Serapis Tasking Form

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

To:	Lot 5 Newman & Spurr Consultancy Ltd	**From:**	The Authority

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

LOT 5 DSTL/AGR/SERAPIS/SSE/01

VERSION CONTROL

V0_1

REQUIREMENT

Proposal Required by:	31/08/2022	**Task ID Number:**	SSE53
The Authority Project Manager:	Redacted under FOIA Section 40 - Personal Information	**The Authority Technical Point of Contact:**	Redacted under FOIA Section 40 - Personal Information
Task Title:	Improved Machine Learning for COTS		
Required Start Date:	01/09/2022	**Required End Date:**	31/03/2023
Requisition No:	RQ0000020811	**Budget Range**	~ 100K?

TASK DESCRIPTION AND SPECIFICATION

Serapis Framework Lot	☐ Lot 1: Collect ☐ Lot 2: Space systems ☐ Lot 3: Decide ☐ Lot 4: Assured information infrastructure ☒ Lot 5: Synthetic environment and simulation ☐ Lot 6: Understand

Statement of Requirements (SOR)

Dstl is interested in applying machine learning (ML) to computerised games of warfare to analyse the moves players have chosen.To this end, Dstl has recently completed a project with its industry partner Montvieux examining the use of ML models to asses player moves and provide player feedback using the Slitherine Published commercial off the shelf (COTS) wargame Flashpoint Campaigns. This project demonstrated that it was possible to extract the necessary data from the COTS game to train a ML model, and that this model could make predicitons about the future state of the game based on it's current state. In addition to predicting the location and sustained casualties of units within the wargame, the previous work also trained a value model. This value model was capable of inspecting a given game state and computing a score of how likely each side was to achieve overall victory in the scenario. In combination, these two models (ML model and value model) allowed a method of providing player feedback by predicting the position of units, the casulaties taken by those units and the overall chance of victory that would result from the given set of orders. Similarily, the project showed that it was possible to recommend a "good" move to the player by using a brute-force method where possible moves were selected at random and the ones which resulted in the highest predicted likelihood of success were presented to the player.

In order to demonstrate the proof of concept, previous work has mainly focused on a small number of simplified scenarios to allow for rapid training and iteration of the underlying machine learning models. Dstl would now like to expand on this work by applying the tools previously developed to a number of classified defence scenarios frequently used by Dstl for analytical wargaming. These scenarios will cover a range of threats from irregular and sub-peer forces to peer plus adversaries. The scenarios will also cover a range of map sizes and terrain types from complex European terrain to more open arid environments.

Dstl would like to see the project split into two distinct phases.

Phase 1

The existing machine learning models will be trained on the analytical scenarios with the aim of producing a tool that can provide interesting and tactically useful suggested moves to the player. To achieve this it may be necessary to further refine the algorithims produced by previous work including implementing some of the proposed improvments such as hyper parameter tuning or implementing alternative architectures for choosing suggested moves.

Phase 1 will examine how the existing methods cope with a wider variety of more realistic scenarios and in particular how “easily” the trained system can deal with situations outside of its training set. Dstl will provide a variety of scenarios to train and test against. This may turn out to be a simple task with minimal modifications to the method, or it could reveal that larger changes are required.

Phase 2

The activity in phase 2 will depend on the outcome of phase 1, with a decision point at the end of phase 1.

If phase 1 has yet to show that the methods can cope with novel situations then phase two will focus on continuing that research.

If phase 1 has proven successful, then in phase 2, Dstl would like to examine the problem of imperfect or incomplete information. In previous work, all information about the position and state of both the Red and Blue forces has been made available to the machine learning models, as well as the graphical user interface used for viewing suggested moves. However, analytical wargames are typically played with the presence of the fog of war, so players do not know the exact position of all enemy units at any given time. This discrepancy will likely lead to suggested moves that could not realistically have been chosen even by the best players, as they are based on information that was not available to the player at the time. To address this issue, in phase 2, Dstl would like changes to be made to the machining learning models such that they can operate with only the information the player has access to. For example, the model would only have the exact positions of the currently spotted enemy units as well as the last known position of previously spotted units. The model may well make use of the order of battle of the opposing side to try and estimate a position of known but not currently spotted threats but this is not strictly required. The goal of phase 2 will be to produce suggested moves that are of comparable tactical usefulness as in phase 1 but by only considering the information available to the player.

During both phase 1 and phase 2 of the project, it is assumed that the models will be trained on either purely computerised self-play data or a mix of self-play and human data. In either case the expectation is that the model will be able to provide tactically useful suggested moves in human vs human or human vs AI game modes.

Finally, at the end of the project, as a demonstration of the robustness of the produced models, Dstl will provide an as yet unseen scenario which will be added to the training data set to see how well the model architecture can generalise to new scenarios. A demonstration of the model suggesting moves to a human player in the new scenario will form part of the final deliverable for the project.

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 (IP generated by the supplier in performance of the contract)**
DEFCON 703 ☐	Vests ownership with the Authority
DEFCON 705 Full Rights ☒	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* ☐, 15* ☐, 16* ☐, 90* ☐, 91* ☐, 126* ☐	Generally only suitable for deliverables at TRL 6 and above.
BESPOKE IP Clause ☐ *	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

Ref	Title	Due by	Format	TRL	Expected classification (subject to change)	Information required in deliverable	IPR DEFCON

D-1	Progress meetings at appropriate stages in the project, to allow Dstl to provide feedback to shape the project.	As appropriate	Presentation (.pptx)	NA	Redacted under FOIA Section 26 - Def	Presentation pack to nclude but not limited o: Update on technical progress. • Progress report against project schedule. • Review of risk management plan. • Review of deliverables. • Risks/issues. • GFA and supplier performance.	*705*
D-2	A presentation and demonstration on the current model performance	Halfway point	In person or virtual workshop and/or .pptx, and/or video as appropriate	NA	Redacted under FOIA Section 26 - Def	Demonstration of good suggested moves when applied to the analytical scenarios supplied by Dstl in Human Vs AI mode. . Human vs AI play mode.	
D-3	Code generated	End of project	Packaged source code and any trained model files and raw data generated	NA	Redacted under FOIA Section 26 - Defe	Code files. Raw generated data. Trained machine learning models. For the machine learning element of the project, deliverables should include full working code, code documentation, code tests, and a brief user guide. A high level summary demonstrating the use of the tool and its predictions should also be included.	
D-4	Final report	End of project	.docx	NA	Redacted under FOIA Section 26 - Defe	A written report, summarising the work carried out, that includes technical details in annexes (including a description of the data gathered, any input data pre-processing, and details of machine learning approach taken)	

						Technical overview of work carried out. Description of data generated and used for training. Recommendations for future improvement.	
D-5	Demonstration of the produced model on an unseen analytical scenario	End of project	In person or virtual workshop and/or .pptx, and/or video as appropriate	NA		Demonstration of good suggested moves. Human vs AI play mode.	

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)*

Unique Identifier/ Serial No	Description	Classification	Type	Available Date	Issued by	Return or Disposal Date	Any restrictions?
GFX001	Access to Dstl Wargame Staff		*NA*	*At start of contract*	*Dstl*	*NA*	
GFX002	Access to Dstl Project Team staff		NA	*At start of contract*	*Dstl*	NA	
GFX003	Example Scenarios		Information	*At start of contract*	*Dstl*	End of contract	

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

Redacted under FOIA Section 26 - Defence

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

Cyber Risk Level	Redacted under FOIA Section 26 - Defence
Risk Assessment Reference	

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 Reference **QTSL-820-2007 V1.0** **(attached)**

Delivery of the requirement:

The proposal shall include, but not be limited to:

- A full technical proposal that meets the individual activities that are detailed in Statement of Requirements (Part 1 to Tasking Form).
- Breakdown of individual Deliverables, with corresponding Intellectual Property rights applied.
- Breakdown of Interim Milestone Payments, with corresponding due dates.
- A work breakdown structure/project plan with key dates and deliverables identified.
- A list of required Government Furnished Assets from the Authority, including required delivery dates.
- A clear identification of Dependencies, Assumptions, Risks and Exclusions which underpin your Technical Proposal.
- Sub-Contractors Personnel Particulars Research Worker Form and security clearances (if applicable)

PRICE BREAKDOWN

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.

Offer of Contract: *(to be completed and signed by the Contractor's Commercial or Contract Manager)*

Total Proposal Price in £	£94,885.11		(ex VAT)
Start Date:	1st November 2022	**End Date:**	31st March 2023
Lot Leads Representative	Name	Redacted under FOIA Section 40 - Personal Information	
	Tel		
	Email		
	Date		
Position in Company	Director of Business Operations		
Signature	Redacted under FOIA Section 40 - Personal Information		

Core Work – Breakdown

Lot Lead Rates for Task Management Services (TMS)
Please insert/delete rows as necessary

Redacted under FOIA Section 43 – Commercial Interest

Lot Lead Rates for Self-Delivery (only complete if applicable – otherwise delete table)
Please insert/delete rows as necessary

Redacted under FOIA Section 43 – Commercial Interest

Work Delivered by Sub-Contractor(s)

We recognise that suppliers may fit into multiple categories, please choose the drop down that categorises the supplier by the definition that is lowest on the list (i.e. a Defence Supplier Academic would be treated as an Academic.

Redacted under FOIA Section 43 – Commercial Interest

Travel, Subsistence, Materials & Equipment

Redacted under FOIA Section 43 – Commercial Interest

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

Please duplicate the template per milestone table format below as necessary, and rename milestone number accordingly.

Redacted under FOIA Section 43 – Commercial Interest

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 under FOIA Section 40 - Personal Information
	Tel	
	Email	
	Date	10/11/2022
Requisition Number		RQ0000020811
Contractor's Proposal Number		QTSL-820 -2007 V1.0
Purchase Order Number		DSTL0000009821
Signature		Redacted under FOIA Section 40 - Personal Information
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.		