**Project Code:** BEND  
**Project Title:** Implementation and verification of a high-quality aircraft flight dynamic model  
**Project Description:** DSTO undertakes flight simulation and performance analysis to support defence acquisition, operation and sustainment. The aim of this project is to develop an aircraft flight dynamics model that will be used to support the design and development of DSTO and NASA, with potential for the aircraft model to be used as a baseline for the VAV of flight simulation software.

**Tasks/ Duties Required:** Flight simulation and computational analysis; programming; data analysis; report writing.

**Relevant Research Area (academic disciplines):** Aerospace Engineering, Mechanical Engineering.

**Other Desirable Skills:** Familiarity with aircraft flight dynamics, performance or simulation.

**General Information (personal requirements/ academic qualifications):** A minimum of three years study in a relevant discipline; aptitude for teamwork as well as ability to work independently.

**Project Code:** AD 01  
**Project Title:** Helicopter Advanced Fatigue Test Technology Demonstration (HAPT-DT)  
**Project Description:** DSTO has an ongoing program, the goal of which is to demonstrate the capability of performing a full-scale fatigue test on a Helicopter platform. The successful candidate will provide support to the program as needed. Depending on the progress of the program, this may include support to airframe loads and spectrum development, testing and design, and laboratory trials specific to high speed fatigue testing.

**Tasks/ Duties Required:** Review of relevant literature  
**Relevant Research Area (academic disciplines):** Aerospace Engineering, Mechanical Engineering and related disciplines.

**Other Desirable Skills:** Material testing experience (fatigue), Effective written / oral communication skills, Ability to operate effectively in a team environment.

**General Information (personal requirements/ academic qualifications):** Experience in a technique or engineering problem solving team is desirable (in an academic context or otherwise). High academic achievement is regarded favourably.

**Project Code:** AD 02  
**Project Title:** Development of a background oriented schlieren (BOS) system for the DSTO Transonic Wind Tunnel  
**Project Description:** DSTO aims to implement a Background Oriented Schlieren (BOS) system for its transonic wind tunnel (TWT) facility in order to achieve Schlieren imaging (density field) for problems were optical access and therefore traditional Schlieren is not feasible. The project will involve both practical and computational aspects, aimed at enhancing the DSTO BOS capability in conducting scientific testing and research.

**Tasks/ Duties Required:** Post process BOS data from the TWT facility and develop an algorithm to correct for tunnel vibrations. Produce a set of requirements for a new camera and lighting mount. Perform preliminary design of camera and lighting mount.

**Relevant Research Area (academic disciplines):** Aerospace Mechanical Engineering.

**Other Desirable Skills:** Experimental aerodynamics, fluid mechanics, programming, optics, Matlab, design.

**General Information (personal requirements/ academic qualifications):** Experimental aerodynamics, fluid mechanics, programming, optics, Matlab, design.

**Project Code:** AD 03  
**Project Title:** High Resolution Particle Image Velocimetry (PIV) and Image Blending  
**Project Description:** Particle Image Velocimetry (PIV) is a laser diagnostic flow measurement technique that is being increasingly used in the DSTO low speed wind tunnel. The technique has a wide range of applications, including investigating the flow around aircraft and underwater vehicles. The project will involve both practical and computational aspects, aimed at enhancing the DSTO PIV capability in conducting scientific research.

**Tasks/ Duties Required:** The computational work will involve improving an algorithm designed to blend multiple PIV velocity fields and comparing PIV data with computational fluid dynamics (CFD) results. The practical work will consist of design and development of a PIV camera to lens adapter for conducting high resolution PIV measurements. The student will then perform an assessment of the high resolution lens by conducting an experimental study in a DSTO wind tunnel.

**Relevant Research Area (academic disciplines):** Aerospace Mechanical Engineering.

**Other Desirable Skills:** Electrical engineering, Electronics engineering, Mechatronics engineering or other relevant disciplines.

**General Information (personal requirements/ academic qualifications):** Electronics Design, familiarity with Allium Designer software packages.

**Project Code:** AD 04  
**Project Title:** Lithium Ion Battery Management Hardware for Hypersonic Flight Vehicle  
**Project Description:** Design and verification of battery monitoring hardware for lithium ion battery packs. The monitoring hardware must protect cells from Overcharge, over-discharge, and must maintain cell balance throughout the pack lifetime. Importantly the hardware must be flight ready.

**Tasks/ Duties Required:** Background or literature review of plausible solutions. Initial electronics design of solution, prototyping of proposed design.

**Relevant Research Area (academic disciplines):** Electrical Engineering, Electronics Engineering, Mechatronics Engineering or other relevant disciplines.

**Other Desirable Skills:** Familiarity with mechanical engineering. Flight performance, flight mechanical design, flight software development.

