

Serapis Tasking Form

Tasking Form Part 1: *(to be completed by the Authority's Project Manager)*

To:	Lot 4 QinetiQ Plc	From:	Dstl
Any Task placed as a result of your quotation will be subject to the Terms and Conditions of Framework Agreement Number: LOT 4 DSTL/AGR/SERAPIS/AII/01			
VERSION CONTROL			
Version 1.1 – Part B updated in response to Authority review comments			
REQUIREMENT			
Proposal Required by:	Feb 22	Task ID Number:	AII109
The Authority Project Manager:	[REDACTED]	The Authority Technical Point of Contact:	[REDACTED]
Task Title:	WP 1 DCEAT Application of Novel Materials for Generation after next (GAN) RF LOS/BLOS communications systems		
Required Start Date:	Feb 22	Required End Date:	March 2025
Requisition No:		Budget Range	Up to £200K (Year 1 – March 2022) ~£400k Year 2 ~£500k Year 3 ~£300k Year 4
TASK DESCRIPTION AND SPECIFICATION			
Serapis Framework Lot	<input type="checkbox"/> Lot 1: Collect <input type="checkbox"/> Lot 2: Space systems <input type="checkbox"/> Lot 3: Decide <input checked="" type="checkbox"/> Lot 4: Assured information infrastructure <input type="checkbox"/> Lot 5: Synthetic environment and simulation <input type="checkbox"/> Lot 6: Understand		
Statement of Requirements (SOR)			
<u>Background</u> <p>The MOD Science and Technology Strategy 2020¹ highlights that the ultimate goal of Science & Technology (S&T) activity is placing new technology with enhanced capabilities into the hands of the users at the right time. Consequently, experimentation is a vital component of capability development within Defence. S&T experimentation, on early prototypes and proofs of concept. This will be rigorous and the focus of S&T experimentation will be on immature concepts and technologies (with correspondingly low Technology Readiness Levels (TRLs)) to assess the</p>			

¹ MOD Science and Technology Strategy 2020 v1.2 October 2020

feasibility of exploitation of generation after next research. Prototype or conceptual experimentation will demonstrate the opportunities S&T provides and also give valuable assessment points to change course.

It is against this strategic drive that new facilities and capabilities and know-how need to be developed to enable experimentation of low TRL concepts and ideas to support radio technologies needed for the next generation of Multi-domain Command & Control, Communications and Computers (C4) needed to enable rapid decisions making and support “Freedom of Access and Manoeuvre” (FOAM).

The future challenges in a C4 environment and develop the technologies and techniques needed for the S&T theme “Deployed Communications Evolving Against the Threat” (DCEAT) include the need for:

- new techniques and technologies that mitigate against rapidly emerging communications threats
- radio systems to operate in an denied, degraded and RF environment due to spectrum congestion and/or interference,
- resilient and robust communications systems (i.e. low probabilities of detection, interception and exploitation),
- connectivity to all mobile/static platforms (underwater, land, sea, air and space),
- communications links that can support communications ranges beyond line of sight and short range,
- communications capacities from low to very high data rate systems
- global operations, often infrastructure less environment
- conducting operations that range from disaster relief, peacekeeping, surveillance to military engagement
- interoperability with national and international partners
- low signature networking,
- new architectures/protocols
- systems that are application aware
- satisfying convergence of systems and networks

The Generation after next (GaN) communications systems could use novel materials to enable EM connectivity for applications from underwater to space. These materials could for example drive the development of future materials-based high performance antenna systems for the defence sector or the control of EM signatures. For clarity, the definition of a ‘material’ include metamaterials, but only as a means of generating properties beneficial to antenna designs: for example, to access a particular combination of permeability, loss and bandwidth that is not available when using a conventional approach. Antennas purely founded upon metamaterial operating principles (i.e. for which the metamaterial itself acts as the antenna) lie outside the scope of this package of work.

