RCloud Tasking Form – Part B: Statement of Requirement (SoR)

Title of Requirement	TRED-Obj Rec
Requisition No.	1000168420
SoR Version	0.1

1.	**Statement of Requirements**
1.1	**Summary and Background Information**
	TRED – Automated Object Detection TRED is a Chief Scientific Advisor (CSA) funded project to advance UAS technology in order to deliver lethal and non-lethal effect. In order to strengthen evidence in preparation for ABC22, an S&T study into the feasibility of integrating military object detection software into the TRED system should be undertaken. This work will support the de-risking of the wider TRED capability development. TRED is a Dstl, CSA-funded project initiated in 2018. Although significant progress has been made using the TRED Functional platform in effectively demonstrating the effects delivery concepts against REDACTED UNDER A FOIA EXEMPTION, additional work is to be undertaken in order to make this a viable system for the user group's range of target types. Automated target detection and tracking to task the platforms flight controller and effects guidance are core principles to the TRED Functional system. In order to expand its employment across a wider range of use cases and exploit potential payload options, additional user group targets/objects of interest must be identified and included as a data set in the target detection algorithms. A user could, for example, task TRED to deliver REDACTED UNDER A FOIA EXEMPTION, and then rapidly reconfigure the same system to deliver an effect against REDACTED UNDER A FOIA EXEMPTION This study will demonstrate that alternative target types can be uploaded to the TRED Functional platform's on-board computer allowing the Artificial Intelligence (AI) edge processing capability to identify new target types and facilitate automated flight patterns and target engagement/payload delivery to that target. This will enhance REDACTED UNDER A FOIA EXEMPTION, as it will encourage coherence between projects exploiting TRED outputs, ensuring a level of interoperability is maintained between concepts. Moreover, it will ensure TRED and other projects align with the EP, in order to optimise the solution REDACTED UNDER A FOIA EXEMPTION There is significant interest in TRED from the user community as well as REDACTED UNDER A FOIA EXEMPTION. This REDACTED UNDER A FOIA EXEMPTION provides further evidence that TRED is a strategic enhancement to the user, and therefore it is imperative that REDACTED UNDER A FOIA EXEMPTION provide funding, in order to influence the development of TRED with the specialist users of the REDACTED UNDER A FOIA EXEMPTION in mind. The outcome of the study would demonstrate that the TRED principles can be applied across a range of target types and payload delivery concepts and the modular / reconfigurable approach needed in order to counter the rapidly evolving threat. This additional research will be invaluable in accelerating the Concept and Assessment phases should TRED be taken as a ABC 22 funded project.

1.2	**Requirement**
	Dstl has used CSA funding to develop AI enabled RPAS to reduce the cognitive burden on the operator during employment. Dstl has worked with the user group to identify additional target and payload concepts of use that could be met through the modification of the TRED Functional platform. Exploiting this research, the study will select a bespoke target set, develop target detection and tracking algorithms for that target set and automate TRED Functional flight characteristics in order to meet the bespoke concept of use. The software will be integrated into the TRED Functional platform and tested across a range of representative scenarios. The intent is to deliver in a number of 'quick turnaround' work packages, these being: **WP0: Common Processing Pipeline and Data Setup**: This Work Package will set up the baseline capability to address the others. This includes gathering common datasets to be used (after agreement of objects to detect), setting up model training, testing, and video processing pipelines, and data management systems for quality control. **WP1: Low Data Availability**: Explore how to mitigate the problem of low data availability on model performance, and demonstrate how different approaches impact performance. **WP2: Fine-Grained Detection**: Test operationally applicable ways to detect a specific instance of an object (e.g. a red Tesla Roadster, not just a car.) **WP3: Difficult Environmental Condition Mitigation**: Identify approaches to measure and improve performance in operationally relevant environmental conditions **WP4: Niche Class Model Build**: Combining the results of the above Work Packages, train models for two uncommon object classes, as agreed with yourselves. This work package will attempt to develop models that would work for specific mission profiles (i.e. target, time of day, weather conditions, amount of data available, potentially specific target.) **WP5: Go / No Go Decision Making**: Identify whether a mission is viable based on both the location estimated from the image and the contents of the scene. **Work package 0 to start at earliest opportunity. WP 0 + 1 to complete FY 21/22 (T0)** WP0 – Common processing pipeline T0 + 1 Month WP1 – Low data availability T0 + 2 Months **WP 2 to start 1st April 22. WP 2 – 5 to complete FY 22/23 (T1)** WP2 – Fine-grained detection T1 + 2 Months WP3 – difficult environmental condition T1 + 4 Months WP4 – Niche class model build T1 + 6 Months WP5 – go/no go decision making T1 + 8 Months
1.3	**Options or follow on work** *(if none, write 'Not applicable')*

