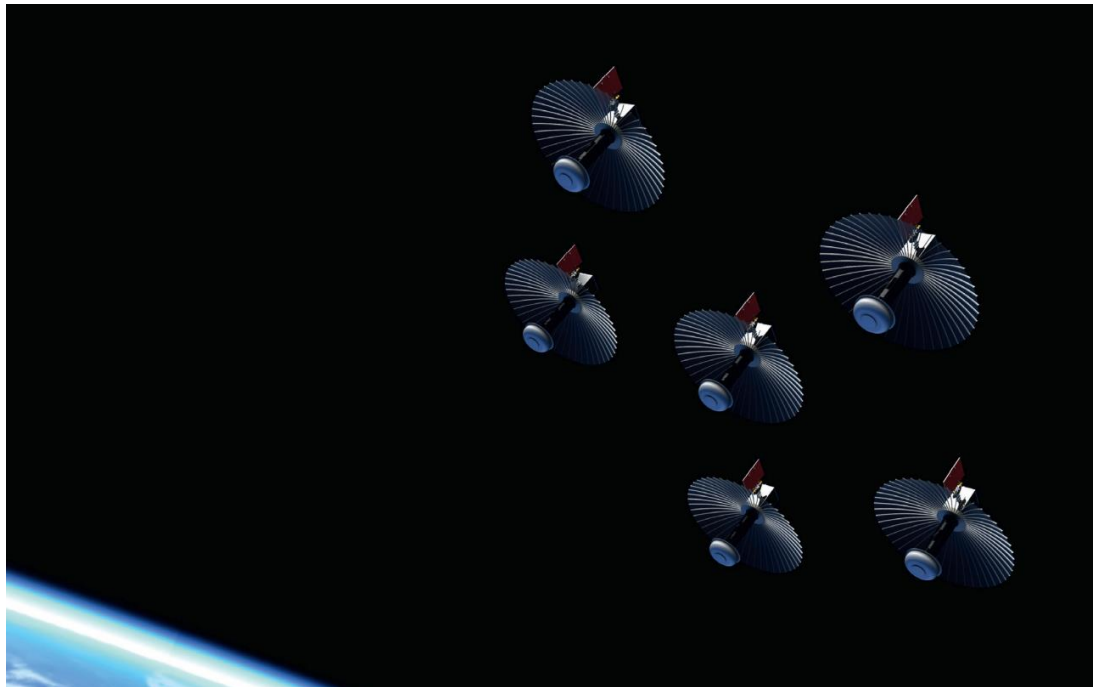Image: Oberon SAR - Credit Dstl - Defence Space Strategy

Report

Defence and Security of Space - sharing perspectives on military operations and behaviours in space

Wednesday 19 – Friday 21 October 2022 | WP3110

In association with:

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Introduction

Space systems are integral to our daily lives, serving functions ranging from monitoring climate change to supporting critical national infrastructure. Military interest in space as a domain is accelerating globally, in part because of the defence advantages the space domain offers. However, because of growing geopolitical instability, the world is facing an intensification of competition between states and space is not exempt. ~Given the physical properties of the space domain, space systems are often vulnerable. Therefore, it is crucial to evaluate responsible space behaviours to reduce the risk of miscalculation and escalation to prevent serious harm to space systems serving both critical civilian and military functions.

In October 2022, Wilton Park, in association with the UK Ministry of Defence, hosted an event: **Defence and Security – Sharing Perspectives on Military Operations and Behaviours in Space**. The intended outcomes of this event were to:

- Clarify the importance of space systems in the context of defence and security
- Consider responsible space behaviours in the face of growing instability
- Share participants' perspectives on responsible space behaviour and managing threats to space systems
- Hear reflections from participants on the military role and responsibilities of improving space security, with space security being understood as the access and use of outer space free from threats to space-based systems

Executive summary

Space systems provide a wide range of essential commercial services and remain **a key enabler for the modern military in the information age** to deliver connectivity and multi-domain integration. The intensification of competition between states has resulted in the **development of counterspace weapons**, both kinetic capabilities and non-destructive capabilities such as non-kinetic, electronic, and cyber.

The intentions of space operations can be ambiguous and measures that can **increase predictability and transparency** in space could improve stability as could collaboration and data-sharing with competitors. **Space Domain Awareness** increases counterspace threat predictability and operational resilience, as well as building a common and trustworthy space operating picture.

Militaries often rely on commercial systems. Although technologically and financially advantageous, this carries risk and raises **questions of responsibility**. Separating civilian and military overlap in **dual use systems** is challenging.

While observing **applicable international and national laws**, adopting responsible space behaviours reduces the risk of **miscalculation and escalation**. The **UN OEWG on responsible space behaviours** was judged a good vehicle for meaningful progress on space security issues.

In **the future space security landscape** technological integration will drive capability expansion, with consequent complexity.

