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

Title of Requirement	J36C – PESC Research Topic 1A/B
Requisition No.	**RQ0000014193**
SoR Version	**1.0**

1.	**Statement of Requirements**
1.1	**Summary and Background Information**
	There is a requirement to analyse the Cosmic Radiation Environment Dosimetry and Charging Experiment (CREDANCE) payload data to provide a more comprehensive data almanac of the Low Earth Orbit (LEO) electron populations from past predictions of artificial vs natural propagation times. This analysis should provide a better understanding of: 1. Increased assurance for environmental specifications including Radiation Design Margin (RDM) and Total Ionising Dose (TID) lifetime predictions. 2. Operational impacts and future system design considerations. 3. Data for analysis of future defence satellite constellations outside of GEO. Further analysis of the protons populations and Galactic Cosmic Rays (GCR) will enable a greater data set for the proton belts and GCR populations respectively. The CREDANCE payload has already had significant MOD sponsorship since ~ 2000 in the design, launch and operation however launch delays and shifting programs has neglected the final data analysis. The original CREDANCE team has continued to engage with international partners i.e. NASA, DoD etc. to ensure the data is available for analysis but it will require funding to carry out the full analysis required by the original Subject Matter Expert (SME) team. **Background** There are several natural sources of ionising radiation in space that can have deleterious effects on spacecraft. Additionally following the detonation of a High Altitude Nuclear Event (HANE) there are artificially generated sources of ionising radiation. Of specific note are free electrons that can cause surface charging and reduce a satellite lifetime through cumulative charge build-up in the form of Total Ionising Dose (TID). To ensure a satellite can meet its specified lifetime requirement a good understanding of the electron populations are required for specified missions i.e. through its Launch and Early Operations Phase (LEOP) and final orbit. There are limited data sets that can

	be used within particle models to predict electron populations and therefore it is crucial to collect sufficient data for ingestion into key particle models and verify past predictions. Due to the complexity of orbital mechanics and particle monitoring systems it is inherently more industrious to provide empirical data sets from a number of different monitoring systems and mission profiles i.e. different system designs and orbital categories. Therefore MOD has invested in data collection and modelling activities that can support strategically critical systems i.e. Skynet. The latest data set has been collected on the Cosmic Ray Effects, Dosimetry and Charging Experiment (CREDANCE) payload that was MOD funded since ~2000 for the design, launch and operation of the payload however launch delays and shifting programs has neglected the final data analysis.
1.2	**Requirement**
	J36C – PESC Research Topic 1A There is a requirement to analyse the data from the Cosmic Ray Effects, Dosimetry and Charging Experiment (CREDANCE) payload that has accumulated 2.5 years of radiation environment data during US Demonstration and Science Experiments (DSX) Mission. Analysis is required to understand the evolving near-Earth environment for defence applications. Analysis shall be in the form of a publishable report and associated data pack that includes: 1. Processed CREDANCE data for the full mission duration from each sensor suite: SURF (electrons), proton telescope, Ion telescope, RADFETs (Total Ionising Dose (TID)). 2. Correlation of CREDANCE, GIOVE and GALILEO data within Medium Earth Orbit (MEO). 3. Correlation of CREDANCE trapped proton and electron (SURF) fluxes data against AE/P-9 (and AE/P-8 if resources allow). 4. Objective predictions of the accuracy of the International GEO Electron (IGE) 2006 using recent CREDANCE data and associated analysis. 5. Correlation of current Low Earth Orbit (LEO) electron populations against past predictions of artificial vs natural propagation times. 6. Validation and comparison of independent sovereign UK trapped particle model (British Antarctic Survey (BAS)) against US AE9 model with addition of CREDANCE data.

