Call for Expressions of Interest: Partnership opportunity in the area of:

Centre for Advanced Defence Research and Enterprise

Operating in Chemical, Biological, Radiological and Nuclear Environments – STaR Shot

Introduction

The threat of Chemical, Biological, Radiological and Nuclear (CBRN) attacks against military forces and civilian populations is growing. State and non-state actors are increasingly willing to use these indiscriminate methods, and knowledge of CBR agent manufacturing processes is proliferating. The ADF has the ability to survive the surprise created by CBRN weapons and improvised CBR devices, but there is a need to do more.

Our forces must be able to respond faster and more flexibly to CBRN events; achieve enhanced situational awareness; and manoeuvre safely, effectively and unimpeded in complex contaminated environments for prolonged periods of time. For this reason, a new ten-year Science, Technology and Research (STaR) program has been initiated by the Australian Department of Defence: the Operating in CBRN Environments (OCE) STaR Shot. Its mission: ***to enable the joint force to operate safely and effectively in contested CBRN threat environments through enhancement in CBRN Defence capability.***

In September 2021 the Department of Defence appointed the inaugural OCE STaR Shot Advisory Council – the OSAC - drawing expertise from leading academic institutions, Defence industry, Publicly-Funded Research Organisations and the first responder community. The OSAC's mission is to provide the OCE STaR Shot leadership with key strategic advice and trusted counsel in programmatic design, implementation and quality assurance.

The OCE STaR Shot has articulated two challenging systems as initial aim points for the program – the Active Collaborative CBRN Environments Sense and Sense-making System (ACCESSS) and the Human Integrated Sensor System (HISS). Both are scalable massively multi-disciplinary challenges that will require harnessing a broad swathe of the Australian Science, Technology and Innovation (ST&I) ecosystem.

To meet its ambitious innovation targets, the OCE STaR Shot now seeks to stand-up a Centre for Advanced Defence Research and Enterprise (CADRE). The CADRE-OCE will be an instrument of implementation for the STaR Shot's research, translation and talent pipeline development objectives. However, a true partnership is sought where the CADRE-OCE is empowered to shape its own direction and explore opportunity to enhance its relevance and impact in overlapping sectors. The CADRE-OCE will require strong experienced leadership capable of both developing and putting into action a clear and ambitious vision. They will be required to work across, and join together, each of the key elements of the Research and Development life cycle – from laboratory experiment to demonstrable prototypes/trials to translation to industry.

This call for Expressions of Interest (EOI) invites Australian universities to partner with Defence to form the CADRE-OCE. While the contracting mechanism requires an identified university lead, proposals that embrace a "first amongst equals" consortium approach and that encourage industry participation are preferred.

Expressing an Interest:

The Centre construct under which the CADRE-OCE will be formalised, leaves significant scope to tailor the research and governance framework, engagement model and translation strategy to suit the unique needs and objectives of the OCE STaR Shot. Therefore, the realisation of the CADRE-OCE will necessarily require an in-depth and integrated co-design effort between Defence (represented by the OCE STaR Shot) and university/consortium partner/s selected following Defence's evaluation of this EOI.

In answering this EOI, Defence is looking for respondents to share their vision and a proposed implementation strategy for how CADRE-OCE would best be

- designed to task;
- initiated with a solid underlying structure; and then
- further established with a view to continued growth (overlapping sectors, new partners and complementary resourcing).