**General Information (personal requirements/ academic qualifications):** A strong background in mechanics and/or C is essential. Some experience using Linux. Some experience in JAVA and HTML. Familiarity with internet protocols is desirable. Able to work independently. Willing to learn new skills. Comfortable solving unfamiliar problems.

**Project Code:** CEW0 01  
**Project Title:** NeedleShark - Searching for specific network protocols across large numbers of packet capture files.  
**Project Description:** Needleshark - searching for specific network protocols in large numbers of packet capture files. The Needleshark software suite has been developed to provide researchers with easy access to the information they require, but is currently incomplete. Needleshark makes use of the popular Wireshark open source network protocol analyser tool. Needleshark uses a client-server architecture. The server, known as Haystack, contains a repository of packet capture files. The client allows researchers to search Haystack for specific network protocols using a browser-based web interface. The search results are combined into a new packet capture file which can then be viewed with Wireshark. Haystack’s design includes the ability to distribute searches across multiple servers and aggregate the results. This has not yet been implemented.

**Tasks/ Duties Required:** Implement additional functionality in the web interface; such as autocomplete, job tracking, resource prediction and file management. Implement distributed search functionality. Implement new development testing procedures. Create installation packages for easy deployment. Update documentation.

**Relevant Research Area (academic disciplines):** Computer Science, Software Engineering.

**Other Desirable Skills:** Comfortable solving unfamiliar problems.

**General Information (personal requirements/ academic qualifications):** A minimum of three years study in a relevant discipline; aptitude for teamwork as well as ability to work independently.

**Project Code:** LD 01  
**Project Title:** Evaluating the ballistic performance of a range of steel grades  
**Project Description:** High strength and high hardness steels are the most commonly used materials in ballistic armour. They offer protection at a low cost, with high structural performance and relatively low environmental sensitivity (e.g. to abrasion, corrosion, thermal cycling, etc). Typically, for military land vehicles, ballistic performance is characterised through impact testing against armour piercing and fragmentation threats. These threats provide a very different loading condition on the armour, and complicate the selection of an ideal steel grade.

**Tasks/ Duties Required:** In this project the student will be required to characterise the protective capability of a range of steel grades against an armour piercing and fragmentation threat through ballistic testing with a DSTO senior technical officer. The failure surfaces of the steels will be examined (e.g. microscopy, etching, etc) and the failure mechanisms will be characterised, e.g. adiabatic shearing, ductile plugging etc. The performance of the steels will then be evaluated against comparable test data to understand differences between materials from different steel manufactures.


**Other Desirable Skills:** Familiarity with mechanical testing of material properties.

**General Information (personal requirements/ academic qualifications):** Exposure to FEA and/or CFD Exposure to mechanical testing of material properties.

**Project Code:** LD 02  
**Project Title:** Evaluation of armour steel for blast protection  
**Project Description:** In this project the student will evaluate a range of armour steels to help determine the blast protection they will provide to an armoured vehicle. The project will look at both the suitability of different test techniques to evaluate blast protection as well as the links between material properties obtained from mechanical tests and the materials performance under blast loading.

**Tasks/ Duties Required:** Literature review of BOS testing techniques. Numerical modelling of armour steel performance and comparison with experiments. Mechanical testing of armour steel specimens.

**Relevant Research Area (academic disciplines):** Mechanical/Aerospace Engineering, Materials Science - Metals.
SVS LD 03
SCOTTSDALE
Investigation into the development of rancidity in cereal-based products.

The aim of this project is to determine the level of rancidity in cereal-based products that have been held under a range of storage conditions and to examine influential factors such as ingredients, temperature and water activity. Cereal-based products, such as noodles, biscuits and breakfast cereal, are important components of combat ration packs (CRP). The development of rancidity during the period between manufacture and consumption can affect acceptability and therefore consumption rates. The purpose of this project is to assist in the establishment of performance criteria for cereal-based components of CRP.

The requirements for this project will be:
* Undertake a brief literature review into the types, causes and measurement of rancidity in cereal based products.
* Conduct rancidity determinations on samples of cereal-based products, interpret and report results
* Present findings to a DSTO audience.

Food Science and Nutrition

Experience with and/or an interest in:
* Food product development/analysis
* Ability to communicate ideas and findings to a range of audiences (scientific/academic, military) using both written and oral means.

This project is targeted at students in their penultimate year of study.

SVS MD 01
FISHERMANS BEND
Sensitivity analysis for the consideration of redundant systems in the probabilistic vulnerability assessment of naval platforms.

The Naval Platform Survivability Group, Maritime Division, DSTO, requires an undergraduate student to investigate the sensitivity of redundant systems in the assessment of naval platform vulnerability.

The study will involve employing specialist vulnerability software tools to model the ship systems and their functional relationships.

Next, consequence analysis to determine the system state (fail or successes) under consideration of various damage scenarios is performed.

