Observe. Investigate. Innovate.

ACHIEVING SPACE DOMAIN AWARENESS

Raytheon
UK

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Building on RTX's proud legacy of shaping space exploration, Raytheon UK is developing the critical capabilities needed for end-to-end space domain awareness and understanding activities in Earth's orbit. We are a trusted partner of UK Space Agency and UK Ministry of Defence building British space capabilities.

We are leading the way in UK Space Domain Awareness (SDA) We understand the key components for effective SDA and the delivery of actionable information:

- Sensor capabilities able to provide high-quality observation data
- Timeliness, accuracy and trustworthiness of data and information
- Bespoke SDA software capabilities
- Data processing and analysis
- Collaboration and information sharing
- Understanding the outcomes, risk, and impact
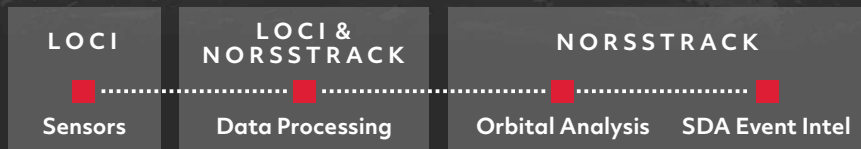
- Training and education
- Investment in technology, resources and R&D

Our systems are shaping a new age of Space Surveillance and Tracking (SST). Our ability to create and enhance systems with transformative, next generation technologies provide our customers with the necessary tools to address current and future threats. And we're making the domain more accessible by integrating commercial off-the-shelf and adaptable tech into our solutions, making space more affordable than ever.

Our wide ranging capabilities enable end-to-end SDA to ensure customers are supported at every stage of their activity, thus ensuring optimal decision-making.

Our global sensor network, bespoke software tools and leading analysts synergise to allow the rapid collection, processing and distribution of critical data to decision makers.

LOCI	LOCI & NORSSTRACK	NORSSTRACK	
▪······	▪······	▪······	▪
Sensors	Data Processing	Orbital Analysis	SDA Event Intel

SPACE BASED SPACE DOMAIN AWARENESS (SBSDA)

Raytheon UK SDA simulation technology enables you to model SST sensors, both on orbit and on the ground. Whether you're deploying global sensor networks, SST constellations or a single unique sensor, our technology enables you to forecast bespoke operational times and detection opportunities for specific Resident Space Objects (RSO) of interest and catalogue statistics for your optical, radar or any other SST sensor technology.

We can aid operations and mission planning by understanding your optical operational limitations and characterisation prospects. Our optical sensor simulators analyse RSO brightness predictions, illumination conditions and lunisolar disrupters for optimal SST operations. Our experts simulate your image plane to predict synthetic light curves to maximise characterisation data quality and collection frequency. Whether you are developing bespoke camera designs or repurposing on orbit payloads for an SBSDA application, Raytheon UK offers consultation and R&D services to optimise your hardware constraints and expand your systems' detection horizons.

Our bespoke sensor simulators can provide you with image recognition reinforcement to optimise your unique operational SST mission requirements including: revisit rates, detection ranges, satellite observation duration windows and maintaining persistent custody of tracked targets.

Mission simulation applications we support:

- **Space Based – Space Surveillance & Tracking:** surveying the space catalogue to optimise sensor hardware and maximise data output.

- **Active Debris Removal:** exploring the stability of debris.

- **Mission Extension Vehicle:** maintaining custody of target clients. And much more.

Raytheon UK Orbital Analysts can design and define bespoke simulations to ensure the success of your SBSDA prospects. We're experts in building solutions that meet the extraordinary standards required in and around space.
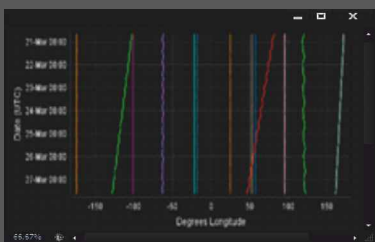
NORSSTRACK

Raytheon UK's NORSSTrack Space Domain Awareness software assesses events including re-entry, proximity operations, fragmentation, manoeuvre detection and collision risk assessment – all to help customers make better decisions.

Space Domain Visualisation
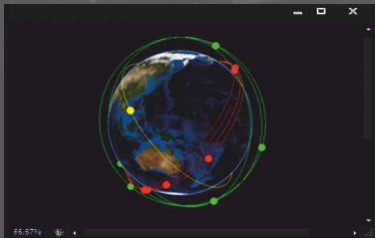
Data Processing

Lifetime Assessment

Developed to support both defence and civil missions, as well as to ensure spaceflight safety and sustainability, NORSSTrack enables analysis to be performed and outputs to be produced efficiently in operational environments. The software has been specifically designed to meet orbital analyst requirements, producing outputs in minimal steps to reduce training burdens and provide customers with key decision-making information that enables their timely response to events on orbit.

The NORSSTrack tool suite offers a variety of products and capabilities, including space domain visualisation; data processing; lifetime assessment; GEO Manoeuvre assessment; advanced re-entry analysis; conjunction analysis; satellite monitoring; fragmentation analysis; and sensor modelling.