Responses should be formulated in the context of the information provided in this document (as guidance) and in relation to the terms of the identified contracting instrument - *Defence Science Partnering 2.0 Head Agreement Schedule 8 – Centre for Advanced Defence Research*

OCE STaR Shot - Priority areas:

- **low-cost, robust sensors** (including wearable) that detect and identify in near real-time advanced threats (especially chemical agents that are designed to be undetectable or virulent pathogens) and how much of them there are present;
- **CBRN threat detection, identification and monitoring** from a safe distance or without putting humans at risk. This includes detection of pathogens before they affect humans or before infected humans become contagious and spread a disease;
- **Threat modelling and prediction**, that reliably and on time, push warning signals out to humans in danger, both military and civilian personnel.
- **Novel protection technologies and systems** that safeguard mental, physical and physiological strength and allow humans to keep operating for extended periods of time. This protective gear cannot reduce significantly Australian warfighters' freedom of manoeuvre;
- **Automation and autonomy** technologies that reduce the risk of exposure to CBRN threats or may lead to new ways of operating in these environments;

- Innovations that make **military vehicles, ships and aircraft impenetrable to CBRN threats** or, if chemicals or pathogens do penetrate, technologies that help characterise accurately which parts of the equipment are affected, contain the contamination or neutralise it effectively and efficiently
- New ways of **decontaminating infrastructure, sensitive equipment, platforms and people** quickly and cost effectively. This includes technologies that allow for the assessment of the decontamination actions' effectiveness; and
- **Facilitation of movement between contaminated areas and clean areas** without spreading the threat. This is particularly important when the ADF has to manage injured people, wounded people or sick people.

Initial targets: Integrated System Capabilities

The OCE STaR Shot research and development (R&D) priority areas are broad and the challenges associated with OCE are numerous. A further guiding principle of the program is to be "open for ideas, always". However, there has been a concerted effort to develop and articulate a sub-set of focused and well-defined activity plans. They are initially centred on developing and demonstrating two scalable, high-impact, ambitious integrated CBRN capabilities: the Active Collaborative CBRN Environmental Sense and Sense-making System (ACCESSS) and the Human Integrated Sensor System (HISS). ACCESSS and HISS are system-level innovation products that the OCE STaR Shot is going to develop and progressively demonstrate over the coming years. It is expected that further ST&I target systems will be added to the OCE STaR Shot program over its life time.

1. **ACCESSS:** Scalable network of hundreds to thousands of sensors that sample the environment for CBRN threats and other information required to identify, characterise and monitor CBRN threats. Some of these sensors will be mounted on military platforms and infrastructure, some randomly emplaced in the area of operation, and some autonomously deployed and controlled. Value is added through data analytics, predictive modelling, visualisation and other decision support tools.
    - *Considerations and research threads:* Low-cost, low-power, small form-factor sensor development, sensor re-purposing, distribution methods, sensor networking, network scalability, autonomous platforms and autonomous agent teaming, robots, data fusion, advanced analytics and visualisation approaches, interoperability with extant ADF and coalition systems.
    - The military impact of the ACCESSS will be significantly greater freedom of manoeuvre in CBRN environments than is currently achievable.
2. **HISS:** Detect and interpret subtle variations in a human's biomarkers caused by exposure to chemical or biological threats and to warn warfighters of threat exposure before obvious symptoms manifest and at a time when countermeasures can be employed with greatest effect.

- Considerations and research threads: HISS will likely bring together both novel and commercially available wearable sensors to perform on-skin, sub-cutaneous and bio-fluid measurements, and pair them with advanced data analytics to draw accurate inferences from variations in biomarker signals. In population-based applications, the HISS is a network of sensors that interoperates with military and civilian threat warning systems.
- The major military impact of the HISS will be the neutralisation of biological warfare agents targeting humans. A major benefit of a civilian application of the HISS will be the reduction of spread, morbidity and mortality of infectious diseases.