• Literature review on ship vulnerability and reliability assessment methodologies
• Familiarity with specialist software tools
• Carry out analysis
• Report writing and presentation

数值与可靠性分析

Computing skills

SVS MD 02
FISHERMANS BEND
Graphical User Interface for Planning Damage Control Response Actions.

The Naval Platform Survivability Group, Maritime Division, DSTO, requires an undergraduate, 3rd year student, with software engineering skills, to develop a Graphical User Interface (GUI). The GUI will facilitate the generation and analysis of response networks for planning damage control on Royal Australian Navy ships.

The response network is a hierarchical representation of redundancy in a ship system. A user may interact with the generated response network to select ship damage control response actions and intelligent rules.

1. Development of a GUI to visually generate a damage control response network.
2. Development of GUI to interact with an existing damage control response network.
3. User manual documenting how to generate and interact with the damage control response network interface.

Software engineering, software programming.

1. An understanding of graph theory; and

SVS MD 03
FISHERMANS BEND
Development of relationships between performance and design aspects for naval patrol boats.

The decisions made during the conceptual phase of naval ship design, often related to design and performance attributes, can have a significant effect on the military effectiveness of a ship.

The Defence Science and Technology Organisation is currently undertaking a project to develop an approach that helps to inform decision makers during the conceptual design stage. The tool supports the design process by providing a rudimentary design space that is linked to mission effectiveness. This linkage is achieved using parametric and surrogate relationship models. These models can subsequently be used in simple numerical simulations of naval missions to evaluate the performance of the design relative to the design space.

The aim of the summer vacation student (SVS) project is to develop a set of parametric and surrogate models for a naval patrol boat conceptual design.

• Literature review and collection of relevant data
• Establishing the scope and aim of the project
• Analysis of data
• Familiarity with statistical analysis techniques, such as regression analysis
• Familiarity with software tools, such as Matlab, MS Excel and MS Word.

Naval Architecture, Mathematics, Mechanical Engineering

A student currently enrolled in the Bachelor of Engineering (Naval Architecture) with an interest in:
* Food product
* A minimum of three years of study in a relevant discipline

SVS MD 04
FISHERMANS BEND
The effect of loading frequency on the amount of intergranular fracture and crack growth rate at specified levels of stress intensity factor in structural steel

A sound understanding of material mechanical properties is crucial to making informed decision regarding the design and acquisition of major Naval assets such as ships and submarines. This project is part of ongoing work to inform the fundamentals of fatigue crack growth behaviour of materials for Naval platforms. The student will perform fatigue testing on steels to obtain crack growth rate data at a variety of frequencies. This data will validate an experimental test set-up for future experimentation. The fracture surfaces will be analysed using optical and scanning electron microscopy to characterise the crack morphology. The students will work directly with DSTO staff to carry out testing and microscopy and assess the percentage of intergranular fracture. A detailed report will be written by the student to describe the experimental techniques and results.

Familiarisation with provided literature, gaining an understanding of relevant fatigue testing standard, operation of an electrically driven test instrument and associated software, analysis of test data, Fractographic analysis using optical and scanning electron microscopy, materials characterisation and scientific report writing

Materials Science or Engineering, Physics or Mechanical Engineering

SVS MD 05
EDINBURGH
Real-time Assimilation of Geographically dispersed ocean SVPS for enhanced 3-D ocean modelling

The performance of ship sonar systems is highly dependent on the temperature of the ocean. Sonar trials take account of this by measuring temperature at various depths across the area in which these trials take place. These measurements are made using expendable bathythermograph (XBT) probes dropped from trials ships and with autonomous ocean gliders that send data back via satellite.

Maritime division would like a student to develop some software that organises and visualises this information live. This will involve:
1. Reading XBT and GPS data from a file written by existing XBT interface software.
2. Reading Glider temperature and GPS data from a file written by existing Glider interface software.
3. Visualising the temperature and GPS data: a) At a selected Latitude/Longitude location.
4. Along a transect between two locations, using an

Geographic Information System (GIS)

C++, Matlab, GIS database design

SVS MD 06
FISHERMANS BEND
Impact of load frequency on the amount of intergranular fracture and crack growth rate at specified levels of stress intensity factor in structural steel

The effect of loading frequency on the amount of intergranular fracture and crack growth rate at specified levels of stress intensity factor in structural steel.

A sound understanding of material mechanical properties is crucial to making informed decision regarding the design and acquisition of major Naval assets such as ships and submarines. This project is part of ongoing work to inform the fundamentals of fatigue crack growth behaviour of materials for Naval platforms. The student will perform fatigue testing on steels to obtain crack growth rate data at a variety of frequencies. This data will validate an experimental test set-up for future experimentation. The fracture surfaces will be analysed using optical and scanning electron microscopy to characterise the crack morphology. The students will work directly with DSTO staff to carry out testing and microscopy and assess the percentage of intergranular fracture. A detailed report will be written by the student to describe the experimental techniques and results.

