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

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| **Title of Requirement** | UK Academic Centre of Excellence in Hypersonics Science and Technology |
| **Requisition No.** | 61180463 |
| **SoR Version** | **1.0** |

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| **1.** | **Statement of Requirements** |
| **1.1** | **Summary and Background Information** |
|  | Hypersonic flight will form a key component of MOD's future technical and capability strategy. The objective of this investment is the creation of an enduring world renowned Centre of Excellence in Hypersonic Science and Technology at the University of Oxford that supports the needs of government, industry and wider academia and can deliver a step change in sovereign capability to assess, design and exploit hypersonic vehicles. Key deliverables include improved facilities, high quality scientific research and the development of suitable qualified and experienced personnel.  The flow physics encountered in hypersonic flight are complex and considerably more challenging than flight at subsonic, transonic or supersonic Mach numbers. In the hypersonic speed regime (M>5) the following issues must be understood: aerodynamic heating, laminar-turbulent boundary layer transition and real gas effects such as non-equilibrium chemistry. All of which require fundamental research and development to enable the design and exploitation of a hypersonic vehicle.  The proposed MOD investment Redacted builds on current MOD/DSTL research investments at Oxford that are currently supporting a Post-doctoral Researcher and a cohort of 4 DPhil/PhD students, these are researching various aspects of Hypersonic aero-thermodynamics.  This investment will receive significant gearing by exploiting a Royal Academy of Engineering grant for a Senior Research Fellow, which provides Redacted as a contribution to the lead academics salary to enable him to focus on developing the centre and research capability.  The University of Oxford will support this initiative by reinvesting the salary savings enabled by the Fellowship by recruiting a new, full-time, Departmental Lecturer to cover the Senior Research Fellow’s teaching and administrative obligations. The lectureship will be aligned with the interests of the centre and they will develop their own research agenda to broaden the expertise and compliment the work of the centre. The university will also fund two DPhil studentships geared towards the fulfilment of the fellowship’s research goals. |
| **1.2** | **Requirement** |
|  | **WP 1 - Improved Hypersonic Facilities**   * 1. – Rarefied/high altitude aerodynamics.   1.1.1 Re-establish Low Density Tunnel (LDT) and associated instrumentation, perform calibration.   * + 1. Re-commission the Magnetic Suspension Balance System.     2. Demonstration of LDT using simple test case and compare results with open source dsmcFoam+ solver.   1.2 – Enhanced Capacity and Capability of Oxford High Density Tunnel (HDT) and T6 Multi-mode Facility.   * + 1. Review current capabilities of HDT and T6 and identify and recommend areas of improvement relating to productivity/throughput and capabilities such as Mach number and run duration     2. Demonstration of HDT and T6 enhanced capacity and capability using simple test case   1.3 – Review of UK Hypersonic aero-thermodynamic facilities in academia and industry, report on capability gaps and make recommendations regarding future facilities  **WP2 - Establishment of a UK Hypersonics Network**  2.1 – Create UK academic Hypersonic network and facilitate workshops (2 per year) to review current activities and coordinate joint proposals etc.  **WP3 – Hypersonic Shock Separation Experiment**  3.1 – Design and manufacture an Axisymmetric Wind Tunnel Model as part of the UK contribution to the collaborative TTCP WG TP-5 activity on shock separation.  3.2 – Conduct wind tunnel test of 3.1.  3.3 – Further wind tunnel test in support of TTCP WG TP-5.  **WP4 –** Redacted |
| **1.3** | **Options or follow on work *(if none, write ‘Not applicable’)*** |
|  | **None** |
| **1.4** | **Contract Management Activities** |
|  | **The Task shall be managed in accordance with the terms of R-Cloud v4** |
| **1.5** | **Health & Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement** |
|  | **The Contractor shall ensure that Suitable Qualified and Experienced Personnel (SQEP) are engaged in the performance of this Task** |

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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** |
| *1.1.1* | *Report of LDT Calibration* | *T0+36* | *Report* | *O* | *Description of flow quality of the LDT for a range of conditions* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *1.1.2* | *Demonstration of the magnetic suspension balance system* | *T0+48* | *Demonstration + Summary Report* | *O* | *Demonstrate the use of the magnetic suspension balance system to provide model support (levitation) and quantitative measurements of overall forces and moments* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *1.1.3* | *Final Report/ Thesis* | *T0+60* | *Report* | *O* | *Description of the LDT and its flow quality. Description of the magnetic suspension balance system and results from force and moment tests, including recommendations for future developments* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *1.2.1* | *Report on enhancing capacity and capability of the HDT and T6* | *T0+12* | *Report* | *O* | *Review current capabilities of HDT and T6 and identify and recommend areas of improvement relating to productivity/throughput and capabilities such as Mach number, run duration and diagnostics* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *1.2.2* | *Demonstration of the enhanced capacity and capability of the HDT and T6* | *T0+36* | *Demonstration + Summary Report* | *O* | *Demonstrate the use of the HDT and T6 in experimental setup to provide agreed enhancements in capacity (throughput) and capability (such as Mach number, run duration, diagnostics)* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *1.3* | *UK Hypersonic aero-thermodynamic review* | *T0+18* | *Report* | *O* | *Review of UK Hypersonic aero-thermodynamic facilities in academia and industry, report on capability gaps and make recommendations regarding future facilities* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *2.1* | *Outputs from Networking Workshops (2 per year)* | *T0+6*  *T0+12*  *(At 6 month intervals)* | *Workshop, Presentation* | *O* | *Slides and Executive Summary* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *3.1.1* | *Design review of wind tunnel model for shock separation experiment* | *T0+12* | *Presentation* | *O* | *Presentation describing the geometry and test objective for shock separation experiments and the dimensions, tolerances and materials of the wind tunnel models to be used in those experiments.* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *3.1.2* | *Manufacture of (at least) 2 wind tunnel models for shock separation experiments* | *T0+18* | *Physical object* | *O* | *At least two (one for use in each shock separation experiment) wind tunnel models, constructed as per the agreed design and tolerances* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *3.2* | *Wind Tunnel Data pack* | *T0+36* | *Data pack (DVD)* | *O* | *Experimental data acquired during initial wind tunnel test* | *Default RCloud Agreement Terms and Conditions shall apply* |
| *3.3* | *Data pack + Report/Thesis on shock separation experiment* | *T0+48* | *Report + Data Pack* | *O* | *Report to include details of experiments conducted in support of TTCP WG TP-5.*  *Data from second wind tunnel test* | *Default RCloud Agreement Terms and Conditions shall apply* |
| Redacted |  |  |  |  |  |  |
| *WP’s 1-4* | *Annual Report and Presentation on progress against all active items* | *T0+12*  *T0+24*  *T0+36*  *T0+48*  *T0+60* | *Report + Presentation* | *O* | *Annual report and presentation summarising work undertaken during the year.* | *Default RCloud Agreement Terms and Conditions shall apply* |

