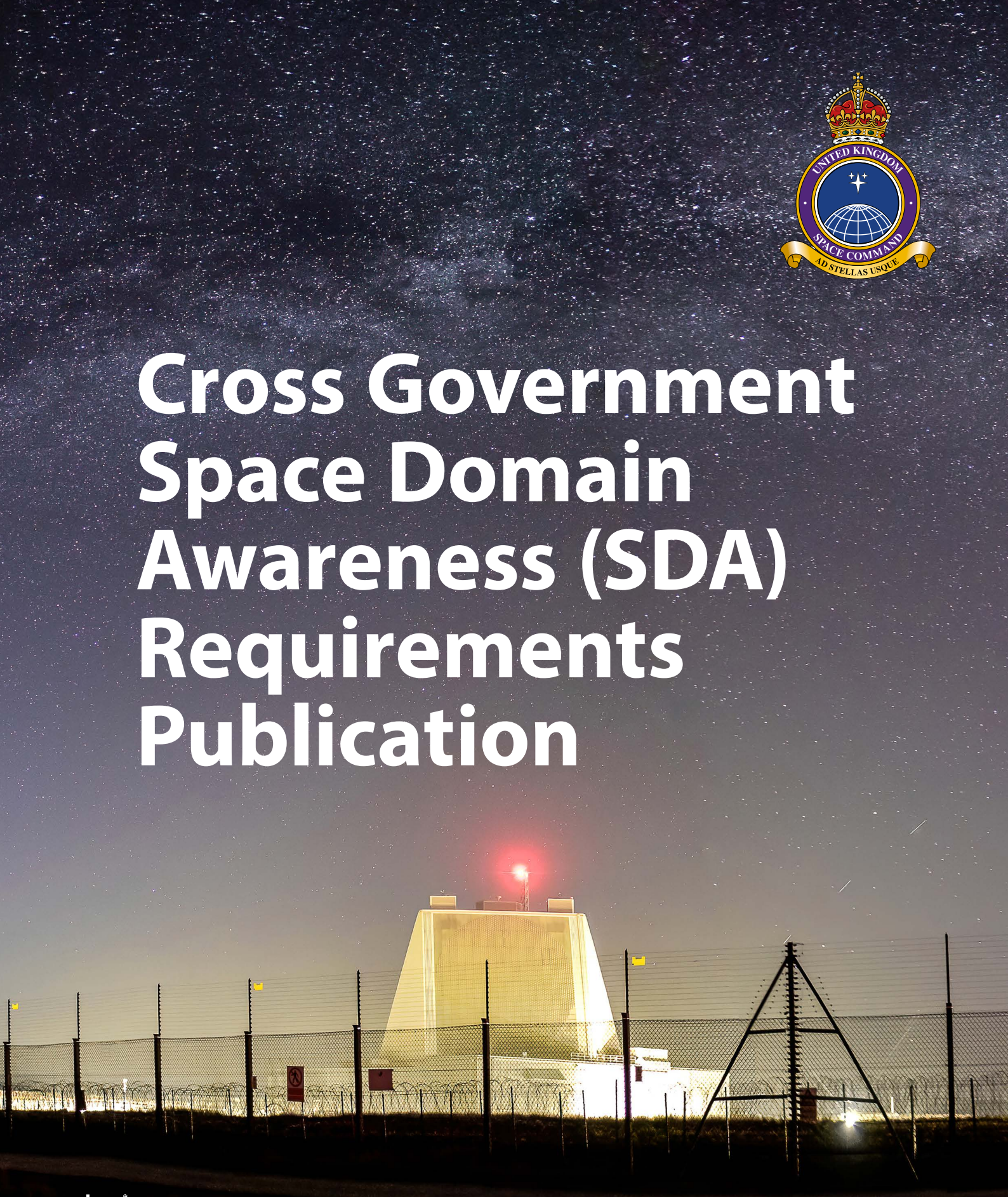
# Cross Government Space Domain Awareness (SDA) Requirements Publication



Ministry of Defence

UK SPACE AGENCY

# Contents



**The following requirements are for transparency only to inform industry of potential future requirements for the Government Space sector. It must not be construed that a tender or contract will necessarily be forthcoming.**

## Introduction

The UK National and Defence Space Strategies (NSS and DSS) were published in 2021 and 2022 respectively and state the UK's ambitions with respect to the Space domain, providing clear strategic direction to deliver improved Space Domain Awareness (SDA). The strategies also highlight the importance of working across civil and defence sectors with a single integrated approach. UK Space Command and the UK Space Agency (UKSA) are working closely to progress towards the stated aims particularly delivery of the National Space Operations Centre (NSpOC). As part of this broader programme, SDA will be delivered via a system of systems approach, making full use of opportunities to work with international partners and purchase off the shelf solutions which complement our national capabilities, whilst protecting our sensitive data and continuing to provide capability assurance. This approach will be underpinned by a set of cross-government SDA requirements which have been developed by MOD and UKSA in partnership with various stakeholders across government. The baseline requirements are detailed within this document as described below.

