Mr Chairman, let me begin by thanking you for the opportunity to address this forum on one of the most important topics: to prevent and arms race in outer space.

I would like to take this opportunity to give my view on some of the aspects related to space weapons in general; then reflect on the way they are usually defined; and finally say a few words about new space technology, which I believe needs to be looked at in much greater detail from a space security and PAROS perspective.

So what is a space weapon? The term “space weapon” is not well defined, but it is useful to start by dividing them into categories depending on where the weapon is stationed and where the target is: The first category is then earth to space, which, for example, includes ground-, ship- or airplane based missiles than can be used to target satellites in space. We often refer to such weapons as Ground Based Anti-Satellite, or ASAT, weapons. Secondly there is space to space, when both weapon and target is situated in space. With the same logic we refer to these weapons as Space Based ASAT-weapons. Lastly there is space to Earth when a weapon is based in space but designed to attack targets on the ground, at sea, or in the air. Together, these three categories cover what most of us would consider to be space weapons.

Of course, sometimes it more useful to categorise weapons in terms of function. On earth, we typically do not speak of weapons in terms of land, sea or air. Instead we often think of specific types of weapons such as guns, bombs, knives, chemical- or nuclear weapons. Similar types can be specified for space. Some space weapons are more or less only existing weapon technology adapted to space. One example is the direct ascent kinetic energy ASAT missile, which is a ballistic missile defence system modified to see and hit a space object, such as a satellite, rather than an incoming missile. Other concepts are unique to space and the space environment. An example of this could be hypervelocity rods dropped from space onto targets on earth.

Why do I mention all this? All these categories hopefully illustrate that space weapons comprise a very broad range of different platforms and technologies. It should be obvious that not every type poses an equally great risk to space security. The first point I would like to make is therefore that it could be useful to carefully examine which specific space weapons pose the most serious threat to space security. Reaching a common understanding of this would make an excellent basis for further discussions on preventing an arms race in outer space by being more focused.
How are space weapons defined? Definitions have always played an important role in any attempt to regulate and preventing an arms race in outer space. One could probably argue that the definitions, or rather, the shortcomings of the definitions, are partly responsible for the fact that we still do not have any such substantial regulations. As you are all aware of, one of the principle difficulties when it comes to defining space weapons is the lack of a strict definition of outer space itself. As a result it is unclear when an object or weapon is in space or is to be considered a space object. This debate has been ongoing for close to half a century and will probably not see a solution any time soon. I personally believe that this is a non-issue. The proposals that have been put forward in this fora, and elsewhere, should suffice as working definitions on which to base the more difficult question: what is a space weapon? It is safe to say that there has been a great number of attempts to define space weapons, but so far no one has succeeded in coming up with a universally acceptable working definition. Why is this?

One of the main problems with most efforts so far is the attempt to include all types of space weapons in one definition, rather than being specific. As many before me have pointed out, the difficulties with being to general can be appreciated by simply replacing the word “space” by “on earth” or “on the ground” in most definitions and consider the consequences of trying to regulate everything that can be dangerous. To be more specific, there are two main reasons for the apparent difficulties of these very broad definitions:

First: any definition which attempts to address space weapons as a whole risk becoming so general that non-weapons are included. This, as you all know, comes from the fact that many satellites have a residual capability to damage other satellites. The velocities at which satellites travel are so great that any satellite that can manoeuvre can potentially be used as a space weapon by simply steering it into another satellite. In some sense this is not entirely different from the horrific use of vehicles, such as cars, trucks and even planes, as weapons to commit terrorist attacks on Earth. This type of residual weapon capability, often referred to as “weapons of opportunity,” makes broad definitions somewhat problematic—on the ground as well as in space. Broad definitions, attempting to cover all types of weapons, is probably not the way forward. As I suggested before it could be more constructive to identify the specific space weapon technologies that will have the most negative impact on space security and regulate that.

