Capability Area	Location(s)	Title	Description	Aerospace/ Aeronautical Engineering, Naval Architecture	Chemical, Radiological, Biological, Food sciences	Computer Sciences, IT, Software Engineering, Telecommunications	Electronic/ Electrical Engineering	Materials Science	Mathematics and physics	Mechanical and Mechatronic Engineering (including robotics)	Psychology and Social Sciences	Desirable Skills
Distributed Combat & Mission Systems	Edinburgh (SA)	Distributed Decision Making	The application of psychological principles to human-based decision making for tactical warfighting, most likely addressed through experimentation. Potential areas for investigation include: 1) Examining the key aspects of distributed human decision making and how technology can be best designed to support it; 2) Examining human and autonomous system interactions, such as how humans can work together with drones to achieve tactical outcomes.							■	■	• Good communication skills • Ability to work in teams; Motivated and goal-focussed.
Integrated Combat Capability Assessment	Brisbane (QLD)	Embedded Fibre Optic Communications for Experimental Flight Vehicles	This project seeks to continue the development of an embedded, system-level, fibre optic communications solution for experimental flight vehicles. The project work will encompass firmware (FPGA/u Processor) and hardware (PCB) development to progress existing prototype modules through bring-up, verification and revision towards an integration ready system.			■	■			■		• Experience in FPGA (VHDL) and microprocessor (C) firmware development. • General software development skills, (i.e. scripting, source control, configuration management). • An understanding of common electronic communications protocols and signalling standards (e.g. RS-485, RS-422, LVDS, Ethernet, I2C, SPI etc.) • An understanding of network and bus topologies, and factors affecting performance of communications links • Testing, diagnosis and problem-solving skills • Effective hand soldering/re-work skills (SMT components down to 0603 size as a guide) • Good communication skills • Ability to work in a team environment • Motivated and goal-focussed
Weapons Systems Technology	Edinburgh (SA)	Adaptive Information Acquisition and Fusion	This project seeks to develop fast and effective data fusion techniques for reducing false alarms and improving the identification of Improvised Threats in complex operational scenarios using a suite of artificial intelligence (AI) and machine learning (ML) based adaptive data fusion systems.			■	■		■	■		• Experience with MatLab and/or Machine learning preferred.
Weapons Systems Technology	Edinburgh (SA)	Image-based sensor-data fusion algorithms implementation.	The project will use an unmanned air vehicle as a desired platform with the collocated multiple electro-optical sensors to investigate data and sensor fusion at a low level (object tracking) and test the chosen algorithm within MATLAB environment.	■		■	■		■	■		• Experience with MatLab and/or image processing algorithms preferred.

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Weapons Systems Technology	Edinburgh (SA)	Cognitive feature characterisation from non-collocated sensors	This project seeks to investigate information fusion algorithms from non-collocated sensors. Design and run series of experiments collecting the data with the aim to characterise the environment (feature labelling). The algorithms will be tested within MATLAB environment.	X		X	X		X	X		• Experience with MATLAB, experiment design and image processing preferred.
Weapons Systems Technology	Edinburgh (SA)	EMC of HPRF Systems	Electromagnetic compatibility (EMC) is an important component in the assessment of the military utility of future systems. This project will examine the issue of EMC of high power RF (HPRF) systems when integrated into different platforms. In particular, it will be of interest to examine the potential for a HPRF effector on a generic naval platform. This will require an investigation of RF sources and their location, and specification of an appropriate location for a generic HPRF effector. FEKO will be the main tool utilised for the analysis.				X					• Physics, Engineering, Mathematics, a desire to learn computational electromagnetics (FEKO), ability to write a report.
Weapons Systems Technology	Edinburgh (SA)	Impact of EMI on the performance of UAVs	UAVs are being widely used in many Defence applications, and are consequently exposed to various electromagnetic environments. However, knowledge of the effects of electromagnetic radiation, especially from high power microwave sources, on the operation of a UAV is limited. Such knowledge would be useful for developing strategies and techniques to minimise the effects of electromagnetic radiation on the performance of the guidance and control systems of a UAV during its mission, as well as technologies that might be used to defeat an airborne improvised threat.				X					• Python, C++, Matlab, Simulink • Modelling and Simulation
Weapons Systems Technology	Edinburgh (SA)	Modelling of Sensor Effects on UAVs	The effects of RF on collections of sensors in UAVs will be modelled and used to determine vulnerabilities.				X					• Python, C++, Matlab, Simulink • Modelling and Simulation
Science Information Services	Edinburgh (SA), Fishermans Bend (VIC) or Fairbairn (ACT)	IT Service Management Renewal Program	This project will reinvigorate IT Service Management (ITIL) practices in IM&T particularly focussing on Research ICT Service Management Practice and procedure development and rollout to IM&T Directorates and to the Divisions to improve Service Delivery and Maturity.			X						• Base level IT Service Management capabilities related to Capacity Management, Release Management, Service Delivery, Operations Support including Incident, Problem and Change Management.

