

Centre for Defence **Enterprise**

CDE proves the value of novel, high-risk, high-potential-benefit research. We work with the broadest possible range of science and technology providers, including academia and small companies, to develop cost-effective capability advantage for UK armed forces and national security.

Affordable space-based capability



This CDE themed competition seeks novel concepts and technologies that could provide a step increase in capability or a substantial reduction in the cost of future sovereign military space-based systems for communications and surveillance.

The total funding available for phase 1 of this competition is £1 million.

Competition networking event: Tuesday 18 November 2014
in London at [De Vere Canary Wharf](#)

Competition close: Thursday 6 January 2015 at 5pm

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Dstl: www.gov.uk/dstl

CDE: www.gov.uk/dstl/cde

Centre for Defence Enterprise
Affordable Space Based
Capabilities
Dstl/CP84099 Issue 1, 23
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Defence Science and Technology Laboratory

Affordable space-based capability

Background

UK defence and security are dependent on services and capabilities provided from space. At present the UK depends heavily on foreign owned assets outside our direct control. In this context, a new space research programme has been initiated by Defence Science and Technology Laboratory (Dstl). The programme will provide guidance to the 2020 UK Security and Defence Strategic Review and help the Ministry of Defence (MOD) achieve an indigenous, resilient and affordable military space capability.

This CDE themed competition is seeking novel concepts and technologies that could provide a step increase in capability or a substantial reduction in the cost of future sovereign military space-based systems for communications and surveillance.

This is a 2 phase competition. Phase 1 of the competition will fund exploratory studies and demonstrations on projects at [technology readiness levels \(TRL\) 2 and 3](#)¹. We plan to take the most successful projects forward for further development at phase 2.

Technology Challenges

Solutions to the following technical challenges are sought:

Challenge 1: Surveillance

Space-based surveillance of wide areas: We need to search large areas rapidly in order to detect and identify small objects of military interest. Search areas may be as large as 1000km x 1000km with potential targets being as small as a few metres in size. Typical challenges would include the detection of small fast-moving craft for maritime surveillance and the detection of mobile weapon systems or people for wide-area land surveillance. Current Synthetic Aperture Radar (SAR) and Electro-optical (EO) imaging systems only collect limited spatial information and are not ideally suited for wide area search applications, even when used with methods of automatic target detection; alternative approaches are therefore of interest.

Space-based observation of short lived terrestrial events: The use of sensors on satellites in low Earth orbit can only provide occasional information about particular sites unless a very large number of satellites are used. With only a few satellites, short lived events (such as the movement of vehicles and people) can be missed. Carrying sensors on satellites in higher orbits, including medium Earth orbits and geosynchronous Earth orbits, is an alternative method. However, this involves different

¹ For a description of Technology Readiness Levels (TRLs) see the Acquisition Operating Framework

<https://www.gov.uk/acquisition-operating-framework>

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technical challenges and expensive dedicated launches so MOD is seeking methods of providing affordable persistent surveillance that also aid the detection of short-lived events.

Detecting concealed objects: Objects of military or security interest can be hidden from satellite view under foliage, inside buildings, buried underground, located underwater or concealed in other ways. These objects can include military facilities (eg airfields, command & control infrastructure), military vehicles and weapon systems. MOD is seeking novel methods for detecting, locating and possibly characterising these objects; both from a targeting perspective and from a strategic intelligence gathering point of view. These novel methods must also be affordable and can either be by direct or indirect detection.

Challenge 2: Secure communications

Secure, hand held communications from difficult locations: Current mobile satellite communications can be limited when terminals are shielded from satellites by buildings, landscape or when they are located at polar latitudes (for geostationary satellite based systems).

Proposals are sought for concepts, technologies or techniques that could provide low cost, secure communications from small devices able to communicate in difficult environments. These solutions should consider locations such as from inside buildings, from within (natural and urban) canyons or from polar latitudes where communications are difficult to make. MOD is seeking solutions for low bandwidth/capacity text, voice and high capacity data. Exploitation paths for these technologies might be payloads hosted on allied or third party satellites or auxiliary payloads on UK satellites.

Challenge 3: Platforms and Infrastructure

Secure use of existing commercial space infrastructures: Space systems developed for civil or commercial applications could have important military utility. However this will depend on the appropriate level of their security; both in terms of data security and in terms of reducing or quantifying the risk of an adversary locating the source of transmissions. Additional security can increase the cost of the services drastically. MOD is seeking novel, cost-effective ways of using commercial space infrastructure for secure military applications.

Novel ways to reduce development and operating costs of military space systems: MOD is seeking improvements to platform technologies such as mission computers, on-orbit propulsion, power/energy systems, attitude control and structural subsystems. The cost of payload technologies could be reduced by using novel approaches such as deployable structures and self-programming computers. Also of interest for this challenge are techniques such as standardisation and mass manufacture. It is recognised that such techniques will not be very novel so a significant benefit must be demonstrated for them to be considered.

All solutions must reduce costs without reducing capability or reliability.

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The technology for launching satellites is outside the scope of this competition although methods to increase capabilities of satellites for a given launch cost are of interest. These could include increasing satellite payload to platform mass/volume ratios.