	Not Applicable
1.4	**Contract Management Activities**
	Contract shall be managed as per the Dstl Management System particularly relating to Project Management Governance.
1.5	**Health & Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement**
	ISO9001

1.6	Deliverables & Intellectual Property Rights (IPR)					
Ref.	**Title**	**Due by**	**Format**	**Expected classification (subject to change)**	**What information is required in the deliverable**	**IPR Condition**
WP-0	*Presentation outlining base models and datasets*	T0+1month	.pptx	OS	Datasets to be used (after agreement of objects to detect) for setting up model training, testing, and video processing pipelines, and data management systems for quality control.	Default RCloud Agreement Terms and Conditions shall apply
WP-1	WP-1 Summary meeting	T0+2 months	.pptx and physical meeting	OS	Measure the performance impact of a number of approaches against a baseline model.	Default RCloud Agreement Terms and Conditions shall apply
WP-2	Model demonstration and Report	T1+2 months	Docx. pptx. Video/Stills	OS	A demonstration of the model finding a specific target in pre-recorded imagery (either video or stills) identifying a specific target from a reference image amongst others. The relative performance of all approaches tried compared and reported.	Default RCloud Agreement Terms and Conditions shall apply DEFCON 705
Wp-3	Presentation and Video	T1 + 4 months	Video and pptx.	OS	A range of approaches to improve model robustness to poor environmental conditions, including processed videos in the chosen weather conditions. These should be compared and combined to identify approaches that deliver the most robust operational solution.	Default RCloud Agreement Terms and Conditions shall apply DEFCON 705

					A video comparing different models on real data in the chosen environmental conditions, as well as examples of any augmented or simulated data.	
WP-4	Model Files and Code. Video and Powerpoint	T1 + 6 months	.doc and .pptx Model Files Python Code	OS	This work package should deliver trained model files, a simple guide of how the models were put together, and python code to use them to process either a video or a live camera feed. It should also deliver processed videos showing their use, and a slide pack detailing the approaches used and the overall system performance and limitations.	Default RCloud Agreement Terms and Conditions shall apply DEFCON 705
WP-5	Presentation and Report	T1 + 8 months	Pptx. Docx.	OS	This work package should explore the limitations and difficulties faced by an autonomous platform in the terminal phase of a mission. The location accuracy and accurate “go / no go” decision made will be recorded.	Default RCloud Agreement Terms and Conditions shall apply DEFCON 705

1.7	**Deliverable Acceptance Criteria**
	• On agreement through progress meetings between supplier and dstl

2	**Evaluation Criteria**
2.1	Method Explanation
2.2	Technical Evaluation Criteria
	Dstl technical experts shall perform a subjective assessment to confirm the proposed solution meets and address the technical scope.
2.3	Commercial Evaluation Criteria
	The commercial assessment shall cover a series of Pass / Fail questions, including: 1. The proposal has been submitted a firm price 2. The submitted proposal is priced in accordance with the RCloud rate card? 3. The supplier provided One full technical proposal (excluding cost data) and One full technical and commercial (including all cost data) 4. The proposal has included, where appropriate, completed Personal particular Research Workers Forms (PPRWF) or confirmed that active security details shall be provided to Dstl Security Controller for review and acceptance.