## Domain Overview

The Space domain has become increasingly congested and complex requiring cross-government agencies to utilise space surveillance and tracking techniques in order to detect, track and identify objects in or entering the space domain. SDA is defined in Joint Doctrine Publication 0-40[1] as 'the provision of security-focused, decision-quality information that can be used to successfully mitigate adversary space effects while supporting the integration of allied space effects into multi-domain operations'. The intent is to combine individual sensors through a system of systems approach to draw data from a variety of capabilities and fuse it with operational and intelligence sources to underpin the analysis of activities in space and provide true domain awareness. Encompassing space, ground and link segments, SDA is complex and rapidly evolving, however, the endeavour is inherently dual use with the same sensor data potentially being suitable for a multitude of functions.

## Cross-Government SDA Requirements

The initial baseline set of UK SDA Requirements are in Annexes A & B. These have been generated and reviewed by key cross-government stakeholders. These requirements are not yet exhaustive and do not capture the entire space domain awareness chain and are therefore subject to change and will be regularly reviewed and expanded to reflect the changing nature of the operating domain. **Annex A** sets out the operational user requirements covering areas such as orbital events assessment, conjunction analysis and space object characterisation. **Annex B** contains the systems requirements and is more technical in nature and baselines the current view of what the cross-government space enterprise requires from the systems of systems. Specific system requirements are identified in terms of orbital regimes, object size detection criteria, sensor revisit rates, resolvable separation distance, etc. The aim is to present requirements in a logical, easy to read format that clearly articulates the user and system needs. **Annex C** provides a glossary of the acronyms and definitions to assist in breaking down unfamiliar terminology.

## Summary

In line with NSS and DSS, a cross-government approach has been utilised to establish a baseline set of SDA requirements to underpin a dual-use, civil and military SDA system of systems. These will be subject to regular review, and shared where possible, to keep pace with operational and technological advances in a rapidly changing domain. More detailed subsets of these requirements will be made available via appropriate commercial routes as part of procurements for elements of the SDA system of systems.

[1] JDP 0-40 – UK Space Power, Sep 22

# Annex A – UK Space Domain Awareness Requirements – User Requirements

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-UR-100** | **UK Spacecraft Licensing** | Verify adherence of UK-licenced spacecraft (HMG and commercial-owned) to licence conditions as follows: |
| UKSDA-UR-101 | | - To support validation of long term de/re-orbit simulations |
| UKSDA-UR-102 | | - To enable assessment of compliance with space debris mitigation lifetime requirements |
| UKSDA-UR-103 | | - To support re-entry analysis; prediction, survivability, impact area, risk assessment |
| UKSDA-UR-104 | | - To support the verification of passivation procedures |
| UKSDA-UR-105 | | - To support monitoring of the radio spectrum for compliance and interference with respect to spectrum compliance dependency on orbital position of the object |
| **UKSDA-UR-200** | **Conjunction Assessment** | Support the identification and assessment of potential conjunctions, and in particular Collision on Launch Assessment (COLA) of spacecraft launched from UK spaceports |
| **UKSDA-UR-300** | **Orbital Events Assessment** | Understand the origins of orbital events to allow assessment of cause and attribution of fault/cause |
| **UKSDA-UR-400** | **Space Environment Sustainability** | Ensure sustainability of the space environment and strengthen the UK's reputation as a responsible space-faring nation, providing the UK with the evidence and expertise to inform and influence international technical standards and guidelines |
| **UKSDA-UR-500** | **Risk Assessment** | Provide adequate and appropriate risk assessment, of both on-ground and in-space risks as per sub-requirements |
| UKSDA-UR-501 | | - Assess terrestrial risks to life, property, public health, and the environment from current and potential UK-licenced RSOs |
| UKSDA-UR-502 | | - Assess on-orbit risks to life, property, and the environment from current and potential UK-licenced RSOs |
| UKSDA-UR-503 | | - Assess terrestrial risks to UK life, property, public health and the environment from orbital debris and other nation's RSOs |
| UKSDA-UR-504 | | - Assess on-orbit risks to UK life, property and the environment from orbital debris and other nation's RSOs |
| UKSDA-UR-505 | | - Provide timely information to reduce the risk from orbital hazards to UK Government owned space-based Critical National Infrastructure (CNI) or UK-licenced RSOs e.g., provision of conjunction warning and fragmentation break-up information |
| UKSDA-UR-506 | | - Assess the terrestrial risk to life, property, public health, and the environment from UK launch activities |
| **UKSDA-UR-600** | **Dual Use Applications** | Provide dual use capabilities/applications to enable the ability for UK users to concurrently exploit both Civilian and Military applications and capacity for those providing and/or requiring SST data |
| **UKSDA-UR-700** | **Collaboration Policies** | Foster and develop appropriate international collaboration and data sharing policies |
| **UKSDA-UR-800** | **Independent UK SST data and assurance capabilities** | Build independent UK SST data and assurance capabilities, e.g. through independent sensor capability, and direct data acquisition rights from non-UK assets |
| **UKSDA-UR-900** | **Independent UK SST national capabilities & skills** | Build independent UK SST national capabilities, e.g. through development of national skills, expertise growth in SST data analytics, and national software capabilities |
| **UKSDA-UR-1000** | **Protect & Defend** | Protect & Defend nominated and critical UK space assets |
| UKSDA-UR-1001 | | - Enhance understanding of the threats and hazards in, from and through space |
| UKSDA-UR-1002 | | - Deliver high-quality information and intelligence in real time from space |
| UKSDA-UR-1003 | | - Deliver and support a series of constellations of novel sensors to track targets to earth |
| UKSDA-UR-1004 | | - Understand design and field technologies |
| **UKSDA-UR-1100** | **Operational Space Picture** | Enable the development of a high-quality operational space picture, to enable decision-making by the Military and Other Government Departments |
| **UKSDA-UR-1200** | **Payload Deployment (UK Launches)** | Provide confirmation of payload deployment where UK holds liability, with timely identification of objects prioritised for UK registered and/or launched objects |
| **UKSDA-UR-1300** | **Rendezvous Proximity Operations (RPO)** | Enable detection, tracking, identification and characterisation of Rendezvous and Proximity Operations (RPO), incl. In-Orbit Servicing Operations, and Debris Removal Operations |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-UR-1400** | **Space Object Characterisation** | Enable object characterisation, including characterisation of cooperative and non-cooperative RSOs |
| **UKSDA-UR-1500** | **Warning Enabling Services** | Ensure that the appropriate UK Users continue to have access to existing space and services for the provision of extant Warning Enabling Services as required, which include but is not limited to the following:<br>- Direct Ascent ASAT Warning (incl. GEO)<br>- Catalogue Maintenance<br>- International Treaty Obligations |

