

Capability Areas		Areas	Description
Satellite Communications		Defence User Segment	High-integrity user terminals and equipment, including <b>terminal hybridisation</b> , also enabling bearer diversity and greater efficiencies in size, weight, and power. Assured user segment PNT technologies including <b>global navigation satellite system receivers</b> . MOD will also need <b>assured anti-jam capabilities</b> – the ability to generate or receive precise timing when terminal is prevented from receiving global positioning system data.
		Antennas, Receivers and Electronic Scanners	Access to a UK source of resilient, high performing space-based antennas and receivers is essential to assured space capability. <b>Electronically scanned array systems, with beamforming, shaping and null generation capabilities</b> are of particular interest. Whilst optimisation of these capability for X-band and KA-Band activity is likely to have the broadest utility to Defence, other frequencies are not discounted. Highly assured <b>large aperture or high gain systems</b> are likely to have niche application.
		Inter-satellite Links	<b>Resilient Inter-satellite Link System (ISL)</b> are an essential underwriting component of space infrastructure, including <b>electro-optical and radiofrequency</b> . Defence has a need for ISLs which are hardened against dazzling and other forms of interference, and for which the overall integrity of the ISL system against supply chain interference can be assured.
Space Domain Awareness		Software reconfigurable onboard process	There is a demand for critical processing technology which is <b>reconfigurable and resilient on-orbit</b> to be available to Defence from an on-shore supply base. MOD is particularly interested in reconfigurable processing for data traffic routing, and the generation of waveforms. <b>On-board edge processing and algorithmic development</b> that are enabled by reducing the size, weight, and power ratio processing, will allow us to transport data and information at a time of relevance.
		Tracking Telemetry & Control	Tracking, Telemetry and Control (TT&C) is fundamental to all space operations. Defence will continue to require robust <b>UK cryptography</b> solutions and <b>jamming protection</b> for our TT&C links across all orbital regimes.
		Robust threat and hazard mitigation	On space platforms, assurance measures include prevention measures, and engineering a system to be <b>robust</b> (resistant to some threats), <b>resilient</b> (promptly recovering from other threats) or <b>with redundancy</b> (maintain options unaffected by specific threats). We seek to develop technologies which: assist in threat attribution, stealthy operations and active defence and deterrence measures; to further harden our assets against radiation and electro-magnetic interference; to mitigate against the risk of laser dazzling and countermeasures; to understand and counter activity in the radio-frequency spectrum and to provide capabilities which will allow us to manoeuvre rapidly and regularly. We also seek protection against dazzle and countermeasures for electro-optic and hyperspectral sensors.
Intelligence, Surveillance & Reconnaissance		Assembly, Test & Integration	The capacity to integrate a wide variety of components in an assured way within a larger system is critical in enabling MOD access the wider market and deliver cutting edge capabilities. Threat-based environmental testing at sub system and component level will be critical to being able to understand the risk we face from evolving counter-space technologies. Performing space system integration in the UK is a key route to ensuring capability protection. Just as critical is being able to test and evaluate the performance of these integrated systems in a secure environment. This capacity will be particularly important in the test and evaluation of <b>electro-optical and radio-frequency protective measures</b> , as well as sensor performance and resilience.
		Space Control	Software

<b>Position, Navigation and Timing</b>		<b>Sensors</b>	<p>Sensors, both ground and space based, are critical for space operations. MOD requires access to assured UK terrestrial capabilities in <b>radar system integration</b>, and passive radio-frequency sensing, and will also seek access to sensors which enhance our understanding of space environment, hazards and threats including those which will need to be placed in-orbit. <b>Defences sensor mix</b> requirement will continually evolve, informed by threat and intelligence requirement.</p>
		<b>Time transfer through space and Timing Capability</b>	<p>There is a sovereign requirement for a timing capability including the ability to transfer time through space. While not space-based, as part of this there is also the requirement of timing technology, such as <b>atomic and quantum clocks</b> and the broader development of <b>quantum technology</b>.</p>
		<b>Alternative Navigation Technologies (AltNav)</b>	<p>Alternative Navigation (AltNav) technologies are required to provide an alternative PNT solution to global navigation satellite systems and enhance the UK's resilience. This will include space-based AltNav technologies, such as <b>satellite signals of opportunity, terrestrial satellite signals of opportunity, image based odometry and image based scene matching</b>.</p>

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