

## SERAPIS TASKING FORM

**COMPLETE SQUARE BRACKETS AND REMOVE COMMENTS BEFORE SENDING TO THE SUPPLIER**

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

<b>To:</b>	Lot 1 Roke Manor Research LtdLot 1 Roke Manor Research Ltd	<b>From</b> :	Dstl
<b>REQUIREMENT</b>			
<b>Proposal Required by:</b>	30/04/2021	<b>Task ID Number:</b>	C37
<b>Project Manager:</b>	[REDACTED-PERSONAL INFORMATION]	<b>Technical Point of Contact:</b>	[REDACTED-PERSONAL INFORMATION]
<b>Task Title:</b>	Foundry Mathematics	<b>New Task</b> <input checked="" type="checkbox"/>	<b>Change</b> <input type="checkbox"/>
<b>Required Start Date:</b>	07 May 2021	<b>Required End Date:</b>	(Before) 15 <sup>th</sup> October 2021
<b>Requisition No:</b>	1000162423	<b>Budget Range</b>	Indicative budget: £100k
<b>TASK DESCRIPTION AND SPECIFICATION</b>			
<b>Serapis Framework Lot</b>	<input checked="" type="checkbox"/> Lot 1: Collect <input type="checkbox"/> Lot 2: Space systems <input type="checkbox"/> Lot 3: Decide <input type="checkbox"/> Lot 4: Assured information infrastructure <input type="checkbox"/> Lot 5: Synthetic environment and simulation <input type="checkbox"/> Lot 6: Understand		
<p>Statement of Requirements (SOR)</p> <p>To be discussed with Lot Lead.</p> <p><b><u>Outline</u></b></p> <p>This task provides an exciting opportunity for those working within or aligned to the field of Mathematical Sciences to directly engage with and inform on the development of novel mathematical approaches for DSTL (the Authority).</p> <p>The task is sponsored by The Foundry project, within the Future Sensing and Situational Awareness (FSSA) programme. It seeks to develop disruptive sensing technologies to enable a step-change in future capability within the <b>Scope of resilient sensing, situational awareness (SA) and position, navigation and timing (PNT) in contested and congested environments<sup>1</sup></b>.</p> <p>More specifically this task is focused on Defence and Security applications, with a development horizon spanning the next 20-40 years. The Foundry project wishes to engage with researchers</p>			

<sup>1</sup> This research requirement is *defence environment* agnostic, i.e. not specific to land, sea, air, space, cyber.

with skills and experience in the mathematical sciences to generate novel mathematical concepts (within the Scope) which may influence research for years to come.

The outcome of this task is anticipated to be a number of mathematical concepts that have potential application to Defence and Security challenges. Each concept would have been assessed for its validity in a limited sense, for example, by application to a synthetic data set.

### **The Requirement**

The Authority is seeking to contract with a single successful entity selected via competition. Suppliers shall submit a proposal which demonstrates their potential to contribute in terms of reach, breadth and depth in the field of mathematical sciences applied to the Scope of work. Suppliers must use this information to support their application to describe why they are best placed to conduct this task.

Suppliers should also include relevant Case Studies, describing prior contributions to innovative research in which mathematical skills has provided the foundation. Suppliers should also describe any relevant resources (i.e. qualified staff, facilities, specialist equipment) that may support the delivery of this task.

Upon contract award, the successful Supplier shall deliver the requirements outlined by the 3 steps described below. It must be noted that the available budget of £84,000 for this task is apportioned as follows:

- **Step 1 and Step 2a:**
  - Challenge Workshop (Step 1) and submission of Candidate Concepts (Step 2a)
  - Funding available up to a maximum of £34,000
  - Note that Step 2b shall constitute a contractual breakpoint
- **Step 2b and Step 3:**
  - Concept Research (Step 2b) and Reporting (Step 3)
  - Funding available up to a maximum of £50,000

#### **Step 1: Challenge workshop**

Suppliers working within the field of (or aligned to) Mathematical Sciences shall attend an Authority led one day workshop, due to take place before 14<sup>th</sup> May (Suppliers should assume that this will be hosted by the Authority at POorton Down, however, COVID restrictions may dictate a virtual workshop; date/time to be confirmed). The workshop shall be organised by Serapis Lot 1 Prime Contracting Office (PCO). The Authority shall use this forum to present the current FSSA landscape and associated Defence and Security problem spaces. The Supplier is expected to ensure that at minimum 3 representatives attend the workshop. The representatives shall provide a breadth of expertise across a variety of mathematical approaches to stimulate discussions in regard to the challenges and how they might be explored using mathematical approaches. The supplier shall submit CV's for those allocated to this task in order to provide a view of the expertise being provided.

The Supplier shall consider the problems and challenges presented by the **scope** and work to identify different mathematical techniques that may be applied.

#### **Step 2: Concept development**

Following the above workshop, the Supplier shall be provided with a period of time spanning from 17<sup>th</sup> May – (prior to) 20th August 2021 (tbc) to progress initial development of mathematical

approaches to the challenges presented at the workshop. The following Steps 2a and 2b shall be completed within this timeframe:

**Step 2a: Candidate concepts**

The Supplier shall identify candidate concepts and prepare one or more costed proposals (one per concept) in response to the challenges. Each proposal shall be sufficiently mature such that they may be assessed. The Authority shall provide guidance on the relevance of each candidate concept throughout this phase. Proposals shall be submitted to Serapis Lot 1 Prime Contracting Office (PCO) by Monday 14<sup>th</sup> June 2021.

The submitted proposals will be assessed by the Authority. This process will ensure that proposals which are already in use or are outside the Scope are not continued and those most likely to make a difference to Defence and Security capability are prioritised.

Suppliers shall note the following requirements which satisfy this review point:

- The Supplier shall use information provided during the Challenge workshop as a foundation for each candidate concept.
- For each candidate concept, the Supplier shall clearly identify the Defence and Security Application problem(s) addressed.
- The Supplier shall describe the candidate concept and explain why it may provide benefit to the problems identified.
- The Supplier shall describe the proposed activity to develop the candidate concept and anticipated outcomes.
- The Supplier shall attend checkpoint meetings with the Authority every 2 weeks to ensure that their candidate concepts remain valid in the context of the Defence and Security Application problem space.

For each proposal that is submitted for assessment, the Supplier shall ensure the following is included:

- A description of the candidate concept.
- Mathematical disciplines / approach to be utilised for the candidate concept.
- Questions / challenges the candidate concept seeks to address.
- Justification for why the candidate concept will provide an improvement in Defence and Security capability.

Following assessment, the Authority shall inform the Supplier no later than 2<sup>nd</sup> July 2021 of the successful proposals and provide feedback on rejected proposals. Note that this decision point will decide which proposals to take forward and may result in no proposals being taken forward.

**Therefore, this shall constitute a contractual break point.**

**Step 2b: Concept research**

The Supplier shall conduct the activity described within the proposal(s) down-selected for progression. The Supplier shall prepare and present a technical briefing to be presented to Authority technical teams via a virtual workshop, to be held no later than w/e 20<sup>th</sup> August 2021 (date TBC). The workshop shall be organised by the Supplier who will present concepts and collate feedback in readiness to generate final reports for each concept.

### **Step 3: Reporting**

The supplier shall generate a single final report. This shall include a summary of the initial full candidate concepts prior to down selection and a full description of the successful concepts developed during the subsequent development activity. The report shall be completed and submitted to Serapis Lot 1 PCO before 13<sup>th</sup> September 2021.

The report shall be structured to contain **at minimum** the following contents:

- The initial candidate concept list prior to prioritisation (Step 2a).
- The following for each of the concepts taken forward for development (Step 2b):
  - Concept description and approach(es) utilised.
  - Defence and Security challenge(s) the concept seeks to address.
  - Explanation and, if possible, demonstrate as to why the concept may provide an improvement in capability.
  - Considerations of feedback provided at Workshop / impact on the concept.
  - Successes / lessons identified.
  - How the Supplier would plan to further develop the concept; what are the challenges involved?
  - Identify additional applications (if any) for Defence and Security challenges.
  - Conclusion.

That the report shall be considered by the authority for future funded opportunities.

### **Monitoring**

The Supplier shall arrange kick-off meeting to take place no later than 1 week prior to the Authority workshop (Authority workshop date before 15<sup>th</sup> May, tbc)

- At least 2 working days prior to the kick-off meeting, the supplier shall send the PCO a completed kick-off meeting presentation (template to be provided by the PCO).

The Supplier shall schedule with the Authority and attend checkpoint meetings every 2 weeks. The first checkpoint meeting shall be 2 weeks following the date of the kick off meeting. The objective of the meeting is to provide informal progress updates to the Authority so that they may be assured approaches remain on track.

The Supplier shall schedule a workshop to present research to Authority technical experts before 20<sup>th</sup> August (TBC). The workshop shall be interactive enabling the Authority the opportunity to provide feedback. Presentation materials for the workshop should be submitted to the PCO no later than 3 working day before the event.

The Supplier shall arrange a contract Close Down meeting to take place NLT 1 week prior to the end of the contract.

- This meeting shall serve as a contract closure meeting and as a forum in which to collate lessons identified.

