

The State of Space Security

From Space Deterrence to Space Sustainability

General (ret.) Bernard Molard

EADS ASTRIUM

January 24, 2008

Security in space

Security in space is a growing concern shared by more and more nations and I am very happy to be here in Washington, to participate in an important debate in front of such a distinguished audience and to present a European perspective.

As has already been mentioned, more and more nations 1) have developed their own industrial capabilities to enable a presence in space, 2) have acquired national space assets on the market, or 3) have decided to make intensive use of space capabilities acquired through service providers in both the telecommunications and observation sectors.

While implementing national space policies, some nations could feel uncomfortable with their neighbor's space capabilities and could be driven to limit them by destroying or neutralizing their space assets.

This situation, technically impossible outside the USA and Russia until a few years ago, raises the question as to if space will become a new area of expression of power like the sea and air in the past. In other words, after the appearance of sea powers in the 16th century and air powers in the 20th, **will the 21st century see the emergence of space powers?**

A growing threat

Some recent facts and events seem to demonstrate that nothing can stop such an evolution. Human nature being what it is, the use of space to counter or to destabilize an enemy or an adversary seems unavoidable. In my view, there are at least three reasons to support the rise of what has to be seen today as a real risk.

First, the technology to strike a ballistic missile (or a launcher) in its boost phase or to neutralize a satellite, either physically or with a laser beam, microwaves or jammers, will likely become more and more accessible.

Of course, between space nations which behave in a fully responsible way, one can believe that a permanent posture of **space deterrence** could work efficiently. If two parties, both possessing the capability to destroy or to neutralize each

other's space assets, are threatening each other and clearly demonstrating their intent to use it if needed, then one could imagine that a kind of artificial stability could be achieved through a logic of space deterrence.

Second, the destruction of an adversary's space capabilities does not appear as tragic as damage from a nuclear bomb. The consequences would not as tragically visible and CNN would not be able to report with impressive images. Therefore, any hit on a satellite, even one of strategic importance to the enemy, does not seem to be morally impossible.

Moreover, even if a satellite could be seen as an instrument of vital interest, no one can imagine launching a nuclear strike in response to any aggression on a satellite.

The **final reason** for which a battle in space is likely to occur is due to what was referred to in the mid-1990s as the "Digital Divide", which is the continuously growing frustration between the "haves and the have-nots". The consequence could be a temptation on the part of the latter to express their anger by wishing to destroy a satellite, the backbone of the information technology from which they don't benefit. Since those who could be tempted to do so are not likely to belong to the community of space nations, they will probably try to use any dirty device such as a basic ballistic missile equipped with a nuclear warhead built to create maximum electromagnetic impulsion in space in order to affect any space assets, regardless of to whom they belong.

Industrial readiness

As far as industry is concerned, it would be very wise to prepare ourselves for such an eventuality where our satellites could be threatened. We have to invest in R&T in order to be able to face the risk of a potential aggression to our national space systems. As far as EADS Astrium is concerned, we do this in three different manners:

- **By developing the means for an efficient deterrence posture.** This requires acquiring the technology for neutralizing any satellite in orbit (via laser beam, microwave technologies or jamming devices);

- **By developing the ability to identify the aggressor.** This requires the ability to observe any suspicious launch and to install onboard our satellites devices capable of identifying when and from where the aggressive beam is coming. The idea behind this is, of course, to know the identity of the aggressor in order to take appropriate counter action;

- **By being able to build more robust satellites** or, alternatively, to use small, cheap, 'throw-away' satellites, which can be replaced very rapidly.

Let's have a closer look in these three areas.

As far as **space deterrence** is concerned, openly or in secret, laser firing devices are being developed around the world. Quite accurate information is even available on the Net. More serious intelligence sources confirm the existence of laser firing systems which when equipped with adaptive optics, could in the short term be effective for eliminating or neutralizing satellites without generating new debris. I think we must consider that this threat is already a reality.

In terms of **identifying the aggressor**, we see two different axes of R&D investments.

- The first idea is linked to the role of an early warning system. As you know, by the end of this year France will launch two micro-satellites capable of extracting the signature of the plume of a ballistic missile (or a classical launcher) from the infra-red background of the Earth. This demonstrator, support by a powerful ground segment, is called SPIRALE and will be operational in 2009–2010. The aim of this initiative, funded by the French DoD, is to prepare the specifications of what could be an operational early warning system for Europe, capable of detecting any undeclared launch.