Familiarisation with provided literature, gaining an understanding of relevant fatigue testing standard, operation of an electrically driven test instrument and associated software, analysis of test data, Fractographic analysis using optical and scanning electron microscopy, materials characterisation and scientific report writing

Materials Science or Engineering, Physics or Mechanical Engineering

SVS MD 07
FISHERMANS BEND
Graphical User Interface for Planning Damage Control Response Actions.

The Naval Platform Survivability Group, Maritime Division, DSTO, requires an undergraduate, 3rd year student, with software engineering skills, to develop a Graphical User Interface (GUI). The GUI will facilitate the generation and analysis of response networks for planning damage control on Royal Australian Navy ships.

The response network is a hierarchy of response options to a set of observations. A user may interact with the generated response network to choose their damage control response option to assess the effect of their actions.

1. Development of a GUI to visually generate a damage control response network.
2. Development of GUI to interact with an existing damage control response network.
3. User manual documenting how to generate and interact with the damage control response network interface.

Software engineering, software programming.

1. An understanding of graph theory; and

SVS MD 08
FISHERMANS BEND
Development of relationships between performance and design aspects for naval patrol boats.

The decisions made during the conceptual phase of naval ship design, often related to design and performance attributes, can have a significant effect on the military effectiveness of a ship.

The Defence Science and Technology Organisation is currently undertaking a project to develop an approach that helps to inform decision makers during the conceptual design stage. The tool supports the design process by providing a rudimentary design space that is linked to mission effectiveness. This linkage is achieved using parametric and surrogate relationship models. These models can subsequently be used in simple numerical simulations of naval missions to evaluate the performance of the design relative to the design space.

The aim of the summer vacation student (SVS) project is to develop a set of parametric and surrogate models for a naval patrol boat conceptual design.

• Literature review and collection of relevant data
• Establishing the scope and aim of the project
• Analysis of data
• Familiarity with statistical analysis techniques, such as regression analysis
• Familiarity with software tools, such as Matlab, MS Excel and MS Word.

Naval Architecture, Mathematics, Mechanical Engineering

A student currently enrolled in the Bachelor of Engineering (Naval Architecture) with an interest in:
* Food product
* A minimum of three years of study in a relevant discipline

SVS MD 09
FISHERMANS BEND
The effect of load frequency on the amount of intergranular fracture and crack growth rate at specified levels of stress intensity factor in structural steel

A sound understanding of material mechanical properties is crucial to making informed decision regarding the design and acquisition of major Naval assets such as ships and submarines. This project is part of ongoing work to inform the fundamentals of fatigue crack growth behaviour of materials for Naval platforms. The student will perform fatigue testing on steels to obtain crack growth rate data at a variety of frequencies. This data will validate an experimental test set-up for future experimentation. The fracture surfaces will be analysed using optical and scanning electron microscopy to characterise the crack morphology. The students will work directly with DSTO staff to carry out testing and microscopy and assess the percentage of intergranular fracture. A detailed report will be written by the student to describe the experimental techniques and results.

Familiarisation with provided literature, gaining an understanding of relevant fatigue testing standard, operation of an electrically driven test instrument and associated software, analysis of test data, Fractographic analysis using optical and scanning electron microscopy, materials characterisation and scientific report writing

Materials Science or Engineering, Physics or Mechanical Engineering

SVS MD 10
FISHERMANS BEND
Graphical User Interface for Planning Damage Control Response Actions.

The Naval Platform Survivability Group, Maritime Division, DSTO, requires an undergraduate, 3rd year student, with software engineering skills, to develop a Graphical User Interface (GUI). The GUI will facilitate the generation and analysis of response networks for planning damage control on Royal Australian Navy ships.

The response network is a hierarchy of response options to a set of observations. A user may interact with the generated response network to choose their damage control response option to assess the effect of their actions.

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2. Development of GUI to interact with an existing damage control response network.
3. User manual documenting how to generate and interact with the damage control response network interface.

Software engineering, software programming.