# Annex B – UK Space Domain Awareness Requirements – System of System Requirements

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-SR-100** | **Licence Adherence** | The SST system shall support the analysis of adherence to licence conditions for UK licenced spacecraft and any other applicable tasks |
| UKSDA-SR-101 | | - Validation of long term de/re-orbit simulations |
| UKSDA-SR-102 | | - Enable assessment of compliance with space debris mitigation lifetime requirements |
| UKSDA-SR-103 | | - Support re-entry analysis; prediction, survivability, impact area, risk assessment |
| UKSDA-SR-104 | | - Support the verification of passivation procedures |
| UKSDA-SR-105 | | - Support monitoring of the radio spectrum for compliance and interference with respect to spectrum compliance dependency on orbital position of the object |
| **UKSDA-SR-200** | **Conjunction Assessment** | The SST system shall support Conjunction Assessment, including Collision on Launch Assessment (COLA) for UK launch |
| **UKSDA-SR-300** | **Event Refinement** | The SST system shall be capable of high interest event refinement e.g., conjunctions, re-entry, RPO |
| **UKSDA-SR-400** | **Event Notifications** | The SST system shall be capable producing notifications of satellites which have (or are about to) violate their orbital slot allocation, as well as high interest event and conjunction warnings for objects for which the UK is a stakeholder |
| **UKSDA-SR-500** | **Warnings** | The SST system shall provide warnings, including re-entry, RPO, collision and fragmentation warnings, and supports report generation of any RSO re-entry that could affect the UK and/or overseas territories |
| **UKSDA-SR-600** | **Manoeuvre Planning** | The SST system shall be capable of manoeuvre planning and optimisation primarily for conjunction avoidance, although the capability should have the capacity to be utilised for other purposes as required |
| **UKSDA-SR-700** | **Object Size Detection** | The SST system shall be capable of sufficient RSO size detection in all orbits of interest to enable maintenance of SDA |
| UKSDA-SR-701 | | The SST system shall be capable of sufficient RSO size detection to maintain SDA in LEO |
| UKSDA-SR-702 | | The SST system shall be capable of sufficient RSO size detection to maintain SDA in MEO |
| UKSDA-SR-703 | | The SST system shall be capable of sufficient RSO size detection to maintain SDA in HEO |
| UKSDA-SR-704 | | The SST system shall be capable of sufficient RSO size detection to maintain SDA in GEO |
| UKSDA-SR-705 | | The SST system shall be capable of sufficient RSO size detection to maintain SDA in BEO |
| **UKSDA-SR-800** | **Object Track Association** | The system shall enable RSO observation to track association |
| UKSDA-SR-801 | | The SST data shall associate each RSO observation with a specific track |
| UKSDA-SR-802 | | The SST data shall assign each RSO observation a probability of association against each potential track |
| UKSDA-SR-803 | | The SST data shall associate each RSO observation/track with a specific catalogued RSO or support creation of a new catalogue entry |
| UKSDA-SR-804 | | The SST data shall assign each observation/track a probability of association against each potential catalogued RSO or new entry |
| UKSDA-SR-805 | | The SST data shall include UCTs where observation/track to catalogued RSO association fails |
| UKSDA-SR-806 | | The SST system shall be capable of track-to-track correlation of UCTs |
| **UKSDA-SR-900** | **Data Time Stamp** | The SST data shall be timestamped with sufficient accuracy and precision for all orbits of interest |
| UKSDA-SR-901 | | The SST data shall be timestamped with sufficient accuracy and precision for LEO |
| UKSDA-SR-902 | | The SST data shall be timestamped with sufficient accuracy and precision for MEO |
| UKSDA-SR-903 | | The SST data shall be timestamped with sufficient accuracy and precision for HEO |
| UKSDA-SR-904 | | The SST data shall be timestamped with sufficient accuracy and precision for GEO |
| UKSDA-SR-905 | | The SST data shall be timestamped with sufficient accuracy and precision for BEO |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-SR-1000** | **Object Surveillance** | The SST system shall be capable of providing surveillance on all RSOs that can be detected by the system for SSA and SDA purposes |
| UKSDA-SR-1001 | | The SST system shall be capable of providing surveillance of all detectable and identifiable RSOs in LEO |
| UKSDA-SR-1002 | | The SST system shall be capable of providing surveillance of all detectable and identifiable RSOs in MEO |
| UKSDA-SR-1003 | | The SST system shall be capable of providing surveillance of all detectable and identifiable RSOs in HEO |
| UKSDA-SR-1004 | | The SST system shall be capable of providing surveillance of all detectable and identifiable RSOs in GEO |
| UKSDA-SR-1005 | | The SST system shall be capable of providing surveillance of all detectable and identifiable RSOs in BEO |
| **UKSDA-SR-1100** | **Object Tracking** | The SST system shall be capable of tracking all detectable RSOs for SSA and SDA purposes |
| UKSDA-SR-1101 | | The SST system shall track all detectable RSOs in LEO |
| UKSDA-SR-1102 | | The SST system shall track all detectable RSOs in MEO |
| UKSDA-SR-1103 | | The SST system shall track all detectable RSOs in HEO |
| UKSDA-SR-1104 | | The SST system shall track all detectable RSOs in GEO |
| UKSDA-SR-1105 | | The SST system shall track all detectable RSOs in BEO |
| **UKSDA-SR-1200** | **Revisit Rate (High Priority)** | The SST data shall have sufficient minimum revisit rates for High Priority RSOs in all orbits of interest to enable SDA |
| UKSDA-SR-1201 | | The SST data shall have sufficient minimum revisit rates for high priority RSOs in LEO |
| UKSDA-SR-1202 | | The SST data shall have sufficient minimum revisit rates for high priority RSOs in MEO |
| UKSDA-SR-1203 | | The SST data shall have sufficient minimum revisit rates for high priority RSOs in HEO |