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Science Information Management Technology	Edinburgh (SA)	Wireless and Mobility Information System Patterns for Distributed Experimentation	This project will investigate and develop wireless and mobility architectural patterns for distributed experimentation environment at the edge. Information Systems are becoming complex due to a need for capturing and collating real-time data from various distributed sensors and IOT devices. Moreover, demands on integrating Operations Technology with IOTs for remote operations is a challenging problem, and needs to be addressed. The advancement in the IT areas with respect to data intensive analysis and the deployment of Cloud environments have effectively addressed rapid system scaling issues for the enterprise and software development areas. However, this has posed new challenges for rapid system integration where experimentation with physical systems is required. This project will identify the future requirements for distributed experimentation, and investigate emerging information technology solutions to address some of the gaps. In particular, effective adaptation of evolving wireless and mobile technology with AI is seemingly promising. Nevertheless, there is lack of a coherent system framework and patterns that are available to system designers address the distributed experimentation problem areas.			■						• Experience in IT and Communications engineering, • General hardware/software development/instrumentation systems skills • Good communication skills • Ability to work in teams • Motivated and goal-focussed
Intelligence Analytics	Edinburgh (SA)	Neural information retrieval techniques for multilingual text search	This project contributes to the implementation of an existing framework and interfaces for cross-lingual and multimodal queries, and is used to evaluate query effectiveness. The student will: • Implement further web interfaces for demonstration of a query and results • Extend existing components for a neural multilingual retrieval methods • Evaluate this method against benchmark datasets using existing components • Extend the support for benchmark datasets			■			■			• Programming experience in python is preferable. • An interest in artificial intelligence, natural language processing, machine learning, and/or skills in languages other than English are desirable but not essential.
Non-Acoustic Signature Management	Fishermans Bend (VIC)	Novel materials for marine biofouling control	This project requires the successful applicant to develop, test and evaluate novel materials for marine biofouling control. The project will involve the use of additive manufacturing (as well as other techniques) to manufacture material test samples, with the successful applicant involved in all aspects of the production, from concept design to manufacture. Materials will be tested under laboratory and real world conditions, with some fieldwork required.		■			■				• Experimental skills, manufacturing testing, modelling skills, fieldwork experience • Excellent computer, verbal and written communications skills • Ability to work in teams, Motivated and goal-focussed
Undersea Command & Control	Stirling (WA)	Human-Machine Workload Strategies	This project will assist Human Scientists at DST Group to better understand the workload limitations of RAN computer system operators. This is an area of Human-Machine teaming that is fundamental to Navy performance but that is still not well understood beyond general descriptive performance degradation. To provide better guidance to Navy on how to manage increasing levels of data in the workplace we need to be able to better predict the implications of workload in the sense of cognitive or mental load, typical performance degradation patterns and if possible, mitigation strategies to sustain performance under high workload conditions.								■	• Experimental psychology and statistics • Coding in Python would be useful.