1. An understanding of graph theory; and
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<tr>
<th>Project Code</th>
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<th>Project Description</th>
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</table>
| SVS MD 06    | EDINBURGH       | Environmentally Adaptive Binary Classification Techniques for Underwater Acoustic Signals | An important task in sonar system operations is separating detections caused by objects of interest (man-made) from irrelevant detections caused by other (natural) objects. It can sometimes be possible to classify an object into interesting and uninteresting by careful examination of the acoustic return that allowed the object to be detected. Unfortunately, acoustic propagation in the sea imposes a highly variable distortion upon returns from underwater objects. This project is to investigate the degradation of acoustic object classification by the environment. It is also to determine if incorporating environmental measurements into the analysis of acoustic returns can improve classification accuracy. | 1. Develop and implement the approach. 2. Refine the preliminary designs. 3. Perform various numerical studies of a photonic crystal fibre. 4. Create a composite file of XBT, GPS and Glider data for export to other code. 5. Extend the existing XBT interface software to log sea surface temperature using a temperature probe. 6. Write a report assessing the implementation and recommend improvements. | Electrical/Electronic Engineering  
Applied mathematics  
Statistics | Programming skills in MATLAB  
Signal processing knowledge would be useful but is not required or expected. |
| SVS MD 07    | EDINBURGH       | Development of a method for the generation of wide-band acoustic transmission for underwater acoustic scattering measurements | The use of wideband acoustic pulses has become a topic of interest in active sonar because it may lead to improved echo detection and classification. Conventional active sonar systems generally operate in a narrow-band mode. Research has shown several approaches in generating wideband transmitting signals which have nearly uniform magnitude as a function of frequency. This can be done by pre-compensating the electrical driving input of the transmitting pulse or to de-convolve with the transmitting signal so that the desired acoustic output pressure waveform maybe achieved. The student participating in this project will work in a multidiscipline team to refine the requirements, implement and perform some rigorous experimental experiments in the Maritime Division’s Underwater Acoustic Scattering Laboratory as well as analyse the data and document the findings. | 1. Work with DSTO scientists and engineers to define the requirements, algorithms and software architecture needed. 2. Implement a simple ray tracing algorithm in OpenGL/C/C++ to verify the feasibility of the approach. 3. Review the approach/architecture and modify as necessary. 4. Implement the ray tracing algorithm. 5. Test the implementation against the requirements. 6. Write a report assessing the ray tracing implementation performance and recommend improvements. | Electronics/Electronic Engineering  
Software Engineering  
Computer Science  
Computer - Systems Engineering. | Knowledge of analog and digital filtering, correlation functions, Fourier Transforms -  
Programming Knowledge of: MATLAB, LabVIEW |
| SVS MD 08    | EDINBURGH       | Underwater Acoustic Ray Tracing in OpenGL | Photonics is a fast growing field and its use has led to various disruptive military capabilities. A number of critical defence applications using photonic technologies, e.g. stealth, secure communications, countermeasures, and remote sensing, have been developed and demonstrated at many research institutes and defense organisations such as Defense Advanced Research Projects Agency (DARPA) and the Defence Science and Technology Organisation (DSTO). Australian Department of Defence has recently employed photonics in numerous remote sensing applications, including hyperspectral imaging and electro-optic hydrophones. An optical fiber-based sensor, whose fiber glass is the sensing element, has been considered as an alternative approach which offers numerous advantages over electronic methods, namely electromagnetic interference immunity, compactness, relatively short acquisition times, and multiple spatially-separated sensors configured as a sensing network. Thus, the aim of this project is to develop a highly sensitive photonics-based magnetic sensor. The key component of this device is a two-dimensional photonic crystal fiber (PCF) modified with magnetostatic materials such as metals, metallic liquids, or vapours. This fiber-based approach is made viable by the enhancement of the light-matter interaction within a resonant optical cavity, which would enable ultra high sensitivity of the sensor. Additionally, the relative compactness, robustness, and low power consumption of a fiber-based sensor makes it ideal for many defense sensing applications. | Part perform various numerical studies of a photonic crystal fibre-based magnetic sensor via Matlab and COMSOL.  
Carry out some experiments to characterise a commercial magnetic sensor and a state-of-the-art photonics-based magnetic sensor. | Sonar, real time processing and architectures. | C++, Qt, OpenGL, mathematics. |
| SVS MD 09    | SYDNEY          | Development of an advanced photonics-based magnetic sensor | Field robotics are increasingly being adopted by defence forces to do "dirty and dangerous" jobs like detection and neutralisation of mines. Robotic mine disposal on land is relatively straightforward, since the device can be visually monitored and driven by remote control. However, radios and cameras don't work very well underwater, so robots looking for sea mines have to be a bit smarter and make the most of the few opportunities there are for communication. Typically, control of underwater robots involves a good deal of detailed mission pre-planning on the keyboard, something most people would rather not have to do. On the other hand, people generally like talking on their mobile phones, or using online chat ("instant messaging") or IM. Wouldn't it be great if we could chat to our | The task is to develop a mobile phone app to perform mission planning for a REMUS 100 unmanned underwater vehicle. Use of existing mobile apps, open source code or online tools (such as Google maps) is encouraged. From a science and technology perspective, the challenge will be to make best use existing "real estate" on a smart phone screen (preferably or tablet, and communicating the minimum amount of information required to complete a mission. An interesting aspect of the project is to investigate the extent to which machine intelligence can be used to minimise the load on | Mechatronics  
Command & Control  
Java programming  
Android O/S or similar  
Image/signal processing  
Mobile communications  
Geospatial Information Management | Write a mobile phone app may be more appropriate for the control of ground or air robots, this task will demonstrate proof-of-concept, application and feasibility in the most difficult case of intranet and/or low bandwidth communications, and will provide useful guidance towards a general |
| SVS MD 10    | SYDNEY          | Mission IMpossible | Field robotics are increasingly being adopted by defence forces to do "dirty and dangerous" jobs like detection and neutralisation of mines. Robotic mine disposal on land is relatively straightforward, since the device can be visually monitored and driven by remote control. However, radios and cameras don't work very well underwater, so robots looking for sea mines have to be a bit smarter and make the most of the few opportunities there are for communication. Typically, control of underwater robots involves a good deal of detailed mission pre-planning on the keyboard, something most people would rather not have to do. On the other hand, people generally like talking on their mobile phones, or using online chat ("instant messaging") or IM. Wouldn't it be great if we could chat to our | The task is to develop a mobile phone app to perform mission planning for a REMUS 100 unmanned underwater vehicle. Use of existing mobile apps, open source code or online tools (such as Google maps) is encouraged. From a science and technology perspective, the challenge will be to make best use existing "real estate" on a smart phone screen (preferably or tablet, and communicating the minimum amount of information required to complete a mission. An interesting aspect of the project is to investigate the extent to which machine intelligence can be used to minimise the load on | Mechatronics  
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Java programming  
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Image/signal processing  
Mobile communications  
Geospatial Information Management | Write a mobile phone app may be more appropriate for the control of ground or air robots, this task will demonstrate proof-of-concept, application and feasibility in the most difficult case of intranet and/or low bandwidth communications, and will provide useful guidance towards a general |
SVS MD 11  
**PFISHERMANS BEND**  
**Shock Isolator Performance on Naval Platforms Subjected to Underwater Explosions**  
This project will investigate the dynamic response of a shock isolated raft in terms of the mitigation of shock loads transmitted to equipment.