CADRE-OCE Objectives:

The selected partner/s from the EOI process will appoint a Centre Director with the necessary skillset and expertise to develop a clear and ambitious vision for the CADRE-OCE in consultation with Centre Steering and Technical Committees. They will further take the lead in planning and setting in place a governance structure and partnering framework suited to realising the agreed vision and that facilitates collaboration between Defence, Academia and Industry toward articulated goals under the OCE STaR Shot Mission. Initially, the CADRE-OCE will be guided by the following key objectives:

1. To advance tailored technology development and systems integration within the scope of identified major OCE STaR Shot Capability Aim Points. Initially:
    - The Human Integrated Sensor System (HISS); and
    - The Active Collaborative CBRN Environment Sense and Sense-making System (ACCESSS).
2. To build a deep and connected understanding of Australia's sovereign research and development ecosystem as applicable to the OCE STaR Shot Mission - allowing the CADRE-OCE to:
    - address challenges that necessitate the stand-up of a large-scale national effort;
    - be agile to pivot to new discovery at the scientific cutting edge and draw together expert teams around discrete high-pay off activities;
    - Identify emerging and/or existing research that can be (re-)purposed toward significant enhancement of a military taskforce to operate safely in CBRN contaminated environments; and
    - Enable the exploration and identification of opportunity within other sectors of overlapping need and draw in additional resource from these sectors and associated funding bodies into the Centre.

3. To create a coordinated and holistic STEM talent pipeline that:
    - Fosters the development of postgraduate researchers and provides a pathway to careers in Defence science and industry; and
    - Increases the collective knowledge base in OCE pertinent research by supporting exploratory research and facilitating enhanced contextual understanding in the academic sector.
4. To build prototype capabilities based on emerging research in fields applicable to the OCE STaR Shot mission; and
5. To translate evolving capability to operations – including consideration of both individual technology solutions as well as systems approaches.

The CADRE construct:

The "Centre for Advanced Defence Research – CADR" agreement type – Schedule 8 under the Defence Science Partnering Deed 2.0 Head Agreement - will be implemented to formalise contractual arrangements. The addition of "Enterprise" to form "CADRE" is deliberate and of importance – the OCE STaR Shot requires entrepreneurial thinking and commercialisation acumen and understanding. This will complement a portfolio of R&D activity, which may span the entire technology readiness scale, by maintaining a clear focus on the end user and the realisation of tangible capability outcomes.

The CADRE-OCE will have an initial duration of five (5) years, with an option to extend based upon performance, agreement of need for renewed/continued focus (with Defence). Costs associated with running the Centre will be covered by Defence and through negotiation with the selected lead partner. However, Defence is looking for true integrated partners who share a stake in the success of the CADRE-OCE.

Respondents to this EOI are encouraged to familiarise themselves with the template CADR agreement. This agreement construct is relatively flexible and can be tailored heavily to task however there are some required components:

- **Steering Committee:** Appointed in partnership by Defence and lead university, it comprises Defence senior leadership, business/partnership support from the Defence Science and Technology Group (DSTG), ADF client representatives and senior representatives of the partner institutions (as appropriate to a finalised Terms of Reference – ToR). Defence may also appoint external independent experts (science and business) to the committee. The Steering Committee's primary role is not to direct all activity within Centre (although some direction may be necessary) but rather to guide the strategic direction of the Centre Director and Technical Committee and to provide oversight in relation to Defence's interests. It will establish agreed Centre performance measures and monitor performance against them. Other functions specific to the needs of the CADRE-OCE may be defined as necessary.

- **Technical Committee:** Appointed in partnership by Defence and the lead University, the Technical Committee will have responsibility to provide technical emphasis and direction to the Centre (at the working level) in accordance with negotiated ToR. It will identify and aid in the development of activity proposals. The Technical Committee will also prepare decision briefs and reporting documents for the Steering Committee. The ToR of the Technical Committee may be tailored to add additional functions or affect the emphasis according to the needs pf CADRE-OCE. It will comprise end user representatives from Defence, subject matter experts drawn from industry and/or academe and other specialist advisors. It is expected that such a Committee will aid the Centre Director in both planning and realising the Centre's vision.
- **Centre Director:** The Centre Director will be responsible for implementing the core principles of the CADRE-OCE – 1. Alignment with the OCE problem space and context; 2. Establishment and execution of a high-impact research program; 3. Building partnerships across the ST&I ecosystem and with Defence; 4. Creating business opportunities in and generating buy-in from industry sectors other than Defence; and 4. Translation of innovation to capability. The Centre Director will have responsibility for developing, within a provided scope, the overarching vision of the CADRE-OCE and set in place a governance framework and partnership model to realise that vision. They are encouraged to embrace the degree of independence that will be afforded the Centre and will therefore assume significant intellectual responsibility for the CADRE-OCE activities. The Centre Director should seek to grow the Centre's influence and resource within other overlapping sectors. The Centre should also be agile such that focus can pivot to new systems capabilities or discrete "leap ahead" discoveries that fall outside the initial set of objectives/goals.