- The second field of R&D is to develop a pulse detector, capable of receiving the signal of a laser or microwave aggression on board the satellite. Some progress has already been made in this field and the idea would be to equip a maximum number of satellites with this kind of detector which can clearly indicate the origin of the aggression.

As far as **space terrorism** is concerned, other areas of investment must be considered, such as:

1. Building more robust satellites with resistant onboard redundancies;
2. The hardening of satellites and better protection of ground segments; satellites must be able to continue functioning after a nuclear explosion in space.
3. Establishing the capability to quickly restore any lost capacity. The concept of reactive or responsive space (rapidly launched and commissioned payloads or services) is consistent with such an objective.
4. Finally, in a 'system-of-systems' approach, a constellation of small, cheap satellites may be preferable to a single large satellite, as long as it is demonstrated that they provide the same capability.

From deterrence to sustainability

Needless to say, getting ready to face a space battle is also an attempt to avoid a disaster that would affect the future of space exploitation as it would pollute low Earth orbit with a large quantity of debris.

Everyone knows that space debris take ages to fall back to Earth and our already quite polluted planet will not allow any new safe launch if some nations behave like China did with the experiment conducted last January.

In my opinion, the threat of such a situation must generate a collective reaction from responsible space nations and I believe that the U.S. must pave the way to a "Space Sustainability" concept.

Our responsibility is to make all the space actors aware of the absolute necessity of working together in order to avoid any future satellite destruction or any explosion in space which would generate a huge amount of debris.

With reference to last year's Chinese experiment, if the motivation behind this action is still not very clear, at least it has demonstrated that such a hit has terrible consequences in terms of the debris generated.

This is clearly not a responsible action for those who intend to continue to make the maximum use of space for peaceful or commercial applications.

Therefore, if sustainability of space is a concern, space nations should come together and agree on a **new treaty** in which they would commit to severely limiting new space debris. I do not believe in the success of a collective forbidding any military use of space.

This is typically a mission for international organizations like UN COPUOS or the Inter-Agency Debris Committee but nothing is likely to happen without the American impulse.

Conclusion

My last point is to emphasize that the foundations for capabilities dedicated to the improvement of space security lie in a powerful **space situational awareness system**.

The European Space Agency has taken the initiative to study the feasibility of a European system to monitor space activity in order to be able to detect threats to space assets either from direct aggression or from collision with debris.

The political decision will be proposed to the ESA Member States during the next ministerial conference in November and it will be a good opportunity to test Europe's on this issue.

ESA's high-level objectives are to provide users verifiable, dependable, accurate and timely information in order to:

- Identify non-compliance with relevant international treaties and recommendations

- Enable the assumption of responsibility (e.g. as launching state, owner, or operator), and support confidence building measures
- Support safe and secured operation of space assets and related services
- Support risk management (on-orbit and during reentry) and liability assessment
- Assess the functional status and capabilities of space systems

For this purpose, the following areas of activity were identified:

- Survey and Tracking
- Imaging
- Space Weather
- Networking and Data Center

It is proposed to split the program in two periods: the first one (2009 – 2013) funded with 300M€ followed by a second phase (2014 – 2019) funded with 350M€ for the implementation of a fully operational European SSA capability

It is ideally at European level that such a large initiative can be promoted as it is a key capability for each Member State and for Europe but also this project is a really federating project.

Even if one can be optimistic for a positive decision, it seems very unlikely that a full program will be decided in November this year. But who knows? Europe is a world of surprises and sometime good surprises can arrive! For a while, France and Germany will continue to work together to improve the synergy of their national GRAVES and F-GAN TIRA programs, will harmonize the exchange of data and will motivate other European nations on the importance of Security in Space.

In parallel, the idea of promoting a new Space Treaty regarding space debris seems to me an absolute necessity. It must be initiated by some leading Space Powers and the position of the U.S. will be paramount for a successful conclusion.

I am convinced that initiatives like this conference organized by the Space Policy Institute, are contributing to create a collective sensitivity on this issue.

Thank you for your attention.