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<thead>
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<td>1. Learning to use computer modelling software</td>
<td>Naval Architecture, Marine Engineering, Structural Engineering, Mechanics, Civil Engineering</td>
<td>Excellent computer skills, report writing and presentation experience.</td>
<td>A student currently enrolled to obtain a bachelor of engineering degree in relevant disciplines. Preferably the student should have completed his/her first three years of studies and progressed to their final year of study.</td>
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<tr>
<td>2. Generating a computer model</td>
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<tr>
<td>3. Running the model to generate structural response results.</td>
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SVS MD 12  
**PFISHERMANS BEND**  
**Ultimate Strength Assessment of a Surface Combatant**  
Several important developments in naval surface combatant design have occurred in recent years, including the appearance of welded aluminium hulls and novel hull forms; the adoption of classification society design rules for naval construction; and the inclusion of requirements for ultimate strength in naval design standards.

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SVS MD 13  
**STIRLING**  
**Investigation of Using PVDF Films for Modal Shape Measurement.**  
The resonant frequencies of a structure are conventionally measured using accelerometers positioned at various locations on the structure. One problem with this is that the mass of the accelerometers themselves can change the natural frequencies of the object being measured. These effects can be eliminated by using a laser interferometer to scan the surface but this equipment is expensive and cumbersome to use. This project will involve using a thin film of piezoelectric Polyvinylidene fluoride (PVDF) to investigate the feasibility of using it to measure the surface vibration of a vibrating plate. The results will be compared to existing conventional results done on the same plate using accelerometers and laser interferometry.

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<tr>
<td>1. Learning to use computer modelling software</td>
<td>Physics, Engineering</td>
<td>A good knowledge of Matlab and A/D acquisition systems would be desirable.</td>
<td>The project will be conducted at HMAS Stirling, Garden Island (GI), WA. This is situated 50km South of Perth. There is a bus shuttle service from Rockingham train station to GI that runs in the early morning and late afternoon for those needing to use public transport.</td>
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SVS MD 14  
**STIRLING**  
**Construction and Characterisation of a 3-axis Underwater Vector Geophone Sensor.**  
The objective of this project is to construct and evaluate a stand-alone 3-axis geophone sensor suitable for measuring low frequency interface waves at the land/water boundary. In such a situation (fluid/solid) the type of wave that can propagate at the interface is called a Scholtz wave. These waves have similar properties to Rayleigh waves and can propagate for very large distances with little attenuation. The sensor in this project will be designed to measure such waves and investigate it’s capability for detecting and classifying low frequency waves at large distances. One example would be the detection of blue whale vocalisation off our local coastline. Provided time permits the sensor will ideally be configured via a remote interface so that data can be collected and sent to the ship. A good knowledge of electronics would be an advantage.