In evaluating materials for antenna (and other) applications (such as filters, control of EM signatures, RF materials for co-existence), fundamental electromagnetic properties such as permittivity, permeability and loss, as well as their spatial, temporal and spectral variation, are to the fore. The ability to alter these properties dynamically may also be of interest in many applications. Nevertheless, cognisance must also be taken of the environment, application and platform to which the material may be used on and exposed to. Extremes of temperature, shock, vibration, contaminants and exposure to sunlight are some of the more prominent factors to note. In some instances, the impact of high electromagnetic field strengths is additionally of importance, while the utility of a material is also dependent upon the costs, timescales, tolerances and sometimes the maximum dimensions associated with its manufacture. Therefore, in tandem with the discussion of materials below, consideration is also given to methods suited to their manufacture and ultimate use.

There is a requirement to consider the applications of novel (i.e. not Physical Science research) materials to support the design and fabrication of future communications systems to achieve characteristics that include:

- Agility combined within a single package
 - Frequency agility
 - Spatial agility
 - Polarisation agility
- Multifunctional characteristics from a single package
 - Comms
 - EW
 - Sensing
 - Radar
- Dynamic antenna radiation pattern control
 - Omni directional
 - Beam steering
 - Null steering
- Dynamic performance optimisation
 - Low probability of interception or detection (LPI/LPD)
 - Power (gain) control
 - Spatial multiplexing
 - Polarisation environment adaptation
- Conformal to platform structure
 - Bodyworn
 - Land-based
 - Ground-based
 - Air-based
 - Maritime
- Platforms of limited real estate
 - Placement of multiple antennas in close proximity
 - Efficient electrically compact antennas
 - Antenna platform interaction

Materials that enable other aspects of a communications system may have similar drivers.

It is highlighted that Materials could include - but are not limited to - dielectrics, magnetics, artificial magnetic conductors and magneto-dielectrics, superscatterers and controlled index materials, as well as programmable/tuneable materials. Manufacturing methods that enable the fabrication of conformable and large area devices, as well as the hybridisation of materials such as metals, dielectrics and ceramics, are all appropriate. These methods may include 3D printing and additive layer manufacture.

Aim

The aim of this applied SoR is to apply and develop materials technologies, techniques and measurements to facilitate the design, development and operation of communications systems and hence support the S&T needed for “Deployed Communications Evolving Against the Threat” (DCEAT).

The applied Materials S&T work will support research into other themes within DCEAT such as:

- Advanced waveform development:
- Advanced Antennas and Transceivers
- New and novel bearers
- Operational agility

The knowledge, capabilities, tools and system developed will drive the development of resilient deployed communications systems to stay ahead of the threat, and hence respond rapidly to new

threats and exploit new technologies into MoD spiral development approaches. The ultimate research outcomes will enable MOD to rapidly develop and field new technologies cost effectively, to sustain effective C2 and Communications in the Denied, Degraded, Intermittent and Low-Bandwidth environments.

Requirement

The requirement is create a team and drive the applied research and exploitation of on-going materials science research with a focus on the deployed antenna within the communication system, but not to the exclusion of other aspects related to a communications system, that may benefit from materials research, such as shielding . It is expected that TRLs of 3-6 will be achieved at the end of the research programme.

Antenna aspects could include addressing how the antenna materials interrelate with those of the platform that the antenna is to be mounted on, addressing the interface between the antenna and the communications system as well as how different material co-exist within the sub package.

The following are typical expected activities, with an emphasis to be placed on the applied aspects such fabrication, prototyping and test and evaluation under representative environments.

Year 1 (end of March 2022)

Set-up and Chair a core technical team to provide strategic direction, develop and address (either using resources within the team or by drawing on additional expertise outside the team via SoRs) an action log of activities. The team should comprise expertise in the application of materials in innovative RF communications systems along with materials scientists developing novel materials This action log of activities could include:

- Reviews of electromagnetic material advances and related fields focussed towards DCEAT. This review should be used to lead into tasks that show proof of concept and provide demonstration through prototyping
- Identifying equipment required that needs to be purchased this FY
- The development of communications concepts and use cases (ideally up to system impact level) to exploit the materials properties. These may be further refined in latter years to detailed use cases and exploitation routes
- Assessment and analysis of a particular materials for a range of EM attributes and properties focused on a specific antenna, with a consideration towards understanding of installed antenna performance
- Build and testing a prototype technology elements for further analysis and validation of the properties of interest. Data may be required from an anechoic chamber and in the proximity of a representative platform.
- Consideration of challenges and architectures required to interface materials with the communications system.
- Highlight potential international collaborative events and initiate collaborative work US ARL on additive manufacturing
- Develop a costed research plan/outline or roadmap, for year 2 activities with the expectation of materials technology demonstrations in Year 3

Year 2 (end of March 2023)

Maintain/review the technical team composition, provide strategic direction and develop and address the actions list of Year 1. This action list could include:

- Refine and enhance use cases and exploitation routes
- Development via initial experimentation/simulation of key components
- Identifying barriers to developing and exploiting the technologies needed

- Attend exploitation and knowledge gathering events such as conferences and workshops
- Holding a planning meeting to discuss and plan for the coherent demonstration of the research being conducted.
- Develop the costed research plan/outline roadmap for materials for communications systems Year 3 with the expectation of technology demonstrations in Year 3

Year 3 (end of March 2024)

Maintain/review the technical team composition, provide strategic direction and develop and address an actions list of activities. This actions list could include:

- Demonstrate TRL level 3-6 technologies developed and techniques
- Highlight benefits and threats of the technologies to platform development
- Develop an integration/exploitation roadmap
- Input work into international standards, or guidance notes
- Develop a costed research plan/outline roadmap for potential Year 4 activities

Year 4 (end of March 2025)

Maintain/review the technical team composition, provide strategic direction and develop and address an actions list. The actions should focus on final delivery aspects of the programme such as demonstration etc. and could include:

- Demonstrate TRL level 3-6 technologies developed and techniques
- Highlight benefits and threats of the technologies to platform development
- Develop an integration/exploitation roadmap
- Input work into international standards, or guidance notes

Innovation Benefits and Exploitation Plan (IBEP)

By conducting the work the following are anticipated.

- Innovation – (i.e. what are we building on?)
 - General know-how and previous knowledge of platform systems
 - S&T trends
- Benefits (i.e. what will the contracted stakeholders get from this?)
 - Development of new capabilities
 - Closer defence-sector collaboration
 - Increased collaboration between industry, academia and government.
- Exploitation (what are the artifacts that Dstl will get that can be more widely exploited)
 - Reports and papers
 - Understanding of technical barriers
 - Know-how in the wider supply chain for design tools
- Plan (what's the plan for exploitation)
 - Integration into Command and Control (C2) processes and procedures
 - Exploitation and re-use of information for defence purposes

Outputs.

Outputs (or artefacts) of the activities that may be exploited more widely include:

- Reports and white papers
- Prototype system descriptions
- Simulations data and models
- Measurement data
- Conference and journal papers
- Threat information
- Illustrative architectures
- Use cases

Deliverables.

Deliverables of the project are suggested in in the Deliverables section and will be agreed during proposal development.

At the end of FY 22 a report will be required in February/March 2022 highlighting:

- Aims
- Technical Progress
- Achievements
- Exploitable outputs
- Validating costed options and Recommendations

Procurement Strategy

☒ Lot Lead to recommend

☐ Single Source / Direct Award

Pricing:

☒ Firm Pricing

☐ Ascertained Costs*

☐ Other*

Firm Pricing shall be in accordance with DEFCON 127 and DEFCON 643

Ascertained Costs shall be in accordance with DEFCON 653 or DEFCON 802.