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| **1.7** | **Deliverable Acceptance Criteria** |
|  | **Standard acceptance criteria shall apply to deliverables which are reports or data packs.**  Wind tunnel models (this also applies to models designed, manufactured and tested under WP4) –   * *Describe if and how the deliverables will be inspected and accepted and who will be responsible for confirming that they are fit-for-purpose.*   + Redacted (or nominated representative) to check that model(s) delivered meet the design agreed under deliverable 3.1.1/4.3.1, within specified design tolerances also agreed under deliverable 3.1.1/4.3.1, and to confirm they are fit-for-purpose * *What are you expecting to receive, in what state and when?*   + At least two (one for use under each of 3.2 and 3.3) / One (for use under 4.3.3) wind tunnel model(s), constructed as per the design and tolerances agreed under deliverable 3.1.1, at T0+18 months / deliverable 4.3.1 , at T0+30 months * *Provide details of:*   + *Who will be responsible for acceptance of deliverables (name/role) – might not be the same person to whom the deliverables are originally sent;*     - Redacted (or nominated representative)   + *Where acceptance will take place e.g. Dstl/Contractor’s premises;*     - At contractor’s premises   + *When the acceptance will take place e.g. (period/date);*     - Within 30 days of delivery   + *The criteria for acceptance of the deliverables*     - Model(s) meet the design accepted under deliverable 3.1.1/4.3.1, within specified design tolerances also agreed under deliverable 3.1.1/4.3.1, and are fit-for-purpose   Demonstration of the magnetic suspension balance system –   * *Describe if and how the deliverables will be inspected and accepted and who will be responsible for confirming that they are fit-for-purpose.*   + Redacted (or nominated representative) to observe demonstration of magnetic suspension balance system in experimental setup, checking that model is supported in place throughout the experiment and that calibrated quantitative measurements of overall forces and moments are taken, and to confirm that the system is fit-for-purpose * *What are you expecting to receive, in what state and when?*   + Demonstration of magnetic suspension balance system, in experimental setup, at T0+48 months * *Provide details of:*   + *Who will be responsible for acceptance of deliverables (name/role) – might not be the same person to whom the deliverables are originally sent;*     - Redacted (or nominated representative)   + *Where acceptance will take place e.g. Dstl/Contractor’s premises;*     - At contractor’s premises   + *When the acceptance will take place e.g. (period/date);*     - Within 30 days of delivery   + *The criteria for acceptance of the deliverables*     - System is able to support model in place throughout the experiment, calibrated quantitative measurements of overall forces and moments can be taken, and the system is fit-for-purpose   Enhanced capacity and capability of HDT and T6 tunnels–   * *Describe if and how the deliverables will be inspected and accepted and who will be responsible for confirming that they are fit-for-purpose.*   + Redacted (or nominated representative) to observe demonstration of enhancements in capacity and capability agreed under deliverable 1.2.1 for each tunnel in experimental setup, checking that required conditions can be produced for the required length of time, that experimental throughput is enhanced to that required, and that required diagnostics are functional, and to confirm that the overall system is fit-for-purpose * *What are you expecting to receive, in what state and when?*   + HDT and T6 wind tunnels, with enhanced capabilities (as agreed under deliverable 1.2.1) and capacity to run the required number of experiments per day (as agreed under deliverable 1.2.1), at T0+36 months * *Provide details of:*   + *Who will be responsible for acceptance of deliverables (name/role) – might not be the same person to whom the deliverables are originally sent;*     - Redacted (or nominated representative)   + *Where acceptance will take place e.g. Dstl/Contractor’s premises;*     - At contractor’s premises   + *When the acceptance will take place e.g. (period/date);*     - Within 30 days of delivery   + *The criteria for acceptance of the deliverables*     - Tunnels in experimental setup, have capacities and capabilities in experimental setup as agreed under deliverable 1.2.1, and are fit-for-purpose |

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| **2** | **Evaluation Criteria** |
| 2.1 | Method Explanation |
|  | MEAT – Most Economically Advantageous Tender |
| 2.2 | Technical Evaluation Criteria |
|  | Proposals will be assessed against section 1. Statement of Requirements of this tasking form |
| 2.3 | Commercial Evaluation Criteria |
|  | Proposals will assessed as to whether they achieve value for money by:   * Assessing rates against those the supplier submitted in their application to join the R-Cloud framework * Whether the hours proposed are commensurate with the level of effort required to achieve the deliverables * Whether the proposed milestone payment plan is appropriately balanced and linked to the deliverables in section 1.6 |