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<td>Physics, Engineering</td>
<td>A knowledge of Matlab and A/D acquisition systems would be desirable.</td>
<td>The project will be conducted at HMAS Stirling, Garden Island (GI), WA. This is situated 50km South of Perth. There is a bus shuttle service from Rockingham train station to GI that runs in the early morning and late afternoon for those needing to use public transport.</td>
</tr>
<tr>
<td>2. Generating a computer model</td>
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<tr>
<td>3. Running the model to generate structural response results.</td>
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SVS NS00  
**EDINBURGH**  
**ADSS Hypertemporal Imaging (HTI)**  
Imaging sensors employed at frame rates well beyond standard video can provide a unique method for exploitation of interesting temporal phenomena. This project is looking for two highly motivated individuals to expand upon existing ADSS developed Hypertemporal Imaging (HTI) algorithms by providing additional processing capabilities through implementation and development of other spectral techniques such as those used for hyperspectral exploitation.

<table>
<thead>
<tr>
<th>Tasks/Duties Required</th>
<th>Relevant Research Area (academic disciplines)</th>
<th>Other Desirable Skills (programming/deskitop)</th>
<th>General Information (personal requirements/academic qualifications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to use computer modelling software</td>
<td>Signal Processing, Mathematics, Computer Science, Software Engineering, Electrical &amp; Electronics Engineering, Computer Vision</td>
<td>Experience with and/or an interest in:</td>
<td>Team software project experience is desirable as well as an interest in open source software. High academic achievement is regarded favourably.</td>
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<tr>
<td>SVS NSRD 02</td>
<td>EDINBURGH</td>
<td>ADS3 Hypertemporal Imaging (HTI)</td>
<td>Imaging sensors employed at frame rates well beyond standard video can provide a unique method for exploitation of interesting temporal phenomena. This project is looking for two highly motivated individuals to expand upon existing ADS3 developed Hypertemporal Imaging (HTI) algorithms by providing advanced processing capabilities through implementation and development of other spectral techniques such as those used for hyperspectral exploitation. The Analysts' Detection Support System (ADSS) is a successful Australian GEOSPATIAL INTELLIGENCE (GEINT) data processing software platform in national and international operational use. The system contains a sophisticated computational and high functionality processing engine within a custom web application framework. Target detection algorithms and the majority of the framework are implemented in C/C++. The software is typically developed and deployed on x86_64 Linux platforms using open-source tools.</td>
</tr>
<tr>
<td>SVS NSRD 03</td>
<td>EDINBURGH</td>
<td>Advanced Web Application Development</td>
<td>The Evolutionary Layered ISR Integration eXemplar ARchitecture (ELIIXAR) is a hardward/software stack that is comprised of a number of layers including both a services layer and a visualisation layer. The visualisation layer consists of a number of ‘widgets’, which are modular web applications designed to work with other widgets to allow users to visualise and manipulate data in a web browser. Widgets often rely on services in the services layer to perform any computationally complex functions. This project (x3) will focus on extending current ELIIXAR functionality by adding features to current widgets and developing new widgets. As part of this project, students will also be required to develop or extend services to support the new widget functionality.</td>
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<td>SVS NSRD 04</td>
<td>EDINBURGH</td>
<td>Advanced Web Application Development</td>
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<td>SVS NSRD 06</td>
<td>EDINBURGH</td>
<td>Geo-locating Targets from Video Tracking</td>
<td>Target tracking is the process where surveillance sensor measurements are used to answer questions such as “how many targets are there?”, “where are they located?” and “where are they going?” Video Moving Target Indication can track multiple targets from video imagery of a road network by identifying changes from frame to frame over a series of video images. Pixel positions for targets in these images are known; however, it is not easy to obtain the absolute latitude and longitude of targets or their location in the road network accurately. Your contribution will help us develop a method for accurately locating a target. Possible solutions involve the registration of images and the tracking of features in an image to extract the road network. The knowledge of a target’s absolute position enhances models used for tracking, the stitching of track segments representing a single target and identifying anomalous behaviour.</td>
</tr>
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</table>
SVS NSID 07
EDINBURGH
Imaging radar texture exploitation
Imaging radar systems are capable of generating fine-resolution imagery of a scene and find use in a wide variety of civilian and military applications. Typically, radar returns from natural land or ocean scenes are described by single point statistics for which suitable statistical models have been developed and are routinely employed for automated scene classification, target detection and image segmentation. Modern radar systems, however, offer unprecedented resolutions such that highly variable radar returns can now be observed from scenes that were previously considered homogeneous; this raises questions as to the applicability of existing models and whether newer approaches may be better able to exploit finer-resolution radar images. In this project, the candidate will examine the use of texture and spatial variability in radar imagery with a view to improving techniques for radar image processing and exploitation.