Importance of space

Space systems support critical national infrastructure, monitor the impacts of climate change and further the scientific missions of the 21st century. Rapid technological innovation drives a global space economy is predicted to be worth £490 billion by 2030.[1] Space is also critical to the defence community. Space systems enable and enhance defensive and offensive military manoeuvres as space underpins multi-domain integration in the information age, ensuring access to the right information at the right time Space-based position, navigation and timing (PNT) enable precision activities. Space-based information, surveillance and reconnaissance (ISR) is unbounded in space, obviates overflight challenges and provides persistent global surveillance, Similarly satellite communications (SATCOM) provide global connectivity for command and control.

Transparency in a space security context

A lack of transparency, and the resulting ambiguity and unpredictability it creates, is a significant threat to space security.

The following definitions were suggested to clarify types of use:

- Dual use – a space system serving both a civilian and military function, typically not aggressive but may present issues around transparency and responsibility, with collateral consequences if targeted.
- Dual purpose – space technology repurposed for aggressive purposes, for example in rendezvous proximity operations.

Many aspects of space systems are inherently 'dual-use'. Economically it makes sense to have systems that are dual-use, but this creates ambiguity: is it a valid military objective, who else is using that system than just military users, what is that system being used for? Others cannot fully know the intended purpose of a space system. This is further exacerbated by the fact that militaries often rely on commercial operators for an array of space services. Without transparency and dialogue, space operations such as active debris removal – dual purpose - may be perceived as a threat and risk escalation; could this be used as an anti-satellite capability, what is the intent, how do we manage this? Improving predictability would lead to a more stable geopolitical space environment. Collaboration with other states and commercial operators could mitigate the risk of escalatory interpretations. Commercial and state operators could both do more to improve dialogue, transparency and predictability. Outer space legislation prescribes cooperation. Transparency could be improved through greater adherence to the Registration Convention.[2] Registration notifications tend to lack detail and are often not published in a timely manner. If states were willing to disclose more and timely

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[1] Ministry of defence and Department of Business, Energy, and Industrial Strategy, 'National Space Strategy' (2021) 5

[2] The 1975 Convention on Registration of Objects Launched into Outer Space (adopted 14 January 1975, entered into force 15 September 1976) 1023 UNTS 15

information about the intended purpose and location of a space system, this could improve transparency.

Monitoring and illustrating activity in space states and commercial enterprises have developed space situational awareness (SSA) capabilities to monitor and illustrate activity in space.[3] Space surveillance and tracking capabilities (SST), fused with intelligence information, enable space domain awareness (SDA) and understanding the threat picture and intent of space operating nations. Good SDA can increase operational resilience, predict counterspace threat engagements, and allow operators to make quicker decisions based on reliable data. However, there are challenges. Participants expressed concern that the increasing rate of the number of space systems will soon render SST capabilities unable to cope. Further, there is no common operating picture, with many reliant on the US. Participants felt that increased transparency and more accurate reporting from states and commercial actors are important; the less understood about what is happening in space, the more opportunity for someone for denial.

The threat: counterspace capabilities

It was suggested that a threat was an action deliberately taken to do harm. The perception of threat is also important, ambiguity risking inadvertent escalation, reinforcing previous points about transparency.

A number of states have developed counterspace capabilities. These take the form of kinetic physical, such as direct-ascent missiles; non-kinetic physical, such as dazzling capabilities; electronic capabilities, such as jamming devices; and cyber capabilities, such as the capture or manipulation of data traffic patterns.[4] To date, only non-destructive (non-kinetic, electronic, and cyber) capabilities are actively being used in current military operations.[5] As well as creating debris, the use of destructive counterspace capabilities would be seen as highly escalatory. Given that critical national infrastructure is now heavily reliant on space systems, increased methods of context-dependant deterrence should be explored. Participants suggested extrapolating techniques from other domains.

Establishing responsible behaviours in space

1. What do nations see as responsible military space behaviour?
2. How could responsible military space behaviours manage misunderstanding and escalation?

Adherence to applicable international and national laws is pertinent to responsible military space behaviour. Although context-specific, being as transparent as possible and engaging with both allied states and adversaries is beneficial to the wider space security landscape. It was suggested establishing meaningful communication between operators, the developing common terms, and avoiding ambiguity could help generate predictability and transparency. The ongoing efforts of the OEWG could be an appropriate platform for this.[6]

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[3] Space situational awareness refers to 'a holistic approach towards the main space hazards, including collision between satellites and space debris, space weather phenomena, and near-earth objects;' European Union, 'An EU Approach for Space Traffic Management' (2021)

[4] Center for Strategic & International Studies, 'Defense Against the Dark Arts in Space' (2021) 7-9

[5] Secure World Foundation, 'Global Counterspace Capabilities – An Open-Source Assessment' (2022)

[6] A UN General Assembly resolution established an Open-Ended Working Group (henceforth referred to as 'the OEWG) on the topic of reducing space threats through norms, rules and principles of responsible behaviour; UN General Assembly, '76/231 Reducing space threats through norms, rules and principles of responsible behaviours' (2021) U.N. Doc A/RES/76/231

The ongoing OEWG could also map what escalation could look like. This could result in the development of non-binding norms of behaviour – although participants did identify that there is a risk of damaging the international credibility of norms if they are not adhered to. It is also important to bear in mind that space behaviours are subjective, what may be threatening to one state may be otherwise to another. Importantly they should not be Western-centric, but as far as consensus allows, reflect the views of all.

