



In Orbit: The European Union, Defence and Space Domain Awareness

Daniel Fiott | 7 July 2023

Key Issues

- “Space Domain Awareness” has been adopted as a concept by the European Union through its new Space Strategy for Security and Defence. This is an interesting step forward that will guide efforts to monitor, track, assess and react to space threats.
- As the European Union develops its space programme and its approach to Space Domain Awareness, it will need to be more ambitious with investment and technology development and move towards a genuine partnership between military, civilian and industry actors.
- There are important political, military and industrial implications that emerge from Space Domain Awareness. Developing a command and control system, while also developing a coherent response to attributable space threats, are some of the main political challenges.

On 10 March 2023, the European Union (EU) published its first-ever “[Space Strategy for Security and Defence](#)”. The new strategy marks a departure from the EU’s 2016 Space Strategy, which largely focuses on the commercial uses of outer space. The new space and defence strategy sets out how the Union should counter ‘[intentionally hostile activities](#)’ in space, especially in a context of ‘[increasing power competition and intensification of threats](#)’. This focus comes on the back of the Union’s broader strategic re-focus with the March 2022 “[Strategic Compass](#)”, which represents the Union’s first-ever attempt at a comprehensive defence strategy. This document acknowledged that the EU has an ‘[increasing dependency on space systems and services](#)’, but is ‘[more vulnerable to irresponsible and threatening behaviour by strategic competitors](#)’.

One of the interesting aspects of the new EU strategy for space and defence is how it is framed by a wholly different organising concept: “Space Domain Awareness” (SDA). For the EU at least, this is a hitherto alien concept. The 2016 Space Strategy does not use the concept, even if it recognises the importance of situational awareness for space weather and cyber alerts. Interestingly, even the Strategic Compass does not specifically refer to the concept, instead calling for continued investments in ‘[space situational awareness to better understand and reduce space-based risks, threats and vulnerabilities](#)’. Therefore, the particular reference to Space Domain Awareness is something that was uniquely developed during the drafting of the new space and defence strategy.

It is the aim of this Policy Brief

to shed light on the meaning, significance and policy implications of this conceptual evolution. More precisely, we seek to understand the relevance of Space Domain Awareness and probe its significance for defence planning, technology investments and military intelligence. In this sense, SDA is not solely relevant from a conceptual perspective, as it has the potential to reframe the Union's space presence and how it protects sovereign capabilities such as Galileo, Copernicus and the future secure space communications system IRIS2.

What is "Space Domain Awareness"?

Given the nature of outer space and its importance for life on earth, a fundamental aspect of any space policy is being able to detect, monitor and track space activities and events. Space policy is an arena where terms like "Space Situational Awareness" (SSA), "Space Surveillance and Tracking" (SST) and "Space Traffic Management" (STM) are commonplace. It is therefore natural that the introduction of a different term such as "Space Domain Awareness" should add to the terminological fuzziness in the field. Traditionally, the EU has focused on situational awareness and traffic management as a way to detect and monitor space hazards such as debris, break-ups and/or collisions. The idea that the EU should therefore have some capacity to monitor space is not new.

If situational awareness (SSA) and traffic management (STM) are easily understood, and if the EU already conducts such activities, then we would be forgiven for questioning the need for a new concept such as Space Domain Awareness. Indeed, 'there is no universally recognised definition' for the term SDA. We should also acknowledge that any definition of SDA as the 'capability to detect, track, identify and characterise space objects and the space environment' does not really set the concept apart from other, well-established, labels such as SSA or STM. However, Space Domain Awareness can be contrasted with SSA and STM in the way it brings into sharper focus the military dimensions of space. Space situational awareness and traffic management are largely geared to non-military space risks such as debris, space weather and accidental collisions. There need not be anything malicious about these risks, even though they still

pose a major issue for the Union in space.

What is more, [some experts](#) view space situational awareness as an operationally specific approach that only focuses on individual space risks and threats separately. For example, one particular form of SSA might predominately focus on detecting solar flares without simultaneously assessing other non-military and/or military space-based risks. Space Domain Awareness is different as it presupposes the integration of capabilities for the detection, monitoring and tracking of both non-military and military space threats. It thus integrates space situational awareness and traffic management activities together and fuses them with [military needs](#) (i.e. simultaneously detecting, monitoring and tracking collisions, fragmentation and debris, re-entry risks, solar weather, ballistic missiles and glide vehicles).

Fusing these military and civil aspects of space-based intelligence is vital to the proper functioning of armed forces, including their use of remotely piloted systems, integrated next-generation fighter aircraft and more. In this sense, the development of next-generation defence capabilities such as the [Future Combat Aircraft System \(FCAS\)](#) presupposes free access to and secure use of space. Space Domain Awareness provides militaries and defence planners with real-time information that could affect operations and interoperability. Accordingly, Space Domain Awareness can be thought of in two main senses:

- 1) fusion: an ability to monitor, detect, survey and assess the whole spectrum of space risks and threats (military and non-military) rather than specific facets of it; and
- 2) action: the ability to use the fusion of space data to directly inform strategic decisions and policy-making in as real time as possible, while also providing tactical, operational and strategic information.

What are the strategic implications of SDA?

Space Domain Awareness is then in part about monitoring military and non-military space activities, risks and threats – all at the same time. However,

this is only part of the story. SDA equally implies an ability to fuse data across domains based on a range of technologies (i.e. radars, telescopes, lasers, sensors, etc.). The ability to fuse space data is [notoriously difficult](#), as sensors, satellites and radars collect different types of information that focus on a specific object through space and time. This is frequently referred to as the “multidomain” aspect of space awareness and includes an ability to fuse data from across the cyber, land, maritime, air and space domains. Consider how necessary it is to track the trajectory of ballistic missiles across the land, air and space domains. Critically, in addition

the US, for example, Space Command relies on the National Space Defence Center to bring together military officers, intelligence officials and private contractors to conduct a part of America’ space domain awareness activities – where, one may wonder, is the Union’s like-for-like version of this set-up?