In preparing their EOI, respondents may wish to consider and/or address the following:

- Identification of a Centre Director (if appropriate) or the principles/qualities/employment level upon which one would be appointed. Articulation of the proposed appointment process;
- Industry engagement and commercial translation;
- Intra- and extra-centre partnership models;
- Handling of intellectual property and legal liability;
- Research framework concept
- Governance and key decision making processes;
- Reporting structure
- Handling of external contracts
- Harmonisation with the extant OCE STaR Shot initiatives (such as the OSAC)

Respondents may wish to nominate potential representatives to the Steering/Technical Committee and/or propose a sub-structure that supports the stated objectives of the CADRE-OCE, the roles of the Committee's and/or the Centre Director. The EOI should not, however, be approached as Request for Information regarding research disciplines of strength at your institution and exhaustive lists of academic contributors should be avoided unless there is clear articulation of their specific role or leadership function within the Centre.

Essential Requirements

- Formal support from both Chancellery and directly relevant Academic Division/s;
- Clear vision for the manner in with the CADRE construct can be tailored to meet the stated goals and overarching mission of the OCE STaR Shot, including perspective, principles concerning:
    - Research framework
    - Governance framework
    - Outreach and engagement
    - Roadmap for initial establishment
    - Indicative budget requirements to set in place the above
- Strong reasoning/business case presented for the selection of the proposed Lead Institution. This may include:
    - Unique Defence-centric support or facilities
    - Track record of integrated engagement with both Defence and the wider Australian ST&I ecosystem on projects of scale and strategic initiatives of substance;
    - Strong understanding OCE STaR Shot imperatives and the CBRN Defence space in general, through past successfully delivered research activities and/or ongoing projects;
    - Extant integrated connection with relevant DSTG research divisions and major science and technology capability areas;
- Genuine commitment to forging lasting and equal-footed cross-institutional partnerships – particularly in fields relevant to OCE or CBRN Defence; and
- National leader/s in ST&I in a key priority area/s articulated by the OCE STaR Shot.

Desirable Requirements

- Multi-institution consortia that consider not just academic capability but also industry;
- Articulated strategy to engage stakeholders (whether formally within the proposed CADRE-OCE or not) from across the innovation ecosystem and grow a community of OCE STaR Shot aware/oriented innovators.
- Capacity to commit internal resources to support the CADRE-OCE; and
- Genuine interest and track record in the development and growth of sovereign research capabilities in areas pertinent to the OCE STaR Shot, and the promotion of ongoing partnership with Defence.

How to Apply:

Defence is inviting Expressions of Interest from Australian universities either proposing in isolation or as leads of consortia responses. Submissions should be no longer than twelve (12) pages (diagrams inclusive), have font no smaller than 11 pt and document margins not less than 1.5 cm.

Respondents should read the EOI and consider the CADR template agreement carefully. The format in which the EOI is addressed is left at the discretion of the respondents.

Submissions should be in pdf format and sent via email to nicholas.fitzgerald@defence.gov.au by 11th of April 2022. Submissions will be assessed by a panel from Defence. The selected submission/s will then be invited for discussions to further develop the CADRE-OCE ahead of formalised contractual arrangements.

All submissions will be handled in confidence.

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