- At least 2 working days prior to the close down meeting, the supplier shall send the PCO a completed close down meeting presentation (template to be provided by the PCO).

All workshops and meetings shall where possible be held online using MS Teams. The Supplier must ensure that where alternative application is used for workshops, the Authority / PCO are able to access.

### **Unsuccessful Proposals:**

Proposals submitted which are unsuccessful may be considered in subsequent rounds as and when additional funding becomes available. There is potentially an additional round, delivering in February 2022. **We therefore request that your proposals remain valid up to 28 February 2022 after submission.**

### **Further / Supplementary information:**

[REDACTED-DEFENCE]

**Application of Mathematical disciplines within Sensing are exemplified within the table below:**

Application of Mathematical Sciences to Sensing	
Sheaf theory for data fusion	Sheaf theory may be applied to any collection of heterogeneous data to obtain: (i) A quantitative assessment of the consistency of each dataset; and (ii) the nearest globally self-consistent dataset. The latter can be obtained by solving an optimization problem. Hence, sheaf theory transforms a data fusion problem into an optimization problem, for which there are a host of familiar algorithms. The globally self-consistent dataset can then be used to yield better predictions/estimates.
Noise patterning in sensor misclassification	Non-stochastic patterned noise can be targeted to cause misclassification in machine learning techniques like dimension reduction classifiers such as linear discriminate analysis. This has been demonstrated for scenarios such as Raman spectroscopy. Can this be performed for remote sensing and how can it be mitigated?
Bayesian statistics for sensor modelling:	For electro-optic sensors, an algorithm to determine the parameters that constrain a single-photon detector's performance in terms of number of photons incident on the detector surface. The technique being used is Bayesian inference to infer statistics of image based on arrival photon statistics. This comes up against a similar problem as proposed under information theory – how is a “good” image described mathematically? Key parameters include resolution and probability of detection.

**The below provides additional *Maths in Sensing* Challenges:**

- How can we explore the fundamental limits to sensing? Can we move sensing into the information space and define our sensors within this? Would mutual information help us to describe this? How can we compare the performance of very diverse sensors, e.g. camera vs RF signal detection? What visualisations can we use to explain these multi-dimensional limits to our military user?

- Control theory for clock noise management. The physics of modern clocks (atomic and crystal-based) is widely explored. Typically, the stability of the clock is managed by a PID (Proportional Integral Derivative) feedback loop between the output oscillation and the control parameters such as current and temperature. Are there novel techniques within control theory that may be able to provide better feedback loop systems to manage the output time measurement stability, potentially by accounting for noise sources?

#### 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

DEFCON 705 deliverables should be delivered as FULL RIGHTS. The Supplier shall indicate in their proposal submission if they intend to exploit Background IP and their intent to supply either LIMITED RIGHTS or both FULL RIGHTS and LIMITED RIGHTS deliverables. The Supplier shall notify the PCO in the event that Background IP becomes relevant to delivery.

Task IP Conditions (Follow the <a href="#">NIPPY</a> guide to identify your information and IP requirements for each deliverable)	Summary of the Authority's rights in foreground IP (IP generated by the supplier in performance of the contract)
DEFCON 703 <input type="checkbox"/>	Vests ownership with the Authority
DEFCON 705 <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	

#### DELIVERABLES

Unless otherwise agreed, the Supplier shall provide mature draft versions of deliverables to the PCO at least 5 working days prior to the due date below, for review and acceptance / rejection

Deliverable	Due	Description
D1	18 <sup>th</sup> June 2021	<b>Candidate Concepts Proposals</b> Objective: To assess concepts under development for progression
D2	Workshop (tbd, no later than 20 <sup>th</sup> Aug) – 2 days	<b>Stage 3 workshop presentation materials</b> Objective: To provide view of research results due to be delivered for workshop presentation Minutes within 1 week of event
D3	17 <sup>th</sup> September 2021	<b>Final Research Reports</b> Objective: Provide report summarising research and feedback.

## OUTPUTS

Unless otherwise agreed, the Supplier shall provide draft versions of outputs to the PMO at least 5 working days prior to the final deliverable date, for review and acceptance / rejection

Output	Due	Description
O1	CA + 1 week	<b>Kick-off meeting</b> Presentation input to the PCO 2 days before the meeting Minutes within 1 week of meeting
O2	CA + 1 week	<b>Regular checkpoint meeting with Authority</b> Frequency: every 2 weeks Objective: Ensure concept development remains 'novel'. First meeting to combine with O1, kick off meeting
O3	<b>Before</b> 20 <sup>th</sup> August 2021	<b>Stage 3 Workshop</b> Objective: Presentation of concept development for technical feedback. Links into D2.
O4	Contract End – 1 week	<b>Close-down meeting</b> Presentation input to the PCO 5 days before the meeting Minutes within 1 week of meeting

**Deliverable: Acceptance / Rejection Criteria** (30 business days unless agreed otherwise)

DEFCON 524 Rejection ☐ period [30] days

DEFCON 525 Acceptance ☐ period [30] days

## ISSUE OF EQUIPMENT/MATERIAL/INFORMATION

The Authority will issue materials presented at the Stage 1 Challenge Workshop to the Supplier post-workshop as GFI.

