code. It's not anything that we can say of so many arms-control instruments these days.

On the forum this idea of a politically binding instrument, is it something that we could really get inspired to apply to other domains in space? Of course, the ones we could have in mind is ABM, anti-ballistic missile tests. We could think about ASAT weapons as well.

Another fact we could take on the code is the fact that it has made the choice of regulating at the same time or asking for transparency on civilian space-launch cycles and ballistic missiles. This implication of the [inaudible 48:50] technologies is one single mechanism of transparency. That's also something that we could think as a potential model.

I see that the audience is answering that the word "transparency" is coming up a lot. I would like to have your views as well if you answer a couple of questions we had. First, this idea of notifying anti-ballistic missile systems when they are tested. That's something that could be important.

Ways of bringing regulation on the placement of ABM maybe in outer space. Laura, you want to start?

**Laura:** I'm sorry. Could you say that again? [laughs] I was following these really interesting ideas.

**Emmanuelle:** Of course, the idea was could we use this framework that we see working for The Hague Code of Conduct, the idea of [inaudible 49:54] for other activities. ABM tests, for instance, if that's something. The placement of interceptors and, of course, those ASAT weapons or...

[crosstalk]

**Laura:** Voluntary transparency commitments, the idea of non-placement of missile defense interceptors is encompassed in these initiatives in the UN General Assembly to be not be the first to place weapons in space. I actually think that would be useful and helpful.

You can tell from my remarks that I don't think that they're a very useful weapon. They're not useful for their stated purpose. Little would be lost, and a lot would be gained by just setting that option aside.

The domestic politics, certainly in the United States, makes these types of discussions very difficult. It may be less difficult if it isn't just siloed into a missile defense discussion and had this broader context of space security.

I would be hopeful that might actually provide some openings to make that conversation happen in the next round of arms control talks, which I certainly hope start next year.

**Emmanuelle:** Dmitry, do you have any views? Also, on this question we are receiving, can we assume today that this kind of non-binding voluntary measures can be reliable? Of course, it's a political questions, as I said for some time it's been working quite well.

It doesn't mean that if there was a serious issues about compliance, it would be easy to resolve, but can we expect states? You mentioned it in your intro as well, the idea of voluntary transparency on what you're doing, what you're launching, can it still work in the current context?

[pause]

**Dmitry:** It's actually one of the biggest current debates, at least within the Russian expert community, whether unilateral transparency actually works and actually helps something. Same goes to politically binding commitments.

Because there is a school of thought, and it is shared by the Minister of Foreign Affairs to some extent, that arms control must be verifiable, must be legally binding, and these kind of things.

There is all the venerable experts who actually contributed to the creation of the arms control architecture over the last decades that is currently under pressure. There is also people who think that, "Well, we can all just be transparent and everything will work just fine."

In my opinion, it is possible to have the best of both worlds. Given the current state of affairs, we can't make arms control legally binding, verifiable, [inaudible 53:23] to any limitations and reductions from the stretch.

Before we get there, we need some transparency. We need unilateral statements. We need to build confidence.

It may be just the first step, and we might say that in the end, we want disarmament, we want verification, we want reductions, at least. It's hard to discuss these reductions if we actually don't know what this or that country possesses, or which missions does it intend to apply to this or that weapons.

It is good to start with some unilateral stuff. It won't solve anything, but given the current state, again, of international relations, it will be good just to show that this or that country is responsible.

Some people claim that when, for example, the conventional forces in Europe treaty was being prepared, there was no actual data on the stock arsenals of the Warsaw Pact. The initial system was more or less given the virtual numbers, but still, it worked for some time.

In the current age, the circumstances are different. There is no trust. We can start with unilateral transparency.

**Emmanuelle:** That's something we can see in the comments, a question of whether trust or transparency must come first. We also have the question of definition, which I see is popping up. Define what we are talking about, whether it is interceptors, asset weapons. We also have the question with ballistic missiles.

