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Statement of Requirement for the R-Cloud Air Systems Strategic Capability

Introduction:

The Defence Science and Technology Laboratory (Dstl), which is part of the UK Ministry of Defence (MOD), is refreshing its commercial agreement for Science and Technology (S&T) research contracts, known as R-Cloud (Research Cloud).
MOD places extensive fundamental, experimental and applied research with industry and academic suppliers and wants to broaden access for this supply base, reducing the cost of trading with MOD and enabling agile contracting. R-Cloud complements MOD's other contracting mechanisms and academic and industry suppliers of S&T research are now invited to apply to join MOD's research supplier community within the Air Systems Strategic Capability.

This statement of requirement relates to suppliers joining R-Cloud within the Air Systems capability area. R-Cloud provides a low barrier to entry for potential suppliers and offers direct access to MOD's current and future research requirements. Academic and industrial suppliers of Air Systems research are invited to apply to R-Cloud if you are a supplier of Science and Technology Research in this area.

Air Systems encompasses a broad range of technical areas, these are summarised here:

STRATEGIC CAPABILITIES	CAPABILITY ELEMENTS	DEFINITIONS
Air Systems		This capability is responsible for the development, evaluation and demonstration of all aspects of current and next generation air platform systems, be that fixed or rotary wing, manned or unmanned. It covers technologies, concepts, systems and systems of systems. It links the broader S&T and systems capabilities to the Air domain by providing the expertise to ensure the S&T is exploitable and relevant to this environment.
	Concepts and Design	S&T to establish the requirement for a platform, the required specifications, concept design, iteration and design finalisation.
	Performance and Optimisation	S&T to understand, test and evaluate the performance of platforms and to optimise platform performance for specific or multiple roles, including in an operational context.
	Systems Integration	S&T required to integrate technologies, systems (mission systems, combat systems etc.), propulsion systems and weapon integration onto platforms. This could be physical or model-derived integration.
	Information Architectures and Connectivity	Systems engineering that enables platform systems to communicate and perform as a system of systems.

Air Systems

Statement of Requirement:

The work undertaken in this capability area aims to maximise the impact of Science and Technology in the Air Domain and to maintain and advance technology advantage of UK capability against adversary threats. Research is carried out throughout an air platform's lifecycle from pre-concept to in-service to allow MOD to effectively respond to future defence requirements. All aspects of air platforms are considered in-scope, including supporting infrastructure and policy to enable MOD's continued effective use of the Air capability. The following areas of research are in-scope for R-Cloud:

1 Air Systems Engineering & Integration

Typical air systems S&T can be grouped into the following themes:

1.1 Air Vehicle Concepts

Air Vehicle concept development enabling advice, modelling and experimentation support. The envisaged APS requirement for Air Vehicle Concepts covers the following areas:

- Investigation of traditional and non-traditional vehicle designs and the development of appropriate assessment tools & metrics to support their assessment;
- Impact of more electric aircraft technologies on aircraft design; and
- Future integrated concept tool set development.

1.2 Avionics & Mission Systems

- Advice, support, modelling, experimentation and testing covering:
    - Networked tactical mission battle-space integration support:
    - Exploitation of external networked information products to enabling aircrew situational awareness; and
    - Technologies and techniques to improved air decision making and prioritisation.
- Avionics system architectures and processes
    - Common system & information architectures across the avionics industry worldwide;
    - Reducing the cost and timescales of technology insertion/refresh and certification; and
    - Modular software architectures, efficient reuse of software components and certification.
- Avionics technologies and integration (including connectivity, weapons, sensors, displays)
- Development and assessment of all aspects of mission systems, on and off-board the air vehicle (navigation, communications, targeting systems etc)
- Software engineering including safety, cyber risks, air regulation & certification and assurance.
- Fundamental research, advice, experimentation, trials, modelling and simulation to support the development of avionics systems.

1.3 Aircrew Systems

S&T to ensure that aircrew flight safety hazards and Risk to Life remain ALARP

- All-environment protection and performance, duty of care, airworthiness and safety;
- The development and implementation of human-machine interfaces;

1.4 Aerospace Sciences

To enable advice, modelling and experimentation support (covering Aerodynamics, structures, propulsion, guidance and control, supportability). The areas of potential interest are as follows:

- Horizon Scanning, state of the art reviews and technology watching;
- Complex Air Vehicle and weapon aerodynamics covering sub-sonic to hypersonic regimes;
- Air Vehicle structural analysis;
- Air Vehicle and weapon guidance and control - Analysis and Design Techniques, Modelling, performance assessment
- Propulsion systems design, performance assessment and modelling which includes, but is not limited to:
    - Internal combustion engines;
    - Electric propulsion systems;
    - Fuel cells and batteries;
    - Rotor systems;
    - Hybrid technologies.
- Power and thermal management technologies and techniques to meet the need of future military air vehicles
- Availability, supportability, sustainability, logistic support and resilience in the air domain
- Environmental protection assessment/experimentation (Foreign Object Damage (FOD), volcanic ash, sand, salt, snow)
- Modelling, simulation and experimentation of the complex interaction between air vehicles and the operational environment (e.g. a ship flight deck environment).

1.5 Tools & Methods

- Development or assessment of software, tools or methods to carry out design, performance estimation / prediction or assessment of air systems.
- Operational use case assessment and the development of vignettes and measures of performance and effectiveness.

1.6 Technology Development

- S&T to support the design and development of underpinning air systems technologies
- Technology maturation activities
- Innovation drawing technologies from other environments into an air system (along with all requisite safety cases and research)

1.7 Systems Engineering & Integration

- S&T to integrate and assure technologies onto platforms
- Includes specifying the requirements for systems to be integrated and release to service support (e.g. test, evaluation, risk assessment and certification) of integrated systems on the platform, as a system of systems.
- Includes S&T to integrate the platform into force structures and any supporting infrastructure requirements.

- Systems engineering approaches to develop:
    - Requirement setting;
    - Requirement management;
    - Requirement engineering (also referred to as requirement analysis);
    - Systems thinking methodologies:
    - Systems engineering foundations: