

Human Performance Research network (HPRnet)
“Wearable Assistive Technologies for Enhancing Combatant Physical Performance”
2019 Call for Study Proposals

Introduction

The Land Division (LD) of Defence Science and Technology (DST) Group is currently undertaking a programme of work that aims to better understand the efficacy of wearable assistive technologies for enhancing the physical and physiological performance of the dismounted combatant. Wearable assistive devices support and augment the body’s natural physical ability and are rapidly maturing. These devices come in many different forms and range from full body exoskeletons, to joint support and augmentation, such as a knee brace, or devices that support specific user functions, such as holding hand-tools above the head.

Given there are more than 70 unique occupations in the Australian Army alone, there are many applications and use-cases for this technology. Examples range from a combat engineer squadron building a bridge, to a health support company setting up a field hospital on a humanitarian mission. Other Defence industry applications could include naval shipbuilding and vehicle manufacturing and sustainment. We believe that there is the potential for assistive devices to have a transformational impact on the tasks and roles performed by the workforce. By increasing the strength and endurance of the wearer, they would reduce workload and enable personnel to work harder for longer. They could also allow a broader cross-section of personnel to complete physically strenuous tasks safely. Importantly, they could also support the wearer and reduce fatigue and the likelihood of injury, thereby enhancing the availability of personnel and serve to prolong careers.

Background

The performance of its people and their ability to adapt and prevail in future operational scenarios is a critical factor in building and sustaining the Australian Defence Forces’ (ADF) capability edge. DST Group is seeking to build a larger capability in the wearable assistive technology research space to help maximise the utility and adoption of this technology, through a partnership with an Australian University. HPRnet was established in 2016 through Army funding to help address its top Human Performance research requirements and is currently supporting a range of studies with Universities from across Australia. As part of HPRnet, this project will provide an opportunity to further engage with the HPRnet community of researchers focused on delivering Human Performance outcomes for the ADF.

Partnership Opportunity

DST has been seeking Expressions of Interest (EOI) for innovative proposals of future focussed research that can meaningfully address one or more of the ADF’s assistive technologies priorities (see Annex A). The invitation to submit against the EOI is limited to Australian Universities who are signatories of the Defence Science Partnering (DSP) Deed.

Based on a potential investment of up to \$600k, proposers will be asked to detail:

- How funds would be allocated (PhD, Post Doc, Undergraduate, industry engagement, capital, consumables, etc.) in order to deliver the study's ADF’s focused outcomes over a three year timeframe
- A commitment to build a true partnership through the appointment of an academic chair (0.1FTE) to the HPRnet and the investment of university resources to maximise outcomes for Defence.

The preferred University partner will have strong biomechanics expertise and facilities to measure the kinetics and kinematics of human gait along with cardiorespiratory responses, muscle activity and interface pressure distribution. An engineering expertise within the University (or through a University-to-University / University-to-Industry collaboration) is also required in order to translate human factors data into the design optimisation of the wearable assistive technologies.

There is an expectation that the program will lead to the establishment of a substantial national capability in wearable assistive technologies that provides sustained benefit to Defence and other organisations (emergency services, law enforcement agencies and the private sector) over the long term. It is expected that both parties will benefit greatly from extant knowledge, expertise and reach-back capacity offered by the other in a true collaborative relationship.

How to apply

Due to the specific nature of the project application will involve:

- 6-8 page detailed proposal and research plan document

The opportunity is only available to Australian Universities who are signatories of the Defence Science Partnering (DSP) Deed.

Funding limit is up to a total of \$600,000 over a period of up to three years. Budgeting should be undertaken according to costing provisions in the DSP using Research Rate 2. EOIs should not only demonstrate technical expertise and a scientifically sound approach but should also demonstrate a clear advantage to Defence outcomes and a commitment to true partnership.

Proposals must be submitted by no later than 04:30pm (ACST) on 8th May 2019. Submissions should be in pdf form and sent via email to hprnet@dst.defence.gov.au. No late EOI applications which fall outside the guidelines of the EOI template will be accepted.

Submissions will be assessed and down selected by an expert panel from DST Group and its military stakeholders. Applications will be assessed against the "NICER" criteria, defined below:

- Necessary: unlikely to be undertaken without Defence investment
- Invested: involves meaningful co-investment
- Connected: evidence of an openness to working with Defence and the broader HPRnet partners
- Excellent: involves researchers with an excellent track record of delivering high quality research
- Relevant: clearly mapped to stated ADF research priorities

Essential Requirements:

- Demonstrated capability and experience in conducting biomechanical and physiological evaluation of human gait, including design and ethics, data collection, analysis, interpretation and peer-reviewed publications.
- Demonstrated capability and expertise in capturing and analysing biomechanical and physiological data to inform design optimisation of equipment.
- Fully equipped biomechanics laboratory including capacity for continuous ground reaction force measurement, motion analysis, interface pressure distribution measurement and muscle activity measurement.
- Provision of a suitable qualified academic chair (0.1 FTE) to participate in the HPRnet panel.
- Ability to attract suitability qualified research personnel and thereby rapidly stand-up the capability.
- Signatory of the Defence Science Partnering Deed.

Desirable Requirements:

DST is interested in fostering and building a true partnership with appropriate Universities. As such, the following would be looked upon favourably when assessing EOI submissions:

- Provision of appropriate students and scholarship/s in areas of mutual interest to augment the research program.
- Competitive co-funding proposals for academic support to the programme.
- Clear vision for the development of an ongoing capability.
- Universities are encouraged to partner with other agencies (i.e. industry) in order to develop a capability that spans the value chain from technology development to human-system integration to transition into service.

Engagement model:

- Separate scheduled agreements under the Defence Science Partnering Deed.
- For costing of in-kind support and for determining levels of funding required apply Research Rate 2.

The ADF's Assistive Technology Priorities

The targeted Assistive Technology program has five key work areas that fit under Physically Augmented (PA1, PA2, and PA3) HPRnet research questions. The key work areas associated with the Assistive Technologies program are listed below:

AT1 - Identify and evaluate assistive technologies that could offer significant potential within defence.

AT2 - Evaluation of commercial off-the-shelf and custom load sharing technologies that can be integrated into existing body armour systems and that transfer the loads of the armour and attached equipment off the shoulders and to the pelvis.

AT3 - Development of novel assistive technology concepts that have potential for commercialisation.

AT4 - Publish and present key findings in order to establish a national / international reputation in the area of assistive technologies and thereby attract additional funding.

AT5 - Conduct of a regular (6 monthly) technology watch of various assistive technologies that are under development or coming on the market, that are aimed at reducing the burden of load carriage.