| UKSDA-SR-1204 | | The SST data shall have sufficient minimum revisit rates for high priority RSOs in GEO |
| UKSDA-SR-1205 | | The SST data shall have sufficient minimum revisit rates for high priority RSOs in BEO |
| **UKSDA-SR-1300** | **Revisit Rate (Routine Priority)** | The SST data shall have sufficient minimum revisit rates for Routine Priority RSOs in all orbits of interest to enable SDA |
| UKSDA-SR-1301 | | The SST data shall have sufficient minimum revisit rates for routine priority RSOs in LEO |
| UKSDA-SR-1302 | | The SST data shall have sufficient minimum revisit rates for routine priority RSOs in MEO |
| UKSDA-SR-1303 | | The SST data shall have sufficient minimum revisit rates for routine priority RSOs in HEO |
| UKSDA-SR-1304 | | The SST data shall have sufficient minimum revisit rates for routine priority RSOs in GEO |
| UKSDA-SR-1305 | | The SST data shall have sufficient minimum revisit rates for routine priority RSOs in BEO |
| **UKSDA-SR-1400** | **24-hour coverage** | The SST data shall comprise sensing data covering both day and night-time to enable both tracking and characterisation |
| **UKSDA-SR-1500** | **Resolvable Separation Distance** | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in all orbits of interest |
| UKSDA-SR-1501 | | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in LEO |
| UKSDA-SR-1502 | | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in MEO |
| UKSDA-SR-1503 | | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in HEO |
| UKSDA-SR-1504 | | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in GEO |
| UKSDA-SR-1505 | | The SST system shall be capable of identifying and independently tracking all closely spaced RSOs in BEO |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-SR-1600** | **Launch & Ballistic Tracking** | The SST system shall be capable of tracking launch and ballistic activities (such as sub-orbital vehicles etc.) |
| **UKSDA-SR-1700** | **SST Data Capability (Dataset Management)** | The SST system shall enable the optimisation of collected data from various data sources and data products to ensure efficient and effective exploitation and management of current and potential datasets |
| **UKSDA-SR-1800** | **SST System Capability (Independence)** | The SST system shall consist of UK-owned sensors to provide additional data and security resilience by reducing the UK dependency on other nations e.g., existing US provision of SST capabilities |
| **UKSDA-SR-1900** | **SST System Capability (Resilience)** | The SST system shall be resilient to single-point failures |
| **UKSDA-SR-2000** | | The SST system and all individual hardware and software elements shall be designed to fail elegantly, i.e., telescope domes should close upon failure, etc. |
| **UKSDA-SR-2100** | | Upon failure, the SST system shall be repaired within a sufficient timeframe in accordance with individual sensor requirements |
| **UKSDA-SR-2200** | **Sensor Redundancy** | The SST data shall utilise a redundant sensor coverage approach to militate against sensor failure |
| **UKSDA-SR-2300** | **SST System Capability (Assurance)** | The SST system shall consist of UK-owned sensors to provide enhanced data assurance by enabling additional UK prioritised and trusted data sources to be made available in a timelier manner |
| **UKSDA-SR-2400** | **Data Goverance** | The SST system shall provide multi-user (Civilian, Military and Commercial) data access from a single source via a central data repository e.g., UK National Space Operations Centre (NSpOC) and a shared software capability e.g., an overlapping or partially shared software solution with distinct user specific capabilities identified |
| UKSDA-SR-2401 | | The central data repository shall be scalable and flexible |
| UKSDA-SR-2402 | | The central data repository shall be capable of storing historical archival data |
| UKSDA-SR-2403 | | The central data repository shall be capable of storing UCTs for 7 days, after which time the UCT will be removed from the repository |
| **UKSDA-SR-2500** | **Data Classification** | Data shall be held at the lowest possible classification and primarily disseminated at no more than OFFICIAL level with higher classification data products available on request |
| **UKSDA-SR-2600** | **Data Dissemination** | Data shall be delivered to the central data repository with an appropriate Interface Control Document. |
| **UKSDA-SR-2700** | | SST data shall be tagged with appropriate sharing rules/restrictions to enable maximum sharing without commercial/classification compromise |
| **UKSDA-SR-2800** | **Data Fusion** | The SST system shall be able to fuse multiple data types from various trusted and non-assured data sources (both UK-internal and external) as required |
| **UKSDA-SR-2900** | **Data Compatibility (Data Ingest)** | The SST system shall be able to ingest data from all contributing sensors and all common data formats |
| **UKSDA-SR-3000** | **Data Formats** | Appropriate data formats standards shall be used for data generated by or for the SST system |
| UKSDA-SR-3100 | | The SST Orbit Data Message (ODM) shall be delivered in a standardised CCSDS format |
| UKSDA-SR-2900 | | The SST Tracking Data Message (TDM) shall be delivered in a standardised CCSDS format |
| UKSDA-SR-2900 | | The SST Conjunction Data Message (CDM) shall be delivered in a standardised CCSDS format |
| **UKSDA-SR-3100** | **Uncertainty Data** | The SST data shall always include appropriate uncertainty data (such as covariance for tracking or magnitude uncertainty for photometry) as required and where practical |
| **UKSDA-SR-3200** | **Data Compatibility (Observation Data)** | The SST system shall be able to utilise observation data that includes sensor biases and accuracy and in turn produce data including precision and accuracy |
| **UKSDA-SR-3300** | **Agility** | The SST system shall utilise an agile data delivery approach (push/pull) for maximum utility. The output type shall be user configurable based on mission needs |