	7. Assessment of electron population propagations and their implications (for defined LEO, MEO, HEO and GEOs) following rapid injections of electrons (values and locations TBC). 8. Objective assessment of the electron, proton, and ion population uncertainties for natural and artificial sources for the implications upon: Radiation Design Margins (RDM) and Total Ionising Dose (TID) lifetime predictions. 9. Use SURF data and proton flux data in conjunction with dose-depth calculations to evaluate the relative contribution of different particle species to RADFET measurements. 10. Correlate enhancements in RADFET and SURF data to independent observations of CMEs and fast solar wind stream enhancements of the trapped electron environment. 11. Compare integral LET spectra with model predictions of GCR LET spectra. Explore discrepancy between coincidence and non-coincidence channels via Monte Carlo simulations.
1.3	**Options or follow on work**
	J36C – PESC Research Topic 1B Correlation of the CREDANCE data with: 1. The Wave Particle Interaction Experiment (WPIx) (USAF). 2. US particle monitor payloads from DSX. US monitor design was different to UK and may require a different interpretation. 3. Space Environments Effects Experiment (SFx) technology impacts: • COTS FPGAs • ELDRS for transistors DIME for total dose measurements
1.4	**Contract Management Activities**
	Meetings, telephone and email updates as required. The contract deliverable has been divided into two technical reports to enable complete delivery against a subset of objectives but allow tracking of developments towards the full set of objectives for the final report.

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	The supplier can recommend a different ordering of objectives if it will allow a more efficient response to completing the objectives.
1.5	**Health & Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement**

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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**
D1	Interim Technical Report (1)	31/03/2024	Word & PDF Document	[redacted]	See requirement 1.4 Report to include completed analysis for items 1-7 within requirement 1.4 and identify progress towards items 8-11. Report will be reviewed by Dstl Technical Partner for review comments to be incorporated into technical report 2 if required.	RCloud Agreement Terms and Conditions shall apply
D2	Final Technical Report (2)	Dec 2024	Word & PDF Document	[redacted]	See requirement 1.4 Report to include any updated analysis for items 1-7 within requirement 1.4 and completed analysis for items 8-11. Report will be reviewed by Dstl Technical Partner for review comments to be incorporated into a final version if required.	RCloud Agreement Terms and Conditions shall apply

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D3	Technical Presentation	Dec 2024	Presentation (.pptx)	[redacted]	See requirement 1.4. The technical presentation will include summaries of each of the items 1-11 e.g. Objective, method and conclusions.	RCloud Agreement Terms and Conditions shall apply
D4	Data Pack	Dec 2024	CD	[redacted]	See requirement 1.4. The data pack will provide all the raw data and associated analysis i.e. graphical plots etc. to enable inclusion into other reports or data models.	RCloud Agreement Terms and Conditions shall apply

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1.7	Deliverable Acceptance Criteria
	Any payment invoice should not be submitted until the deliverable has been accepted in writing (email) by Dstl.

2	Evaluation Criteria
2.1	Method Explanation
	Please submit two versions of your proposal. The Technical proposal should not contain any pricing information. The Commercial version should be a full response to the ITT including both Technical and pricing information. The supplier's proposals will be evaluated by the Dstl technical and commercial authorities to assess whether the content meets with Dstl's requirements and represents appropriate value-for-money. The placing of any contract will depend upon consideration of the proposal received and the Authority reserves the right, at its sole discretion, to proceed to contract for any part or all of a suppliers proposal. And if necessary, not to place any contract as a result. Please note the MOD operates a policy of No Acceptable Price No Contract (NAPNOC).
2.2	Technical Evaluation Criteria
	The supplier's proposal will be technically acceptable if considered by Dstl Subject Matter Experts (SMEs) that the plan is credible and it provides sufficient confidence that it will achieve the requirements within the stated timescales
2.3	Commercial Evaluation Criteria
	Commercial Proposals will be assessed as to whether the content meets with Dstl's requirements and represents appropriate value-for-money.

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Commercial Compliance:

Firm price and full firm price breakdown for all costs to be incurred to fulfil this requirement, including:

- What rates are being used for what role
- Quantity of manpower hours per role
- Any Materials costs
- Any Facility costs
- Any sub-contractor costs
- Any travel and subsistence costs
- Any other cost

Compliance with this Task specific terms and conditions as stated within the Statement of Requirement and respective Call-Off Tasking Form.

Commercial Scoring criteria:

Score	Definition
Pass	Fully meets the Authority's requirement. Provision and acceptance of the sub-criteria information in the format requested, which is clear, unambiguous and transparent.
Fail	Unacceptable/Nil Return. Tenderer did not respond to the question or the response wholly failed to demonstrate an ability to meet the sub-criteria requirement