One challenge associated with norms of behaviour is implementation and verification. Verification measures can identify how successful implementation has been but can be challenging. States may feel that sharing information only increases their vulnerability. However, some suggested that transparency need not be binary but could be on a spectrum. When transparency is considered as a spectrum, there is more room for compromise and, consequently, more chance of progress.

Military use of commercial space systems

There was discussion of the use or supply of commercial satellite services in times of conflict, and security considerations for both governments and commercial operators. Who is using the services from a satellite, civil or military, implies responsibility for that satellite. Knowing who is using the services from a satellite is another challenge to allocating responsibility for that system. Who is using the services from a satellite, civil or military is also a factor in considering who may be responsible for protecting it; this implied increased cooperation and collaboration between governments and industry and a need for mechanisms to include commercial operators.

Transparency concerns regarding dual-use space systems are exacerbated when that space system serves a critical civilian function. One current example could be the use of Global Positioning Services (GPS), which serves both military and civilian purposes. Although one solution could be to separate these systems, in many cases this would be impractical given the extant ubiquity of the civilian and military overlap. It could also be costly, and any standards or rules to distinguish use should avoid making access prohibitively expensive. It could be more proactive in sharing information about satellite systems functions (notifications), rather than relying on consultations as part of Article 9 to understand the purpose of a space system.

There are ethical and legal questions involving the use of commercial organisations operating in conflict. There are also questions about the applicability and interpretations of general international law, international space law, the law of armed conflict, and the law of neutrality. While not all the international community believe international humanitarian law applies in space, many do. Differences of interpretation increase ambiguity and unpredictability and although states consider legal ramifications participants valued focusing on behaviours while aiming for legal certainty

National governance models

Engaging internationally is difficult when nations have different governance structures; identifying who to talk to can be challenging. Commercial operators also sought greater inclusion in national structures. Participants shared details of their national governance. It was apparent that there were a wide range of governance structures to address space matters as responsibility for space was held across several government departments. One issue was striking the balance between civilian and military interests, while noting the interconnectivity between them. It was noted that it would be counterproductive to have only one government department be the primary decision maker on space matters. One solution proposed that national space strategies featured inputs from several government departments. Another could be to have departments such as defence staff focus on reactive measures and have civilian staff focus on proactive peaceful measures.

"Dual use – a space system with both a civilian and military function. Dual purpose – space technology repurposed for aggressive purposes"

"adopting a highly integrated cross-agency approach versus departmental lead responsibilities"

The UN as a vehicle for space security progress

There are two UN committees relevant to this report – the 1st Committee which deals with security and disarmament, and the 4th Committee which deals with, *inter alia*, peaceful uses of outer space. However, there are some synergies between the two committees, and it was highlighted that there are joint 1st/4th Committee meetings. Participants identified that this split between the security and the safety community is beneficial to space diplomacy, and it would be responsible to maintain this separation. This is because security and disarmament conversations in the international community are often at an ideological deadlock, which inhibits meaningful progress for stability. Whilst at the 4th committee meaningful progress has been maintained, as evidenced by the adoption of the Long-Term Sustainability Guidelines in 2019.[7] As for the security discussions at hand, participants felt the ongoing efforts of the OEWG is the best vehicle for meaningful progress on responsible space behaviours to support security issues. The aligned international community, in global consensus-based systems could support the work of the OEWG promoting responsible space behaviour.

The future space security landscape

It was suggested that as space technology becomes more inexpensive, accessible and agile, space could develop into a complex socio-political ecosystem, and the space and terrestrial environments will increasingly converge. No single technology will become paramount, instead technological integration will drive capability expansion, with consequent complexity. Space may support and accommodate services such as energy generation and climate mitigation. Earth's increasingly harsh climate will drive us to seek space solutions for Earth issues, consequently earth / space supply chains will become inseparable - China's belt and road initiative already includes the moon - and existence on Earth dependent on space space-based services.

Autonomic development may drive Earth to become an autonomous machine which depends on space for connectivity and surveillance; space is the backbone or central nervous system of an automated Earth. Within space itself, both technological advanced and basic support workers will operate; the equivalent of scaffolders and plumbers will operate alongside quantum computer technicians, but many off-earth factories may be autonomous. The internet will expand into space and need to be secured in space. Exploring and understanding these far-reaching possibilities may be best through tools such as digital twins[8].

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[7] UN Committee on the Peaceful Uses of Outer Space, 'Guidelines for the Long-term Sustainability of Outer Space Activities' (2018) U.N. Doc A/AC.105/2018/CRP.20

[8] https://sophiehackford.com/talk-topics