| **UKSDA-SR-3400** | **Flexible Tasking** | The SST system shall have flexible tasking capabilities based on user and mission priorities |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| **UKSDA-SR-3500** | **Tasking Notice** | The SST system shall be capable of being tasked within a required timeframe |
| **UKSDA-SR-3600** | **Data Delivery Latency** | The SST system shall deliver the required data within a required timeframe |
| **UKSDA-SR-3700** | **Attribution** | The SST system shall support and report on the attribution process for unforeseen events in space (whether accidental, irresponsible, or nefarious) |
| **UKSDA-SR-3800** | **System Automation** | The SST system shall be optimised with automated workflows; however, human intervention shall remain possible across the data chain, from sensor tasking through to data interpretation |
| **UKSDA-SR-3900** | **Human Consumption** | The SST system shall produce human readable actionable data products to enable context to be analysed and processed prior to going to UK CO/Ministers |
| **UKSDA-SR-4000** | **Public Utilisation** | The SST system shall produce outputs capable of public consumption by a non-space specialist, e.g. pictorial visualisations of orbital events |
| **UKSDA-SR-4100** | **Adaptability** | The SST system shall be easily reconfigurable and scalable |
| **UKSDA-SR-4200** | **Space-Based Data** | The SST system shall be compatible with space-based data sources |
| **UKSDA-SR-4300** | **Calibration** | The SST system sensors shall be regularly calibrated to quantitatively assess and improve data accuracy |
| **UKSDA-SR-4400** | | The SST data shall comprise sensor calibration data, at a minimum precision bias |
| **UKSDA-SR-4500** | **Cross-cueing** | The SST system shall be capable of cross-cueing of different sensors in the system |
| **UKSDA-SR-4600** | **Characterisation Data Types** | The SST data shall comprise data collected at multiple simultaneous frequencies from the same location (to enable satellite characterisation) |
| **UKSDA-SR-4700** | | The SST data shall comprise data collected at multiple simultaneous polarisations from the same location (to enable satellite characterisation) |
| **UKSDA-SR-4800** | | The SST data shall comprise data collected simultaneously from multiple locations (to enable satellite characterisation) |
| **UKSDA-SR-4900** | | The SST data shall comprise calibrated time-series photometry data to enable satellite characterisation |
| **UKSDA-SR-5000** | | The SST data shall comprise time-series multi-band photometry to enable satellite characterisation |
| **UKSDA-SR-5100** | | The SST data shall comprise hyperspectral observations to enable satellite characterisation |
| **UKSDA-SR-5200** | | The SST data shall comprise high resolution spectroscopic data to enable satellite characterisation |
| **UKSDA-SR-5300** | | The SST data shall comprise of unresolved time-series medium wave (~5 micron) infrared observations to enable thermal satellite characterisation |
| **UKSDA-SR-5400** | | The SST data shall comprise of unresolved time-series multi-band infrared observations to enable thermal satellite characterisation |
| **UKSDA-SR-5500** | | The SST data shall comprise of resolved single-band infrared observations to enable thermal satellite characterisation |
| **UKSDA-SR-5600** | | The SST data shall comprise of resolved multi-wave infrared observations to enable thermal satellite characterisation |
| **UKSDA-SR-5700** | **Resolved Imagery** | The SST data shall comprise resolved imagery to enable satellite characterisation |
| UKSDA-SR-5701 | | The SST data shall comprise of resolved imagery at sufficient resolution to enable characterisation of RSOs in LEO |
| UKSDA-SR-5702 | | The SST data shall comprise of resolved imagery at sufficient resolution to enable characterisation of RSOs in MEO |
| UKSDA-SR-5703 | | The SST data shall comprise of resolved imagery at sufficient resolution to enable characterisation of RSOs in HEO |
| UKSDA-SR-5704 | | The SST data shall comprise of resolved imagery at sufficient resolution to enable characterisation of RSOs in GEO |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| UKSDA-SR-5705 | | The SST data shall comprise of resolved imagery at sufficient resolution to enable characterisation of RSOs in BEO |
| **UKSDA-SR-5800** | **RF MASINT** | The SST data shall comprise RF MASINT to enable satellite characterisation |
| **UKSDA-SR-5900** | **RF Data** | Data from Passive RF collection shall include Time Difference of Arrival (TDOA) |
| **UKSDA-SR-6000** | | Data from Passive RF collection shall include Frequency Difference of Arrival (FDOA) |
| **UKSDA-SR-6100** | | Data from Passive RF collection shall include Phase Difference of Arrival (PDOA) |
| **UKSDA-SR-6200** | | Data from Passive RF collection shall include Centre Frequency |
| **UKSDA-SR-6300** | | Data from Passive RF collection shall include Bandwidth |
| **UKSDA-SR-6400** | | Data from Passive RF collection shall include Signal to Noise Ratio (SNR) |
| **UKSDA-SR-6500** | | Data from Passive RF collection shall include Encoding |
| **UKSDA-SR-6600** | | Data from Passive RF collection shall include Doppler Curve |
| **UKSDA-SR-6700** | | Data from Passive RF collection shall include Data Rate |
| **UKSDA-SR-6800** | | Data from Passive RF collection shall include Spectral Density |
| **UKSDA-SR-6900** | | Data from Passive RF collection shall include Carrier Behaviour (CW, hopped, spread) |
| **UKSDA-SR-7000** | **RF Bands** | Passive RF SST data shall cover the following frequency ranges defined by CCSDS standard for spacecraft telemetry: |
| UKSDA-SR-7001 | | - C |
| UKSDA-SR-7002 | | - Ku |
| UKSDA-SR-7003 | | - X |
| UKSDA-SR-7004 | | - Ka |
| UKSDA-SR-7005 | | - L |
| UKSDA-SR-7006 | | - S |
| UKSDA-SR-7007 | | - UHF |
| UKSDA-SR-7008 | | - E |
| UKSDA-SR-7009 | | - VHF |
| UKSDA-SR-7010 | | - Q |
| UKSDA-SR-7011 | | - V |