Indeed, today the EU does not have a fully-fledged command and control system for the space domain. At most, it has a capacity for certain military missions and operations but not one that can fuse, process and utilise intelligence in a centralised manner. To

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to this multidomain approach it is essential that threats are detected, monitored and tracked on a 24/7 basis – without interruption.

This places a substantial technological and strategic burden on any actor wishing to develop SDA in any meaningful manner. The United States (US), for example, has invested billions into developing its own [vast network](#) of space-based and ground-based sensors, radars and satellites as part of its SDA network. For its part, the EU has taken a piecemeal approach to SSA and STM based on “federating” national capacities to allow for the detection, monitoring and tracking on an EU-wide basis. Today, the EU relies on a space surveillance and tracking partnership (EUSST) that includes 15 member states based on a network of [40 sensors](#) such as radars, telescopes and laser ranging stations to protect more than [400 satellites](#) – the United Nations estimates that there are more than [8,000 satellites](#) currently in orbit.

More than monitoring and tracking capabilities, however, SDA entails having command and control structures in place – even if not all member states would not necessarily agree to creating them. The collection of space-based data is one thing, but fusing various forms of data into militarily-relevant and actionable intelligence is a different matter. In

date, the EUSST consortium is the main network for space situational awareness and tracking and – as of 3 July 2023 – the EU’s Space Programme Agency (EUSPA) serves as the “front desk” for this consortium. However, these are non-military structures and there is a limit to the role they can play in ensuring effective SDA. Even with the new EU strategy for space and defence, it is not clear what appetite exists in all member states to introduce a more military focused approach to SDA, with many recently re-emphasising that EU STM efforts are designed to promote [safe, sustainable and secure](#) uses of space.

What are the expectations and challenges for the EU?

Whether the EU can genuinely shift towards a meaningful appreciation of the military risks of space will come down to politics. The fact that the EU Strategy for Space, Security and Defence did not replace the EU Space Strategy – but exists alongside it – means that member states will pick which strategy best represents their normative understanding of space. Some will be driven by motives other than norms, by also considering how any drift to space and defence applications may introduce technical requirements that cannot be met by civilian space SMEs. Yet, the EU has been heading towards space

and defence for some time: for example, Galileo already foresees military applications through the Public Regulated Service (PRS), which will in time provide positioning, navigation and timing services to armed forces. What is more, the member states are already developing missile interception sensors, microsatellites and other [space-defence capabilities](#) under the European Defence Fund (EDF) and Permanent Structured Cooperation (PESCO).

There is no escaping the fact the EU Strategy for Space, Security and Defence puts down some extremely ambitious and sensitive political markers. For example, consider this line from the Strategy: '[SDA is key for attributing space threats in orbit and triggering a potential EU response](#)' (emphasis added). Not only does this line presuppose that the Union's ability to deter space threats may have failed at some time in the future, but the focus on "response" means that the EU has to forge ahead with a more military approach to space or it will simply not be considered credible. Here, the Strategy specifically states that '[should a space threat or incident amount to an armed attack on its territory](#)', then member states would be able to invoke the Union's mutual assistance clause (Article 42.7 Treaty on European Union). This, in turn, could necessitate a potential military response – again, new terrain for the EU – even if we have no details on what this response would look like in practice.

With such language and ambition, the EU is also steadily enmeshing its own concepts with those already present in NATO and this may have a positive pay-off for EU-NATO cooperation in space. Such cooperation is important given that both organisations agreed to cooperate on space matters in the [2023 EU-NATO Joint Declaration](#). For NATO, SDA has become even more important since the alliance recognised space as a fifth operational domain in addition to air, land, sea and cyberspace. For NATO, space is a [critical enabler](#) in support of military operations and intelligence and so ensuring that the alliance has a comprehensive picture of

military and non-military threats in outer space is essential. This means that there is a growing consensus on space matters between the EU and NATO.

Such cooperation is even more essential after Russia's war on Ukraine, but it remains unclear how the EU's move into Space Domain Awareness could support European efforts to ensure deterrence and defence. For example, the capabilities eventually developed by the EU would clearly contribute to NATO's Integrated Air and Missile Defence System (IAMDS) or the recently established German-led initiative for a [European Sky Shield](#) (ESSI). This is not to say that the EU would replace US space-defence surveillance and tracking capacities any time soon, but having EU assets in Europe's overall space domain awareness arsenal is wise, not least for substitution and support services and activities.

Finally, in addition to needing coherent command and control systems for SDA, the EU clearly needs to invest in cutting-edge space technologies. This is easier said than done. Not only is a [substantial boost](#) to the EU Space Programme and EDF required in the next budgetary cycle of the Union, but there is a need to avoid industrial fragmentation in Europe. An injection of [more investment](#) will attract a range of space companies, big and small. However, the growth of the "new space" sector has raised as many concerns as benefits, as new market entrants in the European space sector – while more than welcome – do not have the industrial or technological critical mass to help develop SDA. While industry has already lent its support to the idea of SDA, seeing it as a fundamental basis for '[developing a fully-fledged and autonomous STM architecture](#)', SDA presupposes greater military and political involvement in command and control and space domain awareness activities. Bringing together all of these actors to ensure that Europe sits on the technological frontier of space, while also ensuring [credible autonomy](#) in space domain awareness, is a key task at hand.