It may look simple, but what you should actually notify from the back of the Hague Code is not clear. I have two interesting comments that I'm reading right now. The first one about this soft law code of conduct. As one participant is noting, there are some misperceptions also about those which have prevented so far some countries from joining.

Dmitry, you mentioned China, but there are also other countries which have no missile capabilities but were afraid that these instruments would also come at the expense of the development of their civilian launch programs, for instance.

How to make sure that this kind of regulation is not seen as a way to prevent the perfectly legal development of civilian technologies when they are connected, as we said earlier, with military aspects.

Another question, maybe as we are really going into the last questions for both of you. Of course, technologies are moving very fast in the outer space domain. Is HCoC politically binding could more efficient to address this constant evolution than a legally binding treaty? Which by the time it is being negotiated might be already outdated on some of the concepts that it is targeting.

The idea of extending the scope of the codes. That's something that we also hear a lot in other forums to other technologies, hypersonic missiles, for instance, cruise missiles. That's maybe another question. I don't know if we have the time to address them all, but maybe if I you can both give some insights on those.

[pause]

**Emmanuelle:** You can start Dmitry.

**Dmitry:** All are very good questions, very important. I'll start with the last one and probably the easiest one. With hypersonic missiles if we speak about those which are deployed like hypersonic glide vehicles, and probably those which will dominate the development in the coming decade. It's easy if they use holistic missile as boosters.

To make a point that they are covered by a transparency measures is easy as long as no one asks for telemetry, because telemetry is what you don't want your adversary to know about. If we speak about why countries like or don't like Hague Code of Conduct, one reason is, as Emmanuelle said, they are afraid that their peaceful aspirations will be limited.

Exactly the opposite thinking is also possible. Why join something that doesn't work, because you don't believe in unilateral transparency, in soft law and political legally binding agreements?

It is quite important for the people working within Hague Code of Conduct to be more vocal explaining what are the positive outcomes of having this instrument? What are the limits that are not there actually? With that, I'll stop and probably let Laura have a few words. Thanks.



**Emmanuelle:** Thank you. Laura, if you have a final word?

**Laura:** Sure. I think a legally binding treaty is out of reach right now. I don't think it's necessarily that technology moves too quickly that that's what would make it difficult. I think, as Dmitry mentioned, you need to start with shared understandings about what you're trying to achieve.

I think that isn't even at all clear. The countries that are interested in these approaches, what problem they're trying to solve and how? There's lots of very easy ways to dismiss those efforts, which don't necessarily hold water, but what isn't clear is a shared goal.

That could easily start in these conversations about confidence building, and transparency, and codes of conduct. Then, sharpen that, and then, move to the next stage. That's probably the most likely path.

**Emmanuelle:** Thank you very much. I think it is time to bring our session to a close. I would like to thank our two respondents, Dmitry Stefanovich, Laura Grego, for those excellent discussions, and, of course, Paul Meyer for his presentation.

I believe we have been able to cover a wide range of issues and I hope our audience has enjoyed this third session of "The Launching Pad." I would encourage you to read Paul Meyer's paper when you go to [inaudible 60:27] website. It would be entitled "Ballistic Missile Defense and Outer Space Security as Strategic Interdependence." It should be available by the end of the month.

UNIDIR will be sending evaluation forms for this session. Please feel free to send your feedback. It will be extremely useful as we move forward with this kind of events.

Also, I would like to invite all of you to register for the next and last sessions of The Launching Pad. It will take place next Wednesday at the same time, and it will aim at rethinking powers and looking ahead at multilateral approaches.

Finally, I would like to thank all the people who have worked to make this series possible at the technical level. Of course, the UNIDIR team, Daniel Perez, Laetitia Zarkan, and the purchasing team as well from [inaudible 61:20] . It's been an excellent teamwork, and we all appreciate this effort. Thank you very much and goodbye.

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