| **UKSDA-SR-7100** | **Conjunction Risk** | The SST data shall report conjunction probabilities for all conjunction events for RSOs in all orbits of interest |
| UKSDA-SR-7101 | | The SST data shall report conjunction probabilities for all conjunction events for RSOs in LEO |
| UKSDA-SR-7102 | | The SST data shall report conjunction probabilities for all conjunction events for RSOs in MEO |
| UKSDA-SR-7103 | | The SST data shall report conjunction probabilities for all conjunction events for RSOs in HEO |
| UKSDA-SR-7104 | | The SST data shall report conjunction probabilities for all conjunction events for RSOs in GEO |
| UKSDA-SR-7105 | | The SST data shall report conjunction probabilities for all conjunction events for RSOs in BEO |
| **UKSDA-SR-7200** | | The SST data shall report miss distances for all conjunction events for RSOs in all orbits of interest |
| UKSDA-SR-7201 | | The SST data shall report miss distances for all conjunction events for RSOs in LEO |
| UKSDA-SR-7202 | | The SST data shall report miss distances for all conjunction events for RSOs in MEO |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| UKSDA-SR-7203 | | The SST data shall report miss distances for all conjunction events for RSOs in HEO |
| UKSDA-SR-7204 | | The SST data shall report miss distances for all conjunction events for RSOs in GEO |
| UKSDA-SR-7205 | | The SST data shall report miss distances for all conjunction events for RSOs in BEO |
| **UKSDA-SR-7300** | **Object Characterisation** | The SST system shall be capable of detecting and characterising all detectable RSOs for SSA and SDA purposes, which shall include, but not be limited to, the following for all orbital regimes of interest: |
| UKSDA-SR-7301 | | - Object Active/Inactive |
| UKSDA-SR-7302 | | - Status Change Detection |
| UKSDA-SR-7303 | | - Rotation Rate & Axis |
| UKSDA-SR-7304 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7305 | | - Attitude Determination |
| UKSDA-SR-7306 | | - Mass |
| UKSDA-SR-7307 | | - Physical Dimensions |
| UKSDA-SR-7308 | | - Material Properties (e.g. Albedo) |
| UKSDA-SR-7309 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7310 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7311 | | - Satellite Payload Identification |
| UKSDA-SR-7312 | | - Capability Assessment |
| UKSDA-SR-7313 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7314 | | - Fault/Anomaly Detection |
| UKSDA-SR-7315 | | - Payload Activity |
| UKSDA-SR-7316 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7400** | **Object Characterisation (LEO Latency)** | The SST system shall provide characterisation of LEO RSOs at a sufficient rate for the following tasks: |
| UKSDA-SR-7401 | | - Object Active/Inactive |
| UKSDA-SR-7402 | | - Status Change Detection |
| UKSDA-SR-7403 | | - Rotation Rate & Axis |
| UKSDA-SR-7404 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7405 | | - Attitude Determination |
| UKSDA-SR-7406 | | - Mass |
| UKSDA-SR-7407 | | - Physical Dimensions |
| UKSDA-SR-7408 | | - Material Properties (e.g. Albedo) |
| UKSDA-SR-7409 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7410 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7411 | | - Satellite Payload Identification |
| UKSDA-SR-7412 | | - Capability Assessment |
| UKSDA-SR-7413 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7414 | | - Fault/Anomaly Detection |
| UKSDA-SR-7415 | | - Payload Activity |
| UKSDA-SR-7416 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7500** | **Object Characterisation (MEO Latency)** | The SST system shall provide characterisation of MEO RSOs at a sufficient rate for the following tasks: |
| UKSDA-SR-7501 | | - Object Active/Inactive |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| UKSDA-SR-7502 | | - Status Change Detection |
| UKSDA-SR-7503 | | - Rotation Rate & Axis |
| UKSDA-SR-7504 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7505 | | - Attitude Determination |
| UKSDA-SR-7506 | | - Mass |
| UKSDA-SR-7507 | | - Physical Dimensions |
| UKSDA-SR-7508 | | - Material Properties (e.g. Albedo) |
| UKSDA-SR-7509 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7510 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7511 | | - Satellite Payload Identification |
| UKSDA-SR-7512 | | - Capability Assessment |
| UKSDA-SR-7513 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7514 | | - Fault/Anomaly Detection |
| UKSDA-SR-7515 | | - Payload Activity |
| UKSDA-SR-7516 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7600** | **Object Characterisation (HEO Latency)** | The SST system shall provide characterisation of HEO RSOs at a sufficient rate for the following tasks: |
| UKSDA-SR-7601 | | - Object Active/Inactive |
| UKSDA-SR-7602 | | - Status Change Detection |
| UKSDA-SR-7603 | | - Rotation Rate & Axis |
| UKSDA-SR-7604 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7605 | | - Attitude Determination |
| UKSDA-SR-7606 | | - Mass |
| UKSDA-SR-7607 | | - Physical Dimensions |
| UKSDA-SR-7608 | | - Material Properties (e.g. Albedo) |
| UKSDA-SR-7609 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7610 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7611 | | - Satellite Payload Identification |
| UKSDA-SR-7612 | | - Capability Assessment |
| UKSDA-SR-7613 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7614 | | - Fault/Anomaly Detection |
| UKSDA-SR-7615 | | - Payload Activity |
| UKSDA-SR-7616 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7700** | **Object Characterisation (GEO Latency)** | The SST system shall provide characterisation of GEO RSOs at a sufficient rate for the following tasks: |
| UKSDA-SR-7701 | | - Object Active/Inactive |
| UKSDA-SR-7702 | | - Status Change Detection |
| UKSDA-SR-7703 | | - Rotation Rate & Axis |
| UKSDA-SR-7704 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7705 | | - Attitude Determination |
| UKSDA-SR-7706 | | - Mass |
| UKSDA-SR-7707 | | - Physical Dimensions |
| UKSDA-SR-7708 | | - Material Properties (e.g. Albedo) |

