



Challenge: Underground Tunnelling Techniques

Summary of the challenge

Underground tunnelling presents an array of opportunities and challenges, so the MoD would like to know how technologies and capabilities in this area could be better harnessed for future operations. In particular there is an interest in how to better access hostile and constrained subterranean environments. The latest HMGCC Co-Creation challenge is to demonstrate ways of producing subterranean pathways, preferably greater than 60mm diameter, with minimal chance of being detected.

Organisations are being asked to apply if they have the capability / technology to contribute to early and ambitious concept demonstrators in a 12 week project. HMGCC Co-Creation will provide funding for time, material, overheads and other indirect expenses.

Key information

Budget up to	£60,000
Project duration	12 weeks
Competition opens	Monday 8 July 2024
Competition closes	Thursday 15 August 2024 at 5:00pm

Context of the challenge

There is a long history of industry, civil authorities and military using underground access to their advantage. The MoD is interested in using novel, automated methods to produce underground tunnels, opening new routes of access into otherwise difficult to reach locations. It is critical that any methods to produce these have a low probability of detection from adversaries.

The gap

One example of a current mature technology is [Directional drilling](#) (reference enbridge); Horizontal Directional Drilling (HDD) rigs are industrial tools to create

underground bore holes for the oil and gas industry, telecoms cabling and pipework. However HDDs are unsuited to MoD purposes due to their size, noise levels and typical need for direct human operation or manual preparation of groundworks before starting. The core technological gap is to provide new or existing industrial processes but with a low chance of detection, summarised in table 1.

The requirement	Can existing industrial processes do this?
Automated long-distance drilling	✓
Bored diameter at least 60mm	✓
Quiet	✗
Low seismic activity	✗
Minimised people power	✗
Small equipment which is difficult to detect	✗
Low spools of waste (or ways to manage this)	✗
Novel methods beyond drilling	✗

Example use case

The year is 2035 and a terrorist group has entered a country, taking a dozen civilians hostage and moving them to a new location. The country is a UK ally and has asked for MoD assistance to free the hostages.

The country's military has tracked the terrorists and hostages to an underground facility with only one entrance and exit.

Alongside a negotiation period, the country's military starts to plan hostage release, in consultation with MoD.

The MoD deploys its Subterranean Access Pathway, or SAPA, machinery – all with the assumption this activity could be observed.

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During the night, a small team moves the SAPA into place 250m away from the facility.

The SAPA is then started, this time to create a diameter of 60mm but with the capability to bore up to a diameter of 600mm. It operates quietly, creating very low seismic activity and no people are needed to keep it running. As it bores, it identifies and navigates around cabling and pipework, directed to the underground facility.

The SAPA notifies users it has completed the job. The users verify the underground facility has been accessed and tunnelling activity has not been detected.

Once this has been confirmed, the operation is handed back to the local country's military to safely conclude the hostage scenario.

Project scope

This is an ambitious project to demonstrate new ways to discreetly create underground pathways, therefore future thinking and highly innovative ideas are welcomed. By the end of the 12 weeks, applicants should be able to demonstrate proposed solutions with a practical demonstration of a characteristic proof of concept to Technology Readiness Level 3, with a plan to reach the 2035 vision. From this, follow-on funding from the customer may be made available.

Proposals should consider the following requirements:

- Low risk of detection e.g. low noise, little seismic activity, small and/or concealable footprint and requires minimal number of people to operate.
- A hole with a diameter of between 60 - 600 mm, proposals with diameters outside of this scope will be considered if potential can be shown to scale up the diameter in the future.
- A scalable system, i.e. it could eventually (although not in initial demonstrators) tunnel across several hundreds of metres underground.
- Consideration given to types of underground material to tunnel through, such as top soil, clay, rock, but not necessarily concrete.
- Consideration given to how this could autonomously operate and navigate underground obstacles such as cabling and pipework, or with a plan to achieve this.
- We are interested in the art of the possible.

Proposals not within scope are demonstrations of existing off the shelf unmodified industrial practices, horizon scanning and paper exercises.

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Dates

Competition opens	Monday 8 July 2024
Clarifying questions published	Monday 5 August 2024
Competition closes	Thursday 15 August 2024 at 5:00pm
Applicant notified	Monday 2 September 2024
Pitch day in Milton Keynes	Tuesday 10 September 2024
Target project kick-off	October 2024

Eligibility

This challenge is open to sole innovators, industry, academic and research organisations of all types and sizes. There is no requirement for security clearances.

Solution providers or direct collaboration from [countries listed by the UK government under trade sanctions and/or arms embargoes](#), are not eligible for HMGCC Co-Creation challenges.

How we evaluate

All proposals, regardless of the application route, will be assessed by the HMGCC Co-Creation team. Proposals will be scored 1–5 on the following criteria:

Scope	Does the proposal fit within the challenge scope, taking into consideration cost and benefit?
Innovation	Is the technical solution credible, will it create new knowledge and IP, or use existing IP?
Deliverables	Will the proposal deliver a full or partial solution, if a partial solution, are there collaborations identified?
Timescale	Will the proposal deliver a minimum viable product within the project duration?
Budget	Are the project finances within the competition scope?