*only at Authority's discretion

Task IP Conditions

Task IP Conditions (Follow the NIPPY guide to identify your information and IP requirements for each deliverable)	Summary of the Authority's rights in foreground IP generated by the supplier in performance of the contract)
DEFCON 703 <input type="checkbox"/>	Vests ownership with the Authority
DEFCON 705 Full Rights <input checked="" type="checkbox"/>	Enables MOD to share in confidence as GFI or IRC under certain types of agreements. Can be shared in confidence within UK Government.
OTHER IP DEFCONS: 14* <input type="checkbox"/> , 15* <input type="checkbox"/> , 16* <input type="checkbox"/> , 90* <input type="checkbox"/> , 91* <input type="checkbox"/> , 126* <input type="checkbox"/>	Generally only suitable for deliverables at TRL 6 and above.
BESPOKE IP Clause <input type="checkbox"/> *	Details to be added and agreed by IP Group

* Do not use without IPG advice and approval

Please state in this text box if MOD or the customer has a requirement a) that one or more Other Government Departments is able to share confidentially with their own suppliers, b) to publish but you do

not think there is a requirement to own or control the deliverable, or c) to share under a procurement* Memorandum of Understanding (MOU).

If any of these three issues applies, please contact IPG for advice before completing this form. *Listing research MOUs is not required, but can be a helpful courtesy to the supplier.

DELIVERABLES

<u>Ref</u>	<u>Title</u>	<u>Due by</u>	<u>Format</u>	<u>TRL</u>	<u>Expected classification (subject to change)</u>	<u>Information required in deliverable</u>	<u>IPR DEFCON</u>
D-1	First year report	February/March 2022	Report (Word)		[REDACTED]	Report to include: <ul style="list-style-type: none">AimsTechnical ProgressAchievementsExploitable outputCosted Recommendations year 2	705
						•	
						•	

DELIVERABLE: ACCEPTANCE / REJECTION CRITERIA

Unless otherwise stated below, Standard Deliverable Acceptance / Rejection applies. This is 30 business days, in accordance with DEFCON 524 Rejection, and DEFCON 525 Acceptance.

Standard Deliverable Acceptance / Rejection:-

Yes ☒ (DEFCON 524 Rejection, and DEFCON 525 Acceptance)

No ☐ (if no, please state details of applicable criteria below)

Deliverable Acceptance / Rejection Criteria:-

If there are any other specific acceptance/rejection criteria you would like to apply to any of the deliverables, please state them here.

Government Furnished Assets (GFA)

ISSUE OF EQUIPMENT/RESOURCES/INFORMATION/FACILITIES (if not applicable, delete table and insert "None" in this text box)

<u>Unique Identifier/Serial No</u>	<u>Description</u>	<u>Classification</u>	<u>Type</u>	<u>Available Date</u>	<u>Issued by</u>	<u>Return or Disposal Date</u>	<u>Any restrictions?</u>
<i>Serial no</i>	<i>Description</i>	<i>Official-Sensitive</i>	<i>Equipment</i>	<i>00/00/0000</i>	<i>Issuer</i>	<i>00/00/0000</i>	<i>Include details here</i>
N/A	N/A						

QUALITY STANDARDS

- ☐ **ISO9001** (Quality Management Systems)
- ☐ **ISO14001** (Environment Management Systems)
- ☐ **ISO12207** (Systems and software engineering — software life cycle)
- ☐ **TickITPlus** (Integrated approach to software and IT development)
- ☐ **Other:** (Please specify in free text below)

SECURITY CLASSIFICATION OF THE WORK**The highest classification of this SOR**

OFFICIAL ☐ OFFICIAL-SENSITIVE ☐ SECRET ☐ TOP SECRET ☐ STRAP ☐ SAP

The highest expected classification of the work carried out by the contractor

OFFICIAL ☐ OFFICIAL-SENSITIVE ☐ SECRET ☐ TOP SECRET ☐ STRAP ☐ SAP

The highest expected classification of Deliverables/Output

OFFICIAL ☐ OFFICIAL-SENSITIVE ☐ SECRET ☐ TOP SECRET ☐ STRAP ☐ SAP

Is a Security Aspects Letter (SAL) required? (A Security Aspects Letter (SAL) will be required for each Task above Official-Sensitive and above)

Yes ☐ No ☐

TASK CYBER RISK ASSESSMENT. (In accordance with DEF STAN 05-138 and the Risk Assessment Workflow)

Cyber Risk Level	[REDACTED]
Risk Assessment Reference	[REDACTED]

ADDITIONAL TERMS AND CONDITIONS APPLICABLE TO THIS CONTRACT

Please ensure all completed forms are copied to DSTLSERAPIS@dstl.gov.uk when sending to the Lot Lead.