| ID | Requirement Heading | Requirement Description |
|---|---|---|
| UKSDA-SR-7709 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7710 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7711 | | - Satellite Payload Identification |
| UKSDA-SR-7712 | | - Capability Assessment |
| UKSDA-SR-7713 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7714 | | - Fault/Anomaly Detection |
| UKSDA-SR-7715 | | - Payload Activity |
| UKSDA-SR-7716 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7800** | **Object Characterisation (BEO Latency)** | The SST system shall provide characterisation of BEO RSOs at a sufficient rate for the following tasks: |
| UKSDA-SR-7801 | | - Object Active/Inactive |
| UKSDA-SR-7802 | | - Status Change Detection |
| UKSDA-SR-7803 | | - Rotation Rate & Axis |
| UKSDA-SR-7804 | | - Identification of Satellites (NORAD/COSPAR ID) |
| UKSDA-SR-7805 | | - Attitude Determination |
| UKSDA-SR-7806 | | - Mass |
| UKSDA-SR-7807 | | - Physical Dimensions |
| UKSDA-SR-7808 | | - Material Properties (e.g. Albedo) |
| UKSDA-SR-7809 | | - Conjunction Avoidance Capability Assessment |
| UKSDA-SR-7810 | | - Identification of Satellite Type/Class e.g. bus type |
| UKSDA-SR-7811 | | - Satellite Payload Identification |
| UKSDA-SR-7812 | | - Capability Assessment |
| UKSDA-SR-7813 | | - Orbital Changes and Manoeuvres |
| UKSDA-SR-7814 | | - Fault/Anomaly Detection |
| UKSDA-SR-7815 | | - Payload Activity |
| UKSDA-SR-7816 | | - Associated Signals (i.e., RF etc.) |
| **UKSDA-SR-7900** | **Characterisation Evidence** | All characterisation assessments shall be delivered with supporting data, evidence, and an estimate of accuracy |
| **UKSDA-SR-8000** | **Characterisation Delivery** | Characterisation results including confidence but not including evidence shall be provided within (see MOE) |
| **UKSDA-SR-8100** | | Characterisation results including confidence and evidence shall be provided within (see MOE) |
| **UKSDA-SR-8200** | **Data Products** | The SST data shall support the delivery of data products associated with the following: |
| UKSDA-SR-8201 | | - Conjunction Analysis |
| UKSDA-SR-8202 | | - Dispersion of Fragments |
| UKSDA-SR-8203 | | - Re-entry |
| UKSDA-SR-8204 | | - COLA |
| UKSDA-SR-8205 | | - RPO |
| UKSDA-SR-8206 | | - LEOP and IOC |
| UKSDA-SR-8207 | | - Orbital Transfer Support |
| UKSDA-SR-8208 | | - Manoeuvre Support |
| UKSDA-SR-8209 | | - Station Keeping |