What we want

- Proposals for novel and innovative ideas where the output is an experimental demonstration
- Indications of the technology developments that would be needed to realise the innovation including the timescale for the technology to reach maturity
- Proposals which have clear military application and exploitation route
- Proposals that consider the complete system concepts will be given priority over proposals that consider only the component technologies
- Proposals that identify the unique capabilities that you can demonstrate
- Phase 1 projects complete by November 2015
- Proposal outlining options for carrying out further development in future years (please see the Exploitation section below)

What we do not want

- Projects where the principal output is a literature review or paper study
- Projects which develop current techniques or technologies with very little innovation
- Projects which will complete after November 2015
- Proposals for civil or commercial applications with no military application
- Proposals for technologies for launching satellites

Exploitation

'Affordable Space' will be an enduring requirement for MOD and is expected to run with a similar level of funding into future years.

The intention is to take the most successful projects from phase 1 forward for follow on funding at phase 2. Please read the information in the ['Invitation for CDE proposals'](#) section of this document carefully to understand how to partition your work and what to include in your proposal document.

Successful proposals will be invited to stakeholder events to support wider exploitation through Dstl and MOD. Government partners of Dstl including the UK Space Agency and, possibly, the Defence Departments of allied nations may be invited to these events. These events are expected to take place before the end of financial year 2015/2016 for the current competition.

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Important Information

Proposals for funding must be submitted by **5pm on Thursday 6 January 2014** using the [Centre for Defence Enterprise Portal](#). Please mark all proposals for this themed competition with “**Affordable space-based capabilities (+ challenge 1, 2 or 3)**” as a prefix in the title (see the ‘Technology challenges’ section for a description of the challenges under this competition).

Technical queries should be sent to CdeSpaceEvent@dstl.gov.uk. Please see guidance under the ‘queries and help’ section.

General queries (including how to use the Portal) should be sent directly to CDE at cde@dstl.gov.uk

Invitation for CDE proposals

Phase 1 proposals are invited from industry and academia in the UK and overseas for research that can demonstrate a proof-of-concept to meet the challenges for “**Affordable space-based capabilities**”.

The total funding available for phase 1 of this two phase competition is £1 million. An additional £1 million is available for phase 2. Only bidders who are funded at phase 1 qualify for entry into phase 2 of the competition.

Whilst there is no cap on the value of a phase 1 proposal it is significantly more likely that a larger number of lower value proposals (eg £50,000 to £100,000) will be funded than a small number of higher value proposals.

[Read further information on what all proposals must include on our website.](#)

Phase 1 proposals should focus on a short, sharp, proof-of-concept stage– typically, but not exclusively, 3-9 months in duration. All research must be completed by the end of November 2015. Proposals must include a descriptive scoping for a longer programme of any duration but the proposal should be clearly partitioned with a costed phase 1 proof-of-concept stage. Within your project plan you must also provide a costed proposal for phase 2 as a deliverable at the end of phase 1. Proposals for work beyond phase 1 will only be considered after the proof-of-concept stage has delivered, using the understanding gained to make an informed decision.

Proposals must include:

- A clear statement of what challenge the solution is aimed towards
- A clear description of what is novel and innovative in the solution
- A clear statement of the programme of work that would be carried out and the outputs (deliverables) from the work
- A clear statement of the expected outcome(s), how this will be proven or demonstrated and how it will provide evidence that the outputs can be exploited

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- A clear description of the value of the solution to operational capability including the likely saving to through-life costs
- A statement on the anticipated practicality of adopting the proposed solution
- An outline of any data/equipment requirements of the proposal, and how these will be met. Any dependencies on the supply of data/equipment from MOD must be stated

Proposals that do not include the required information are unlikely to be successful.

Proposals will be assessed by subject matter experts from MOD, Dstl and Other Government Departments using the [MOD Performance Assessment Framework \(PAF\)](#). Deliverables from contracts will be made available to Technical Partners and subject to review by UK MOD.

Dstl will be available to provide advice and/or guidance via an appointed Technical Partner throughout the project and provide the interface with MOD and wider Government stakeholder community.

Dstl does not commit to fund any follow on work as a result of any contracts placed via this CDE competition, but more promising ideas will be considered for further funding where appropriate.

This competition will be supported by presentations given at the launch seminar on **18 November 2014** at 1 Westferry Circus, Canary Wharf, London. Register via the CDE website. The presentations will be available to download the day after the event via the competition page:

www.gov.uk/government/publications/cde-themed-competition-affordable-space-based-capability

CDE proposal submission process

Key dates

- 18 November 2014 [Competition launch event](#)
- 24 November 2014 Post-launch webinar
- 6 January 2015 Competition closes at 5pm
- 13 February 2015 Successful bidders informed
- 30 November 2015 Research complete and delivery of phase 2 proposals
- Feb/March 2015 (exact date to be confirmed) Stakeholder event
- Early 2016 (exact date to be confirmed) phase 2 funding decisions made

We anticipate that phase 1 contract placement will be started in February 2015 and feedback to unsuccessful bidders will be issued by end February 2015.

Queries and help

As part of the proposal preparation process, queries and clarifications are welcomed:

Technical queries about this specific competition should be sent to CdeSpaceEvent@dstl.gov.uk. However, capacity to answer these queries is limited in terms of volume and scope. Queries should be limited to a few simple questions or if provided with a short (few paragraphs) description of your proposal, the technical team will provide, *without commitment or prejudice*, broad yes/no answers. This query facility is not to be used for extensive technical discussions, detailed review of proposals or supporting the iterative development of ideas. Whilst all reasonable efforts will be made to answer queries, CDE and Dstl reserve the right to impose management controls when higher than average volumes of queries or resource demands restrict fair access to all potential proposal submitters.

General queries (including those on how to use the Portal) should be sent directly to CDE at cde@dstl.gov.uk

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