

## Space Defence Committee Call for Evidence: Astroscale Ltd response

### Organisation Introduction

Astroscale is the first private company with a vision to secure the safe and sustainable development of space for the benefit of future generations, and the only company dedicated to on-orbit servicing across all orbits. Founded in 2013, Astroscale is developing innovative and scalable solutions across the spectrum of on-orbit servicing missions, including Life Extension (LEX), In-situ Space Situational Awareness (ISSA), End-of-Life (EOL) services, and Active Debris Removal (ADR), as well as strong interest in supporting infrastructure such as SSA and ground-segments, to create sustainable space systems and mitigate the growing and hazardous build-up of debris in space. Astroscale is defining business cases and working with government and commercial stakeholders to develop norms, regulations, and incentives for the responsible use of space.

Astroscale has a growing team of over 200 people, 75% of whom are engineers and all of whom have a passion to secure sustainability in space. Headquartered in Japan, Astroscale has an international presence with subsidiaries in the United Kingdom (Astroscale Ltd), the United States, Israel, and Singapore. Astroscale is a rapidly expanding venture company, working to advance safe and sustainable growth in space and solve a growing environmental concern.

Astroscale ensures it is at the forefront of global discussions relating to in-orbit services and engaged with the customer community through several key forums. Astroscale currently chairs the UK Space In-Orbit Servicing and Manufacturing Working Group (IOSM), as well as actively contributing to the Security and Defence Committee (SDC). The IOSM working group invites all key UK players in the IOS market to work together towards growth of the IOS market, such as UK Space Agency InnovateUK, Airbus, MDA, TAS, OneWeb. Astroscale is also part of the executive committee for the Consortium for Execution of Rendezvous and Servicing Operations (CONFERS), aimed to defining policy for Rendezvous and Proximity Operations (RPO) and on-orbit servicing (OOS).

The company has regularly used its expertise on to support several international events. Astroscale has also been invited to speak at the United Nations several times, including UNISPACE-50 in June 2018 in Vienna, and subsequently on behalf of the UK delegation at the 2021 COPUOUS STSC. Astroscale has also been invited to support and speak at the Interagency Debris Coordination Committee (IADC) as well as the Wilton Park Conference “Operating in space: towards developing protocols on norms of behaviours”. Astroscale’s CEO, Nobu Okada, is currently Vice President of the International Astronautics Federation (IAF), Co-chair of the Future of Space Technologies Council at World Economic Forum, and Fellow of the Royal Aeronautical Society (FRAeS).

### Evidence

- **How should the UK Government seek to further develop its strategic relationships and interoperability with allies?** To enable interoperability with allies, especially close allies, the future UK space capability should be considered as an international from the start. This will ensure UK support to allies in key missions as well as ability to leverage allied capability quickly and effectively. The scale of the space domain in terms of the types of threats, space-mission use cases and different types of orbits suggest a burden-sharing approach with allies is the most sensible in terms of cost, capability and messaging against potential aggressors. UK Government should focus on adding value to allied capability in a cost-effective way. This should aim to

maximise the benefit of what the UK does well, spending money appropriately and efficiently to improve allied capability. As well as maintaining the strong relationship with the US as a key ally, it is important to develop beneficial relationships that have not had significant focus, such as those outside of Europe and in the Indo-pacific regions, including Japan, Australia, New Zealand and over time India and South Korea.

The UK has demonstrated space policy leadership at an international level with the work done at UN level in promoting responsible and sustainable behaviours in space by both commercial and state satellite operators. Continuing this effort is essential in mitigating the risk of misunderstanding or miscalculation in space, and this must be done through strategic work with our allies to coordinate and convince others.

- **Where can the UK most effectively develop and deploy its own sovereign defence capabilities, with particular regard to:**
  - **Space Situational Awareness**
  - **PNT (Position, Navigation, Timing) services, in the context of the UK's exit from the EU's Galileo and EGNOS programmes**
  - **Intelligence, Surveillance and Reconnaissance**
  - **Communications**

Sovereign defence capabilities can be considered in several different ways, from a UK only supply chain to the independent freedom to act unilaterally in operational environments. It is clearly important for UK space systems and assets to not be unnecessarily restricted by constraints on the supply chain, but at the same time is not overly costly or restrictive. Of course, the freedom to act and make decisions independently always requires some minimal sovereign operational capability.

Space Situational awareness (SSA) is critical to understanding the space environment in which we operate and the decisions that need to be made. Having access to SSA information, regardless of how that information is procured, is essential. Developing a new, complete sovereign SSA capability from scratch is likely to be extremely expensive. One approach would be to attempt to add value to existing allied capabilities, maximising the overall capability that the UK would have access to whilst keeping costs manageable. Through assessment of SSA capability gaps, this could include dedicated unique analysis capability, or bespoke, novel sensors, particularly from the beneficial use of space-based sensors. Investing in and taking advantage of these capabilities will help propel strategic UK capabilities forward and make us a valuable member of the increasingly capable allied space community. The flexible use of new demonstration and commercial missions, such as Active Debris Removal and Life Extension, by using onboard SSA sensors to support the UK capability, should be considered when developing a road-map for a sovereign UK SSA capability. Another approach would be to consider the development of a collaborative space-based demonstration and/or operational SSA capable satellite system via a partnership with an allied nation (For example, the USA and/or Japan under the recent DSTL/UKSA/JAXA MoU or Australia via the SpaceBridge) which would involve joint funding and joint exploitation.