Tasking Form Part 2: *(To be completed by the Lot Lead)*

To: The Authority		From: The Lot Lead	
Proposal: “Serapis Task All109: WP 1 DCEAT Application of Novel Materials for Generation after Next (GAN) RF LOS/BLOS communications systems Technical Proposal” QINETIQ/22/02956, version 1.1			
COMMERCIAL [REDACTED] At the Authority’s request we have included a Limit of Liability for years 2 and 3. Each Firm Price created (that draws on the Limit of Liability) shall be undertaken via a mutually agreed Contract Amendment Form. Whilst these individual Contract Amendment Forms detail a separate package of work, it is linked to (and shall reference) this Tasking Form. It is understood that the scope of the work being undertaken using the LOL is not yet defined, and will be done so at the time of each Contract Amendment Form. PRICE BREAKDOWN <i>You are to use the costs detailed in Item 2 Table I in the Schedule of Requirement and at Annex E Table 2 of the Serapis Framework Agreement. Please also provide a price breakdown which should include, but is not limited to: Lot Lead Rates, Sub-contractors costs and rates, travel and subsistence. In support of your Proposal you are requested to provide clear details of all Dependencies, Assumptions, Risks and Exclusions that underpin your price.</i>			
Offer of Contract: <i>(to be completed and signed by the Contractor’s Commercial or Contract Manager)</i>			
	£399,984.98 for the core work in FY22/23 £800,000 for the Limit of Liability in subsequent Years made up of: FY23/34 option total £500,000 FY24/25 option total £300,000		(ex VAT)
Start Date:	August 2022	End Date:	March 2025
Lot Leads Representative	Name	[REDACTED]	
	Tel	[REDACTED]	
	Email	[REDACTED]	
	Date	3 rd August 2022	
Position in Company	Assistant Commercial Manager		
Signature	[REDACTED]		

Core Work – Breakdown

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Core Work – Milestone breakdown costs

Proposed Milestones Payments

Your TMS bid costs shall be included in milestone 1.

The final Milestone must reflect the actual cost of the deliverable, and be greater than 20% of the Task value, unless otherwise agreed with your Commercial POC

[REDACTED]

Future Tasks – Summary

Options Breakdown

Full breakdowns will be requested upon invoking through the Serapis Contract Amendment Form. (If you do not currently know the full options breakdown, please include what you do know and rough order of magnitude costs.)

Only complete if applicable – otherwise delete table.

Ref No.	Description	Budget Range (£)	Pricing	Start date	End date
<u>FY23/24:</u> <u>April 23 to</u> <u>March 24</u>	Maintain/review the technical team composition, provide strategic direction and develop and address an actions list of activities.	£500,000.00	Ascertained Costs	April 2023	March 2024
<u>FY24-25:</u> <u>April 24 to</u> <u>March 25</u>	Maintain/review the technical team composition, provide strategic direction and develop and address an actions list. The actions should focus on final delivery aspects of the programme such as demonstration etc.	£300,000.00	Ascertained Costs	April 2024	March 2025

Please Note: Task Option authorisation is to be issued by the Authority's Commercial Officer through a completed Contract Amendment Form and approved purchase order. No work is to be carried out prior to both of these being issued.

Tasking Form Part 3:

To be completed by the Authority's Commercial Officer and copied to the Authority's Project Manager.

1. Acceptance of Contract:		
Authority's Commercial Officer	Name	[REDACTED]
	Tel	[REDACTED]
	Email	[REDACTED]
	Date	16/09/2022
Requisition Number		RQ0000016247
Contractor's Proposal Number		Serapis Task All131: Demonstration Events for All70 –Proposal
Purchase Order Number		DSTL0000007754
Signature		[REDACTED]
<i>Please Note: Task authorisation to be issued by the Authority's Commercial Officer or Contract Manager. Any work carried out prior to authorisation is at the Contractor's own risk.</i>		