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Team	Are the organisation / delivery team credible in this technical area?
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Invitation to present

Successful applicants will be invited to a pitch day, giving them a chance to meet the HMGCC Co-Creation team and pitch the proposal during a 20 minute presentation, followed by questions.

After the pitch day, a final funding decision will be made. For unsuccessful applicants, feedback will be given in a timely manner.

Clarifying questions

Clarifying questions or general requests for assistance can be submitted directly to cocreation@hmgcc.gov.uk prior to the publication date. These clarifying questions may be technical, procedural, or commercial in subject, or anything else where assistance is required. Please note that answered questions will be published to facilitate a fair and open competition.

Routes to apply

HMGCC Co-Creation are working with a multiple and diverse set of community collaborators to broadcast and host our challenges. [Please follow this link for the full list of community collaborators.](#)

If possible, please submit applications via a community collaborator.

If the community collaborator does not host an application route, please send applications directly to cocreation@hmgcc.gov.uk, including the challenge title with a note of the community collaborator where this challenge was first viewed.

All information you provide to us as part of your proposal, whether submitted directly or via a collaborator platform, will be handled in confidence.

How to apply

Applications must be no more than six pages or six slides in length. The page/slide limit excludes personnel CVs and organisational profiles.

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There is no prescribed application format, however, please ensure your application includes the following:

Applicant details	Contact name, organisation details and registration number.
Scope	Describe how the project aligns to the challenge scope.
Innovation	Describe the innovation and technology intended to be delivered in the project, along with new IP that will be generated or existing IP that can be used.
Deliverables	Describe the project outcomes and their impacts.
Timescale	Detail how a minimum viable product will be achieved within the project duration.
Budget	Provide project finances against deliverables within the project duration.
Team	Key personnel CVs and expertise, organisational profile if applicable.

HMGCC Co-Creation terms and conditions

Proposals must be compliant with the HMGCC Co-Creation terms and conditions. By submitting your proposal you are confirming your organisation's unqualified acceptance of HMGCC Co-Creation terms and conditions.

Commercial contracts and funding of successful applications will be engaged via our commercial collaborator, Cranfield University.

HMGCC Co-Creation supporting information

[HMGCC](#) works with the national security community, UK government, academia, private sector partners and international allies to bring engineering ingenuity to the national security mission, creating tools and technologies that drive us ahead and help to protect the nation.

[HMGCC Co-Creation](#) is a partnership between [HMGCC](#) and [Dstl](#) (Defence Science and Technology Laboratory), created to deliver a new, bold and innovative way of working with the wider UK science and technology community. We bring together the best in class across industry, academia, and government, to work collaboratively on national security engineering challenges and accelerate innovation.

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HMGCC Co-Creation is part of the [NSTix](#) Co-Creation network, which enables the UK government national security community to collaborate on science, technology and innovation activities and to deliver these in partnership with a more diverse set of contributors for greater shared impact and pace.

HMGCC Co-Creation aims to work collaboratively with the successful solution providers by utilising in-house delivery managers working [Agile](#) by default. This process will involve access to HMGCC Co-Creation's technical expertise and facilities to bring a product to market more effectively than traditional customer/supplier relationships.

FAQs

1. Who owns the intellectual property?

As per the HMGCC Co-Creation terms and conditions, project IP shall belong exclusively to the solution provider, granting the Authority a non-exclusive, royalty free licence.

2. Who are the end customers?

National security users include a wide range of different UK government departments which varies from challenge to challenge. This is a modest market and so we would encourage solution providers to consider dual use and commercial exploitation.

3. What funding is eligible?

This is not grant funding, so HMGCC Co-Creation funds all time, materials, overheads and indirect costs.

4. How many projects are funded for each challenge?

For this challenge, one solution provider will be funded, based on the merit and strength of the received proposals.

5. Do you expect to get a full product by the end of the funding?

It changes from challenge to challenge, but it's unlikely. We typically see this initial funding as a feasibility or prototyping activity.

6. Is there the possibility for follow-on funding beyond project timescale?

If the solution delivered by the end of the project is judged by the HMGCC Co-Creation team as feasible, viable and desirable, then phase 2 funding may be made available.

7. Can we collaborate with other organisations to form a consortium?

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Yes, multi-disciplinary consortiums are encouraged. But please note there are budget restrictions outlined in key information, depending on the challenge there are sometimes higher budgets made available for consortiums.

8. Do we need security clearances to work with HMGCC Co-Creation?

Our preference is work to be conducted at [OFFICIAL](#), we may however, request the project team undertake [BPSS](#) checks or equivalent.

9. We think we have already solved this challenge, can we still apply?

That would be welcomed. If your product fits our needs, then we would like to hear about it.

10. Can you explain the Technology Readiness Level (TRL)?

Please see the [UKRI definition](#) for further detail.

11. Can I source components from the list of restricted countries, e.g. electronic components?

Yes, that is acceptable under phase 1 - feasibility, as long as it doesn't break [UK government trade restrictions and/or arms embargoes](#).

Further considerations

Solution providers should also consider their business development and supply chains are in-line with the [National Security and Investment Act](#) NPSA [trusted research](#) and [secure innovation](#) advice.

Advice and guidance on how to keep your organisation secure online can also be found through the [National Cyber Security Centre](#).

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