**QUALITY STANDARDS****ISO 9001****SECURITY CLASSIFICATION OF THE WORK** *(A Security Aspects Letter (SAL) will be required for each Task above Official-Sensitive, Quotes are covered by the Framework SAL)***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 ☐SAL Attached ☐**TASK CYBER RISK ASSESSMENT.** *(In accordance with [DEF STAN 05-138](#) and the [Risk Assessment Workflow](#))*

Cyber Level	Risk	[REDACTED-DEFENCE]	Risk Reference	Assessment	[REDACTED-DEFENCE]
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**ADDITIONAL TERMS AND CONDITIONS APPLICABLE TO THIS CONTRACT**

Nil

Please ensure all completed forms are copied to [DSTLSERAPIS@dstl.gov.uk](mailto:DSTLSERAPIS@dstl.gov.uk) when sending to the Lot Lead.

Any Task placed as a result of your quotation will be subject to the Terms and Conditions of Framework Agreement Number:

LOT 1 DSTL/AGR/SERAPIS/COL/01



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

<b>To:</b> The Authority FAO: Tel:	<b>From:</b> The Lot Lead
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<b>Proposal Reference</b> <b>UOB Technical Proposal for C37</b> <b>(attached)</b>	
<b>Delivery of the requirement:</b> <b>The proposal shall include, but not be limited to:</b> <ul style="list-style-type: none"> <li>• A full technical proposal that meets the individual activities that are detailed in Statement of Requirements (Part 1 to Tasking Form).</li> <li>• Breakdown of Deliverables and Interim Payments (Milestone/stage) due dates.</li> <li>• A work breakdown structure/project plan with key dates and Deliverables identified including required delivery dates for Government Furnished Assets.</li> <li>• A clear identification of Dependencies, Assumptions, Risks and Exclusions which underpin your Technical Proposal.</li> <li>• Sub-Contractors Personnel Particulars Research Worker Form and security clearances (if applicable)</li> </ul>	
<b>PRICE BREAKDOWN</b> <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>	
<b>Total Proposal Price in £</b>	51,564.17 (ex VAT)
<b>Start Date:</b>	05/07/21 <b>End Date:</b> 21/07/21
<b>Lot Leads Representative</b>	Name [REDACTED-PERSONAL INFORMATION]
	Tel [REDACTED-PERSONAL INFORMATION]
	Email [REDACTED-PERSONAL INFORMATION]
	Date 01/07/21
<b>Position in Company</b>	Commercial Manager
<b>Signature</b>	[REDACTED-PERSONAL INFORMATION]

### Contractor's Price Breakdown

[PRICING TABLES REDACTED IN ENTIRETY-COMMERCIAL INTERESTS]

Lot Lead Rates for Self-Delivery		
Name & Role	Number of Hours	Total Cost in GBP

[SUB CONTRACTOR PRICING TABLES REDACTED IN ENTIRETY-COMMERCIAL INTERESTS]

**N.B. The Contractor should provide a more detailed breakdown of Sub-Contractor costs in its supporting proposal.**

[MILESTONE PRICING TABLES REDACTED IN ENTIRETY-COMMERCIAL INTERESTS]

<b>Total Cost</b>		<b>51,564.17</b>
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Stage 2

*Estimated price for the optional Stage 2 (D2 and D3) is £50,000, subject to scope and price being firmed up prior to commencement. The assumed start date of Phase 2 is the start of August 2021.*

**Tasking Form Part 3:**

<b>1. Offer of Contract:</b> <i>(to be completed by the Authority's Commercial Officer or Contract Manager and copied to the Authority's Project Manager)</i>		
<b>Authority's Commercial Officer</b>	Name	[REDACTED-PERSONAL INFORMATION]
	Tel	[REDACTED-PERSONAL INFORMATION]
	Email	[REDACTED-PERSONAL INFORMATION]
	Date	07/07/2021
<b>Requisition Number</b>		R1000162423
<b>Contractor's Proposal Number</b>		UOB TechnicalProposal for C37
<b>Purchase Order Number</b>		DSTLX-1000160814
<b>Signature</b>		[REDACTED-PERSONAL INFORMATION]
<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>		