



Durham
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Space Research Centre

Deep Space Advanced Radar Capability (DARC)

What is the proposed Deep Space Advanced Radar Capability (DARC), and what does it mean for UK space security and that of its allies?



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What is DARC?

- The Deep Space Advanced Radar Capability (DARC) is a programme jointly announced by Australia, the UK, and the USA (AUKUS) in December 2023.
- The DARC programme was reconfirmed by the new Labour UK Government in August 2024 and will be built at Cawdor Barracks, Pembrokeshire.
- The Cawdor Barracks radar facility will be one of three complementary sites, with a facility each in Australia and the United States.
- DARC will use radar beams to identify and track satellites and other objects in geostationary orbit (GEO), which is 35,786km above the equator.

Why is it being built?

- There are over 600 active satellites in GEO that provide some of the most essential services for government, military and commercial users, such as military command and control, signals intelligence, satellite TV and radio, and weather monitoring and forecasting.
- As GEO gets busier, the risk of collisions between satellites or pieces of debris increase, increasing dangers to the sustainable uses of outer space
- More information and understanding is needed to keep satellites – both civil and military – safe and provide warnings of possible collisions with other satellites or pieces of space debris.
- Some states, notably China and Russia, are conducting close fly-bys of and unpredictable, risky manoeuvres near UK and allied satellites with their own highly manoeuvrable satellites.
- DARC, in coordination with sites in Australia and the United States, can help prevent surprise

manoeuvres in GEO and hold other countries to account for any irresponsible actions in space.

- NATO and the UK recognise outer space as an operational domain, where our space systems are under increasing threat from possible adversaries and are becoming ever more important in warfare, such as in the Russian -Ukrainian War.

What does it mean for British space capabilities and policy?

- This will be the UK's first dedicated military space tracking radar system, comparable to France's GRAVES military space radar which has been in operation since 2005; and the United States' Space Surveillance Network which first emerged in the 1960s.
- DARC will directly assist in securing the British Skynet satellite communications constellation.
- DARC will allow Britain to provide greater levels of UK-sourced data for the National Space Operations Centre at UK Space Command far beyond what RAF Fylingdales Ballistic Missile Early Warning System provides.
- DARC can help the UK contribute towards space security, sustainability, and developing norms of responsible behaviours in outer space and at the United Nations.

What are DARC's limitations?

- Analytical Capacity: Highly skilled people are needed to operate the equipment and interpret the new levels of technical data DARC provides.
- Single-source intelligence: DARC cannot detect everything satellites reveal about themselves.

It will not provide insights that can be gained from other methods of Space Domain Awareness (SDA), such as optical methods and direction-finding Signals Intelligence techniques.

- Single focus: DARC is focused on global coverage of the GEO belt, and will not provide capabilities to track objects in low, medium, and highly elliptical orbits (LEO, MEO, HEO) where other important satellites we rely on are.

Recommendations for UK Government

1. Invest in technical and political analytical capacity to ensure the raw data gathered via DARC, and other equipment investments outlined in the 2024 Ministry of Defence SSA Requirements, is used to greatest possible effect at NSpOC.
2. Develop UK and international mechanisms for the smooth sharing of suitable DARC and other data/assessments to NATO, partners, and the international community for military and civil space traffic.
3. Integrate political and strategic skills and knowledge in Space Domain Analysis so that technical operators, analysts, and leaders, both military and civil, are aware of the global political and security contexts within which they are working.
4. Building on the UK's prior diplomatic successes at the UN General Assembly, continue working towards consensus in the UN First Committee on defining norms of responsible behaviour, in particular on close fly-bys of satellites.

More information:

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What is SPARC doing?

Optical SDA methods are a complementary technology to radar: It is very precise, flexible in its range, relatively affordable, and scalable with smaller devices compared to large radars. Our optical SDA capability can continuously monitor LEO, MEO and GEO objects.

SPARC is building a suite of instrumentation for the real-time monitoring of objects in LEO, MEO and GEO. We have a prototype survey instrument and are developing the technology for high-precision follow-up of individual objects of interest 24-hours a day through innovative Adaptive Optics systems.

Political and strategic context matters

Detecting and characterising satellites and their flight paths are only part of the puzzle in divining the intent of satellite operators that choose to conduct close fly-bys or inspection missions of other satellites without prior notification or permission. SPARC is developing new research in astropolitics and space law particularly in space security and sustainability.

With no agreed common standards or 'keep out zones', we cannot assume that other parties know or understand what we consider aggressive or irresponsible behaviour.

Satellite operations do not happen in a political vacuum. Previous close fly-bys by Russian and Chinese satellites, such as the Luch-Olymp system and SJ-21, did not happen during periods of acute tension or military crisis between them and the United States.

SPARC has been monitoring the Luch-Olymp K2 satellite since October, as it has been involved in proximity maneuvers that have raised concerns.

In isolation, proximity manoeuvres may be seen as irresponsible but not interpreted as an imminent attack. If such manoeuvres happened during an acute military crisis, these actions could be seen as the first strike in a new conflict regardless of the intentions behind them.

SPARC is developing not only new technical tools for monitoring space activities, but also the research base for understanding the political and legal dimensions of satellite manoeuvres and space security.