# Annex C –
# Acronyms and Definitions

| Acronym | Definition | Additional Notes |
|---|---|---|
| **BEO** | Beyond Earth Orbit | Beyond Earth orbit is the region beyond GEO, bounded herein to within the solar system, but cis-lunar in the first instance |
| **CCSDS** | Consultative Committee for Space Data Systems | Committee that develops space standards |
| **CNI** | Critical National Infrastructure | Assets that are essential for the functioning of UK society and/or the economy |
| **COLA** | Collision on Launch Assessment | Orbital Downrange clearance, Note. US definition different |
| **GEO** | Geosynchronous Regime | Note. the use of GEO in requirements encompasses the various GEO regions and associated graveyard orbits as discussed below. |
| **GEO-Stat** | Geostationary Orbit | Equatorial Orbits at 35786km altitude |
| **GEO-Sync** | Geosynchronous Orbit | Geosynchronous orbits have a minimum altitude 35586km, and maximum altitude of 35986km, with maximum +-15 degrees inclination, as per IADC guidelines |
| **GEO-Incl** | Highly Inclined Geosynchronous Orbit | Geosynchronous orbits have a minimum altitude 35586km, and maximum altitude of 35986km, with minimum +-15 degrees inclination |
| **GEO-Grave** | Graveyard Orbits above Geosynchronous region | The graveyard region exists above Geosynchronous Orbits, extending from 35986km to 37000km |
| **HEO** | Highly Elliptical Orbit | Orbit whose eccentricity is greater than 0.25. Typically used for transfer orbits. An object in a HEO could pass through both LEO and GEO regions. |
| **IOC** | In-Orbit Commissioning | When the satellite goes through initial on-orbit tests, and enters service (i.e., when it starts its mission) |
| **LEO** | Low Earth Orbit | LEO is defined herein as an orbit where apogee and perigee are both within 2000km altitude |
| **LEOP** | Launch and Early Orbit Phase | LEOP covers the period from when an object is launched until it is commissioned (i.e., when it starts its mission) |
| **MEO** | Medium Earth Orbit | MEO is defined as the region between LEO and GEO, from 2000km to 35586km altitude |
| **MOE** | Measure of Effectiveness | Quantifies the results required from the system of systems, note not included with redacted requirements. |
| **Orbital Event** | Orbital Event | Orbital Events include Conjunction, Re-entry, Rendezvous and Proximity Operations, Active Debris Removal, In-Orbit Servicing and Manufacture, Fragmentation, Orbital Changes and Manoeuvres, Object Release, Object Change |
| **RPO** | Rendezvous and Proximity Operations | Rendezvous: matching the plane, altitude, and phasing of two (or more) satellites. Proximity operations: two (or more) satellites in roughly the same orbit intentionally performing some task or action. |
| **RSO(s)** | Resident Space Object(s) | A man-made object in space, excepting objects on ballistic trajectories |
| **SDA** | Space Domain Awareness | See JDP 0-40, https://www.gov.uk/government/publications/uk-space-power-jdp-0-40 |
| **SSA** | Space Situational Awareness | See JDP 0-40, https://www.gov.uk/government/publications/uk-space-power-jdp-0-40 |
| **SST** | Space Surveillance and Tracking | See JDP 0-40, https://www.gov.uk/government/publications/uk-space-power-jdp-0-40 |
| **UCT** | Uncorrelated Tracks | Where a series of observations have been correlated as belong to the same object, but that object has not yet been identified |

Produced by Air Media Centre, HQ Air Command. 4097_23AJ