Secondly: the space sector has become much more complex and technological development is moving faster than ever before. In the beginning of the space age there was a much more well-defined gap between what we considered to be a space weapon and how conventional civilian satellites looked and operated. This, of course, made it easier to define space weapons and it is probably one of the reasons why we still talk about space weapons as a broad homogeneous concept. This gap, however, has blurred significantly with a much more complex dual-use situation. In the not so distant future it will likely be very difficult to separate a military capability from a civilian one. As we heard in the talk given by UNIDIR last week “intent” is therefore often introduced into definitions. By including phrasing like “specially produced or converted” or “specially designed or modified” one hopes to exclude objects with residual weapon capability as these systems were built for entirely different purposes. At least that’s the theory.

If we put aside for a moment the non-trivial task of defining “intent”, I would like to point to what is a far greater challenge. With the rapid technological progression comes new space capabilities that fill the gap between destructive weapons and ordinary space activities. Many of them will be both designed and intended to manipulate, damage, incapacitate and even destroy other
space objects, but they are not weapons and we do need them. Such technology stems from both economic incentives to further the utilisation of space as well as out of necessity to preserve a safe space environment. Let me give you some examples:

**Space Debris** is arguably the biggest threat to the space environment. It is already a challenge in Low Earth- and Geostationary orbits and every credible forecast shows that the problem will increase over time. The orbital regime around Earth is a finite natural resource and needs to be protected. In Vienna, at COPUOS, space debris is one of the main agenda items, and for good reasons. To address the problem, experts often point to three necessary actions: (i) New regulatory frameworks for minimizing the creation of new debris, (ii) better Space Situational Awareness to handle existing debris, and (iii) **active removal of debris** already in orbit.

Research on the last point is already underway and includes space technologies to target, approach and ultimately dispose of unwanted satellites and debris. While such technology is indispensable to save the space environment, it is in every way identical to the broad concept of a space weapon, even in terms of *intentional design and production*. This is a far more difficult challenge compared to the issue of residual capabilities of traditional dual use systems.

**On orbit servicing** is another technology that will see increased use in the near future. This involves repairing or servicing operational space crafts already in orbit by performing close proximity operations or docking while manipulating them in different ways. Again, this is a technology that will be very hard to distinguish from “real space weapons” and that will have a built in and intentional “weapon” capability.

A final example is **space mining**. While exploitation of raw materials from asteroids and other space bodies might seem like science fiction, it is already in the planning by the private sector. It is not hard to envision how technology related to space mining could fall into the same category as the previous two examples with capabilities to physically manipulate and alter space objects, albeit focused on natural objects and the space environment rather than satellites.

Why is this so important? When we step back and take a look at the very reason we think PAROS is important, it is not to ban space weapons per se, but rather to ensure space security and to prevent space from becoming an arena for conflicts. Putting aside for a moment ground based kinetic ASAT capabilities (which is perhaps the greatest and most alarming issue), the arms race in outer space may be triggered by these new technologies for debris removal, close proximity operations, servicing and even space mining. **In my view, it is therefore very important to start addressing these new technologies from a space security perspective, and perhaps even a PAROS perspective. While fully recognising the need for these capabilities, their connection to the issue of space weapons is evident.**

Mr Chairman, let me use my last couple of minutes to summarize:

1. Recognizing that space weapons consist of a great variety of types and categories, and that the space sector is becoming increasingly complex, it will be more difficult than ever to address the issue of an arms race in outer space by a too broad approach and with general definitions. It would most likely be more useful to identify and focus on those weapon types that pose the greatest risk to space security.

Having said that, I would also like to warn about letting definitions come in the way of the actual issues. It is an undisputable fact that we will never reach a perfect and explicit definition of space weapons. The goal has to be to reach an acceptable working
definition. Technical experts, such as myself, have a responsibility to ensure that discussing definitions does not become a never ending excuse for avoiding the real questions.

2. I strongly believe that any PAROS initiative needs to consider the many new technologies that are currently being developed. This includes, for example, systems for debris removal, close proximity operations and space mining. Properly addressing these technologies at an international level will be a necessity for a successful PAROS.

3. And finally, in order to prevent an arms race in outer space we need to focus even more on a holistic approach. A solution, in my view, includes both legally binding bans for different space weapons, in combination with strong TCBM:s, codes of conduct and new norms and rules for responsible behaviour in outer space.

Thank you.