Space Domain Visualisation (SDV)

Our NORSSTrack capability helps customers gain a much greater understanding of the space domain. Drawing data from a pre-defined database and/or uploaded directly by the user, we are able to visualise a comprehensive space picture quickly and easily. SDV is further enhanced with 2D mapping (including aerial views and population density mapping) and 3D visualisation.

Data Processing

Data processing is performed in-house where raw astrometric data is converted into critical space situational awareness information for input into analytical tools and software.

We offer a highly configurable model with different frames, propagators and force models. This acquired data determines timely positional information of assets, allowing for internal cataloguing of satellites in orbit. We also carry out data age assessments to identify sensor tasking priorities.

Our data is ingested in multiple internationally recognised formats, enabling effective collaboration with allies.

Lifetime Assessment

Lifetime assessment provides customers with customisable plotting of orbital elements for any objects over a user defined period. This type of space-control mission support ensures an understanding of common behaviour and allows the user to identify unusual or interesting activity.

NORSSTRACK SPACE DOMAIN AWARENESS SOLUTIONS

Raytheon UK's SDA software and services are supporting future spacecraft operations by enabling in-depth analysis of on orbit events, developed with the end user in mind. These capabilities are part of a suite of analytical tools and solutions provided by NORSSTrack that include:

GEO Manoeuvre Assessment

Commercial, civil and defence customers want to know where satellites are in orbit and what they're doing whilst there. To enhance understanding of object intent and overall SDA threat intelligence, NORSSTrack identifies and monitors manoeuvring objects, calculates drift rates, and times of close approaches to alert users to potential threats within and around the congested GEO belt. Users are notified when changes occur, ensuring operational resilience against unexpected on orbit behaviour.

Conjunction Analysis

NORSSTrack performs high-accuracy conjunction analysis on orbit, to understand risk to close proximity assets. Our system evaluates event history and Conjunction Data Messages to assess data quality. Sensitivity analysis of the collision probability is also carried out to understand true risk. Combining detailed computational models with configurable parameters to accurately assess objects of interest, NORSSTrack provides users with high-confidence results of collision probabilities and object missed distances, enabling informed operators to mitigate risk.

Fragmentation Analysis

By calculating origin, magnitudes and distribution of resultant debris clouds post impact, NORSSTrack performs large-scale propagation of fragments to determine the orbital evolution and the new risk the resulting debris fragments create, over time, for the surrounding environment. We can simulate hypothetical and real-world fragmentation events, such as ASAT testing. By screening simulated fragments against neighbouring satellites, users gain a comprehensive understanding of a breakup event and subsequent impact on other RSOs in the vicinity.

Satellite Analysis

A satellite operator often requires support to monitor elements of their object's activity on orbit and the surrounding area. Objects are monitored periodically for change detection, including: orbital elements' rate of change; data frequency/loss (alerts triggered by configurable risk thresholds); and new object identification.

Re-Entry Analysis

We provide users with a Monte Carlo approach to re-entry analysis, producing probability distributions of potential re-entry locations and times. We also visualise resultant statistics, displayed in chart and map form, to assess the likelihood of re-entry over nations and populous regions. These complex simulations run in the timelines needed for operational use, providing users with an enhanced probabilistic understanding of events compared to common re-entry analysis.

Sensor Modelling

NORSSTrack can model and simulate SDA sensors, spanning a wide and comprehensive range of SST sensor types and technologies. Our solution can model both ground-based and space-based sensors of multiple forms and generate overflight predictions that show when satellites or ground locations are within the field of view of selected sensors. Our coverage analysis for these sensors capture critical intelligence for SST operations.

	SOFTWARE LICENCE	ORBITAL ANALYSIS	DATA PRODUCTS	SDA CONSULTANCY
NORSSTRACK	□	■	■	■
LOCI		□	■	
SST SIMULATOR		■	■	■
SDA / R&D		■		■
MISSION PLANNING		■	■	

□ = Coming Soon   ■ = Available Now

LOCI

Raytheon UK has developed and globally deployed a sensor network of devices, designed for observing satellites in LEO. LOCI has been designed, built and tested with the ever-evolving requirements of Space Surveillance and Tracking (SST) as its priority.

Space Domain Awareness (SDA)

A comprehensive understanding of the environment within which a satellite is operating is imperative for all on orbit missions. SDA is vital in supporting commercial operators, the UK Government's civil liability, and the protection and defence of military assets. Through providing timely and accurate data of satellites, LOCI allows customers to attain a thorough understanding of LEO at a cost-effective rate.

Position and characterisation

LOCI provides both positional and characterisation data, meaning the system can simultaneously detect where satellites are on orbit and distinguish changes in pattern of life that reflect their intent or operational status.
This dual capability enables customers to act with increased understanding and confidence.

Globally Distributed Sensor Network

Ensuring a comprehensive coverage of the LEO environment is critical. The LOCI system's network of globally distributed sensors provides users with essential data. There are further plans for additional diverse locations to build up an ever more comprehensive network.

GLOBAL SITE LOCATIONS:

California, US

Kielder, UK

Florida, US

Hawaii, US

Perth, AUS

Raytheon UK

find out more