Undersea Command & Control	Stirling (WA)	Command Training Innovations	This project will assist DST Group Human SCientists to carry out an examination of training undertaken by key RAN officers against the context of recent research on military, executive and other high performance training schemes across a broad range of industry settings. Its objective is to assess the suitability of emerging training innovations for RAN officers.								■	• Organisational psychology, Education and Training

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Chemical & Biological Defence	Fishermans Bend (VIC)	Method development of a Multiple Reaction Monitoring for the detection of nitrogen mustard adducts from exposed human plasma	Defence is currently an "OPCW Designated Laboratory for Biomedical Samples". The designation benchmarks DSTs capability internationally and enables us to assist in international investigation of alleged use of Chemical Warfare Agent from biomedical samples. To maintain this designation, the laboratory must successfully complete the annual Proficiency Test for Biomedical Samples administered by the OPCW. At the most recent meeting with OPCW, it was suggested that future proficiency tests will involve providing evidence of exposure to the nitrogen mustards. This project will involve the adaptation of the current methodologies used for the identification of biomarkers for sulfur mustard for the nitrogent mustards that will be vital for the successful completion of future tests involving the nitrogen mustards.		X							• Good communication skills, the ability to following instructions and understand scientific literature • Good wet chemistry experimental skill, knowledge of mass spectrometry • Ability to work in a team • Understanding of protein chemistry and purification • Be self-motivated and the courage to seek assistance when faced with problems
Land Personnel Protection	Fishermans Bend (VIC)	Measurement and characterisation of spectral properties of man-made materials and relevant natural terrain background elements using hyperspectral imaging sensors and spectral radiometers for land asset signature study	This project will require the researcher to use hyperspectral imaging sensors and spectral radiometers and other associated instrumentation to conduct data collection, measurements and analysis both in the laboratory and in the field trial. A comprehensive material and field elements spectral data base will be developed to support the Land division's Lelantos' modelling and simulation demonstrator development.			X	X		X	X		• Experimental skills in using instrumentation, data analysis • Self-motivated and outcome focussed
Land Personnel Protection	Fishermans Bend (VIC)	Development of novel sensor algorithm for object D.R.I. using hyper-cube data	This project will require the researcher to use computer vision, machine learning/deep learning techniques and hyperspectral data cube to develop a predictive model and novel sensor algorithm for object detection, recognition and identification considering both spectral and spatial content of the scene.			X	X		X			• Modelling skills, software development skills, scripting, Matlab • Self-motivated and goal-focussed
Aerospace Capability Analysis	Fishermans Bend (VIC)	Understanding bias in knowledge elicitation activities	In Aerospace Capability Analysis (ACA) we often call on subject matter experts (SMEs) to make judgements such as: the performance of a weapon or sensor; the outcome of a military engagement; or number of aircraft required to complete a mission. The main reason for relying mostly on SME judgement is that the problem is too complex to mode using traditional modelling methods. However, SME judgements are clouded by personal, cognitive and other biases. Further, there is a poor correlation between the quality of the SMEs response to their perceived confidence or experience in the question of interest. There are a range of techniques that can be used to reduce and control for these biases including: using neutral language, specific ordering of questions, seeking rationale for responses, training SMEs to de-bias their responses, peering reviewing responses and aggravating responses from experts. The project will investigate the range of techniques available as well as designing and conducting experiments to investigate one aspect of bias relevant to this task. Outcomes of this project may include development of a set of best practice guidelines for the practitioner, or improve the available data collection tools including writing scripts to integrate into LimeSurvey. The result will be applicable to all areas of JOAD that rely on knowledge elicitation methods.			X	X		X	X	X	• Undergraduate in Science, engineering, management or psychology • Knowledge or interest in knowledge elicitation and bias • Experience in survey design, programming or using macros in Microsoft Office • Knowledge and experience in PHP, LimeSurvey and excel will be viewed favourably

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Land Capability Analysis	Edinburgh (SA)	AI Enabled War-gaming	In order to support the force design process, the Land Capabilities Analysis (LCA) MSTC at DSTG delivers S&T that uses constructive and war-gaming simulation-based capabilities to assess the performance of components of the land force in various scenarios of interest. The entities that are represented in these simulations are usually programmed with well-defined rules of movement and engagement with encountered enemies. These behavioural rules are validated by subject matter expertise for both blue and red teams in the scenario of relevance.			■						• Modelling skills, software development • Excellent computer, verbal and written communications skills are required to undertake this project. • General software development skills, scripting, source control configuration management. • Good communication skills, Ability to work in teams, Motivated and goal-focussed
Aircraft Performance and Survivability	Fishermans Bend (VIC)	Training robot swarms for autonomous cooperative surveillance	Traditional linear flight control performs poorly when applied to non-linear, highly dynamic Uninhabited Aircraft Systems (UAS) platforms or when platforms are operated in dynamic environments. To achieve acceptable controller performance, substantial tuning is required, often with respect to a single flight condition. Operating the vehicle away from this flight condition can result in highly degraded air vehicle performance. To address this shortcoming, DST Group is researching non-linear model-based adaptive control for controlling complex UAS operating outside benign flight conditions. Experimental-based system identification (SID) techniques are being used to develop non-linear flight controllers, with a focus on real-time SID techniques for use with adaptive flight control algorithms. The successful IEP applicant will help to investigate and evaluate real-time SID techniques and adaptive control algorithms for small fixed and rotary-wing UAS. The successful applicant will also develop aircraft simulation models and conduct experiments on aerial platforms to verify the effectiveness of real-time SID techniques.	■		■				■		The successful applicant must have: • Excellent interpersonal and written communication skills as well as a range of technical skills. • Software development, computer science and aeronautics. • Experience in the C++ and Python programming languages • Strong academic results and the ability to work independently and as team.