ISR capabilities could be part of a more general space-based imaging approach leveraging UK launch and small-satellite capability. This of course depends on what Space-Command consider as the minimal capability requirement for ISR, and whether small-sats with mass/power constrained payloads can meet them. However, continued govt funding in to space-based imaging payloads, exploration of flexible imaging payloads that can image space and/or ground

or distributed systems of UK satellite systems (not just constellations) will likely provide new avenues to cost-effective ISR that the UK can leverage.

- **How vulnerable are our space assets to deliberate attack, both physical and otherwise, and what steps can be taken to improve their resilience (with regard both to defence capabilities and other critical national infrastructure)?** All spacecraft are vulnerable to counter-space to some degree, and this is becoming ever more pertinent as more capable technologies, both in orbit and the ground, are becoming available to a wider range of groups. The most obvious, and still really the only the domain of state actors, are physical attacks, both kinetic and otherwise. The consequences of a kinetic physical attack are far more severe than other types of attack - they are attributable, visible and will cause detrimental effects to all other space operators – which may make them more of a last resort attack, and perhaps all the less likely for this reason. Mitigation against direct ascent and co-orbital attacks require ensuring that there is suitable Space Situational Awareness of what is happening at any given moment in time, and that spacecraft operators have the knowledge and ability to defend against potential attacks. Ambiguity in the attacking actor whether it be state or non-state, to subvert or undermine, suggests that less attributable non-physical approaches, such as electronic or cyber, are very much a more likely threat in today's world. These threats should be addressed by ensuring all allied spacecraft operators (and particularly those that form UK CNI) are aware of threat and have the tools and support to mitigate against them. Its also important that this isn't viewed in isolation, but that there is national (and may be international allied) resilience in the activities performed by these space systems across all segments (e.g. resilience in ground-seg/operations as well as space-seg)
- **How can defence industrial policy ensure that investment and innovation in in the private space sector is harnessed to align with the UK's defence requirements?** Funding has often focused on either low technology readiness level (TLR) research and development through schemes such as (the very successful) Defence and Security Accelerator (DASA) under DSTL, or on the very high TRL capability procurement via Air/Space Command. However, there needs to be funding support for the gap between them. To evolve those low-TRL technologies that are perhaps less commercially viable but could be essential in the defence domain, for example, space-borne systems used for enhancing object characterisation, is essential to ensuring UK innovation and future capabilities. A realisation that not all key capabilities developed in UK industry are feasible for commercialisation and that some are more bespoke to defence requirements.
- **Have recent machinery of government changes ensured a joined-up and coherent approach to defence space policy both across Whitehall and within the MoD? What further improvements could be made?**

The emergent governance structures for space policy across Whitehall and within MOD seems to provide what was lacking previously in terms of an overall UK space approach. It is important to ensure that the objectives, which will invariably be different, of MOD and non-MOD (BEIS, UKSA, DfT) are appropriately coordinated so as to avoid divergence in the UK space strategic intent and capability As the strategy and governance mature there needs to be oversight to ensure 'UK as a whole' benefits and synergies are realised.

The release of the National Space Strategy would be seen as the most important piece of tangible progress towards a clear policy.

- **What should be the priorities of the new Space Command, and how will its structures facilitate integration across all military domains and co-operation with commercial space operations?**

There has been a period of uncertainty regarding MoD requirements for space and the exact nature of the responsibilities of those groups within MoD. However, the recent structure presented by MoD to UKspace SDC (in May 2021) on how HMG space policy is intended to be managed and coordinated across is seen as a very positive step. Though it is still not entirely clear how the responsibilities of Space Command, Strategic Command and the Space Directorate will develop going forward, the new National Space Governance framework and the Defence Space Construct are welcome in setting a solid foundation. It is important when setting out this governance framework that the interaction with the commercial space sector is well characterised. The US have traditionally been very good at bringing industry with them when it comes to defence, and it would be good to see a similar model employed by the UK. It is important to be clear what the needs of MoD and the levels of funding that are available are reasonably transparent, and that this is conveyed as over-arching requirements that the UK space industry can develop towards and support.

Without a doubt, as space becomes busier with far more novel capabilities and missions, both national and commercial, ensuring SSA (and SDA) will become more important than ever, and so having reliable access to those capabilities is important. As these capabilities are almost certainly dual-funded by civilian and military organisations (e.g. NSpOC) access and cooperation with industry, and particularly UK space operators, is essential.

- **How can the Ministry of Defence ensure that it attracts, develops and retains high calibre space specialists in both policy and operational roles?** To ensure MoD, and wider government, maintains knowledgeable and competent technical specialists, it is essential to provide roles that offer suitable career progression opportunities and have unwavering support from the organisation from which they are in. In particular, the application of the 'civil service generalist' to these roles should be abandoned. Whilst money is always going to be a factor (and govt needs to ensure that the benefits at least come close to rivalling commercial), the challenges, interesting projects and doing work that is not just about 'getting the next commercial contract' can be enough providing that progression and support is there. There are good examples in government where intentions to build and maintain high calibre space specialists were thwarted by poor pay, lack of support and no career opportunities, significantly curtailing the ability to have a credible technical voice in the community. This is especially the case for space and defence.