

HISS

Human Integrated
Sensor System



Request for Information

Request for Information (RFI) title:	Human Integrated Sensor System (HISS)
DMTC Program:	CBR Sensing Systems
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1. DISCLAIMER

The response to this Request for Information (RFI) form will be reviewed by the DMTC CBR Sensing Systems Technical Advisory Group, and if your area of expertise, research or technology is deemed to have merit in contributing to the aims of this program, we may seek further information, including proposals to conduct funded project work in this area (as part of a broader, public, call for proposals). However, having your RFI response reviewed by the Technical Advisory Group is **NOT** a guarantee that you will be granted funding.

DMTC is releasing this RFI to understand capabilities and identify potential partners from industrial and academic organisations to collaborate in the development and enhancement of Defence relevant capabilities in the chemical, biological or radiological (CBR) Sensing Systems domain. The area of interest is Human Integrated Sensor Systems (HISS) *and* the program aims to support prototyping activities around wearable or portable technologies for measurement, analysis and interpretation of human exposure to chemical and biological threats.

2. INTRODUCTION

2.1. BACKGROUND

DMTC is an independent, not-for-profit company that creates, manages, directs and delivers successful industry-research collaborations involving multiple partners to enhance sovereign defence and national security capabilities, consistent with Government policy. Over more than a decade DMTC has been leading collaborative projects to advance technologies, as well as pursuing best practice governance and maintenance of ISO accredited quality systems.

With a historical focus on materials and manufacturing process improvements in the land, sea and air domains, DMTC has developed know-how in how to deliver innovation into Defence projects and has recently hosted programs in new technology areas such as Medical Countermeasures and High Altitude Sensing Systems on behalf of partner organisations wishing to utilise DMTC's proven project management and collaborative research expertise.

Recently, the Department of Defence through its Operating in CBRN Environments (OCE) STaR Shot approached DMTC to lead and manage a collaborative program of work which will enhance warfighter capability via the application of advanced biotechnology and data analytics to measure, interpret and mitigate damage to the human body caused by the effect of chemical and biological threats.

Over the course of a ten year innovation science and technology program, the OCE STaR Shot aims to enhance the Joint Task Force such that it will be able to operate safely and effectively in environments where chemical, biological, radiological and nuclear (CBRN) threats are present. The OCE has been launched as part of Defence's ***More, Together*** Science and Technology Strategy 2030 to focus more on mission driven science and technology, to engage with the wider community and scale up efforts, and to more rapidly translate innovation into military capability.

The threat of exposure to hazardous chemical substances and biological pathogens is growing, both in conflict and in the provision of humanitarian assistance. Defence personnel are challenged to work harder and for longer periods in more difficult environments, whilst under greater physical and mental loads.

As part of an integrated approach to chemical, biological, radiological and nuclear (CBRN) defence, the objective of the Human Integrated Sensor System (HISS) Challenge is to develop novel wearable sensors and / or integrate existing in-human and on-human sensor technology into a networked system to alert warfighters of situations in which chemical or biological threats are present.



Potential theatres of operation include contested, complex and disaster-stricken environments. Given the spectrum of operations, it is envisaged that all Defence services (i.e. Army, Navy and Air Force) could use such wearable sensors and that there may be benefits to integrating new military wearable sensors with environmental sensor systems and commercially available civilian monitoring systems (including wearables).

2.2. PURPOSE

This RFI will enable DMTC to identify capability and capacity within industrial and academic organisations that are capable of developing relevant HISS technologies. DMTC is also keen to understand whether organisations have already developed similar types of technology (alone or in collaboration with other partners). Responses to this RFI may lead to direct discussions with respondents about collaborative activities; or alternatively will inform the selection of organisations to be invited to participate in a HISS collaborative workshop, with a view to taking project proposals forward for funding consideration by the Technical Advisory Group.

This HISS callout may look to align interesting technology developments, where alignments do not currently exist, to drive collaboration and innovation, and reduce development time. The intent, however, is to attract multi-party, multi-disciplinary team efforts of scale that aim to employ multi-method approaches toward a networked whole-of-problem solution.

Respondents could include individuals, companies, universities or already established consortia.

The funding available in the Human Integrated Sensor System challenge informed by and following this RFI is up to AUD \$3 million, with activities expected to have commence in this 2021-22 financial year.

2.3. AN OPPORTUNITY TO CONTRIBUTE AND SHAPE

DMTC views this RFI as an opportunity for organisations within the HISS community to highlight their knowledge and experience in the sector, together with informing the scope of potential HISS projects.

DMTC encourages participation, acknowledging that participation is completely voluntary. You may choose to answer some or all of the questions. Please note this process is independent from any subsequent call for proposals process and your participation or otherwise will have no bearing on any future proposal processes.

After the RFI process, if your organisation is invited to participate in a workshop, you may be encouraged to collaborate with other partners/organisations to submit a proposal for consideration.

2.4. CONFIDENTIAL

DMTC will treat all responses confidentially. DMTC will share responses to this RFI with Australian Government stakeholders including DSTG. DMTC will not distribute responses outside of this group without the explicit permission of the originator.



2.5. CONTACT PERSON

The point of contact in relation to this Request for Information is:

Name:	Dr Felicia Pradera
Title:	General Manager – DMTC Health Security Division
Address:	DMTC Ltd Level 2, 24 Wakefield Street Hawthorn Vic 3122
Telephone:	03 9214 4447
Email:	hiss@dmtc.com.au

2.6. LODGEMENT

Please return completed responses by **Wednesday 25 August, 2021** at the latest. Earlier responses are welcomed.

Please submit responses to: [email](#)

When responding to the RFI by email, please ensure:

- “RFI -Human Integrated Sensor Systems” appears in the subject line of the email; and that
- Your submission is in a **PDF format** prior to submission.

3. SCOPE

DMTC is keen to understand your HISS technology area capability and capacity in prototyping and delivering wearable or portable technologies for the measurement, analysis and interpretation of human exposure to chemical and biological threats. This may include but is not limited to:

- i. Variations of relevant biomarkers in bodily fluids;
- ii. Physiological and cognitive change detected via advanced intrusive and non-intrusive health monitoring devices and including measurement and interpretation of a family of physical parameters and vital signs;
- iii. Electromagnetic signals that are correlated with human health deterioration;
- iv. Infectious disease markers;
- v. Other by-products of changes to metabolic or signalling pathways inside the human body and brought about by exposure to toxic chemicals or biological pathogens; and
- vi. Online and offline data analytics (including big data, artificial intelligence, machine learning and edge computing) that strongly correlate the above measurements with the onset of infectious disease (ideally pre-symptomatically) or chemical poisoning.

4. USER REQUIREMENTS

During this RFI process, DMTC wishes to ascertain your experience in any of the following listed user requirements.

- a. Wearable, active sensing systems comprising one or more integrated sensors should be capable of being networked to, and interoperable with, both local user technologies (e.g. dismounted battle management systems or other personal devices) and remote observation and analysis applications. Linkages to existing or novel environmental sensor platforms should be part of an integrated response and decision-making network. Use of integrated decision-support technology to control second tier, physical or virtual effectors is in-scope. Ideally, the sensors in such a networked system would incorporate a geo-referencing capability.
- b. Sensor systems should be designed to be low cost or include reusable elements to reduce overall life-cycle costs whilst being small and lightweight.
- c. Proposed systems should make measurements and inferences accurately across user populations with differing basal biomarker levels (which may be unknown to the system). Personalisation and intrinsic calibration are important aspects to consider.
- d. How data is collected, transmitted, processed, and displayed will be a consideration, noting that in some settings communication is intermittent and bandwidth is small. Thus, consideration should be given to where and how quickly data are analysed and the form and size of data transmission. Outcomes of data analytics should lead to immediate action, relevant to the measurement, be it actively (e.g. the automatic switching on of specialist filtration systems) or passively (e.g. the issuing of recommendations to decision makers).
- e. Data security and privacy are important to defence applications and, thus, need to be considered in any sensor system design framework.
- f. 'Multi-omics' approaches, utilising parallel integration of datasets, should be considered when employing data analytics approaches. There is strong interest in the use of machine learning to analyse sensor data sets and characterise pre-symptomatic threat identifiers or early prodromal symptoms related to the early stages of human response to chemical and biological treat exposure.

5. RESPONSE SECTION

DMTC has developed a response template (Section 6 onwards) for your completion.

Within the bounds of the word limits specified, your answers may include as much or as little detail as you feel is necessary.

Please provide your responses in the text boxes wherever possible.



6. RESPONDENT DETAILS

Organisation Name:	
Address of Registered Office:	
Australian Business Number:	
Telephone:	
Email:	
Web:	
Contact Person:	
Phone:	
Email:	
Business Type: (select all that apply)	SME / Sole Trader / Private Company / Public Company / University / PFRA / Other (specify)



7. RESPONSE SCHEDULE/SPECIFIC INFORMATION REQUESTED

Respondents could include individuals, companies, universities or already established consortia.

Research Themes

Please indicate to which Research Themes you believe that you can contribute:

Wearable or portable devices	Y/N
Sensor development and integration	Y/N
Biomarkers (baseline v threat exposure)	Y/N
Data Analytics including collection, processing and display	Y/N
Data security and privacy including transmission in complex environments	Y/N
Multi-omics approaches and integration of data sets	Y/N
Quality systems and regulation	Y/N
Other – please specify	



Description of area of expertise, research and/or technology

Give a brief description of your capability and capacity to undertake R&D relevant to the Research Themes above. Please provide exemplars of tangible outcomes from previous work. **(1000 words max or 2 pages including pictures, illustrations or diagrams)**

Description...

Description...



Description of current research programs

Please indicate current research programs being undertaken that are relevant to the research themes and brief description of these. **(400 words max)**

Description...

Description of current or potential collaborations

Please indicate whether your organisation/team has previously engaged with DSTG or Defence on other research and development projects in sensing systems, in CBR or related fields. **(200 words max)**

Description...



Are you collaborating with other groups in this technology space on similar or relevant projects that may be able to compliment the Research Themes above? If so, who are these groups/organisations? (please feel free to share this RFI with them) **(200 words max)**

Description...

Please provide any relevant project outcomes, publications, products or services which demonstrate your capability to address the Research Themes? **(10 items max)**

Description...



8. NEXT STEPS

Once we receive your completed RFI response, we will collate, review and utilise the information provided from all responses to influence and refine the program priority areas ahead of seeking program partners.

Completing this form will help us in determining who we specifically target in any future calls for proposals.

Please note, an invitation to submit this RFI response does not mean that you are automatically eligible to participate in a research proposal submission.

Sign below once you are satisfied that you have completed the form.

I declare that the information given in this Request for Information form is true and accurate to the best of my knowledge and belief.

I declare that I have permission from my organisation and any other partner organisation(s) noted to discuss their capabilities and to sign the Request for Information form on their behalf.

Organisation of Respondent	Name
Print Name of Contact Person	
Signature of Contact Person	Signature
Date (dd/mm/yyyy)	DD/MM/YYYY