Projects Location
Project Title
Project Description
Tasks/Duties Required
Relevant Research Area (academic disciplines)
Other Desirable Skills (programming/technology)
General Information (person requirements/academic qualifications)

SVS NSID 08
EDINBURGH
Web 2.0 Interactive development for the ADSS GEOINT system.
The ADSS Detection Support System (ADSS) is a successful Australian Geospatial Intelligence (GEOINT) data processing software platform in national and international operational use. The system contains a sophisticated computational and high transaction data processing engine within a custom web application framework. This project is for a two student web engineering team to (under the guidance of a supervisor) work with project sponsors and software developers, architects and end-users to prototype some new system capabilities. The project will involve creating an app within the ADSS web stack to expose some powerful graphical controls which drive the ADSS compute engine, as well as a rich GUI to present GEOINT data. Presentation of this sort typically takes the form of multi-layer maps, image and video overlays and annotations.

Under the guidance of your project supervisor:
- use agile and iterative methods for product delivery
- interact with software engineers and the project sponsors to understand the problem domain and elicitation requirements
- design an app to leverage the ADSS web application framework and satisfy stakeholders
- implement your app
- integrate your app with our product timeline by creating appropriate tasks and participating in code review
- present your work to interested stakeholders in the DISTO-E ADSS and GEOINT community
- get to know our team, make some new friends and have some fun!

Any of the following:

Experience with and/or an interest in any of:
- PHP, JavaScript, Python, HTML5, Bash, C++, OpenStreetMap (OSM)
- The Web Map Service (WMS) protocol
- HTML5, Bash, C++, Linux as a development platform
- agile team software development methodologies

Team software project experience is desirable as well as an interest in open source software. High academic achievement is regarded favourably.

SVS NSID 09
EDINBURGH
Web 2.0 Interactive development for the ADSS GEOINT system.
The ADSS Detection Support System (ADSS) is a successful Australian Geospatial Intelligence (GEOINT) data processing software platform in national and international operational use. The system contains a sophisticated computational and high transaction data processing engine within a custom web application framework. This project is for a two student web engineering team to (under the guidance of a supervisor) work with project sponsors and software developers, architects and end-users to prototype some new system capabilities. The project will involve creating an app within the ADSS web stack to expose some powerful graphical controls which drive the ADSS compute engine, as well as a rich GUI to present GEOINT data. Presentation of this sort typically takes the form of multi-layer maps, image and video overlays and annotations.

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- get to know our team, make some new friends and have some fun!

Any of the following:

Experience with and/or an interest in any of:
- PHP, JavaScript, Python, HTML5, Bash, C++, OpenStreetMap (OSM)
- The Web Map Service (WMS) protocol
- HTML5, Bash, C++, Linux as a development platform
- agile team software development methodologies

Team software project experience is desirable as well as an interest in open source software. High academic achievement is regarded favourably.

SVS NSID 10
EDINBURGH
Antenna Control System
To specify, design, build and set to work an antenna controller that will track the trajectory of a known space vehicle with sufficient accuracy to maintain acceptable received signal levels. Required elements including software to select and control the desired track, software to control the antenna servo (may be separate from power amplifiers) exists and may be modified or adapted as necessary.

An existing antenna with servos and power amplifiers exists and may be modified or adapted as necessary.

SVS WCMC 01
EDINBURGH
Aerodynamic Data Generation Tool
The Missile Modelling and Simulation group has developed a number of software architectures, libraries and tools to assist in the modelling and simulation of weapons. One current gap in the group's tool set is a capability to automatically drive current-generation empirical aerodynamic data generators (e.g. Missile DATCOM) to create aero data files in formats and coordinate systems specific to our model missile architectures. This project's objective is to develop a tool that fits that capability gap. It will require a combination of software development skills, vector mathematics and ideally an understanding of basic aerodynamics. The project will conceptually draw on an understanding of basic aerodynamics. The project will conceptually draw on an understanding of basic aerodynamics.

- Effect detailed user requirements for the new tool, where aerodynamic analysts are the target user group
- Reflectively identify target model file formats and user-editable data fields.
- Establish high-level solution design in terms of system decomposition and key external and internal interfaces. Candidate solution concepts include command line tool, stand-alone GUI tool or integrated GUI tool.
- Select implementation language. Candidate languages include C++, C# with WPF and Matlab.
- Implement solution under the direction of the task supervisor and the software engineering advisor.
- Conduct user acceptance testing.
- Present on achievements and lessons learnt.

Computer Science, Software Engineering, Aerodynamics analysis techniques
C++, C# or Matlab programming, Vector mathematics, Object-oriented design principles, Software development experience (design, implement, test), Configuration management (Subversion or similar).

Ideally should have prior existing software development experience, either from university level studies or another source.

SVS WCMC 02
EDINBURGH
Missile Development for SWAT
The Weapons Capability Analysis (WCA) Group within Weapons and Command, Control, Communications, Computers, and Intelligence (WCMC) considers the development of a number of software libraries, used by modellers and analysts to support analysis tasks on a

The project duties will include:
- Develop and implement a house developed SAA framework and SWAT application

Computer Science, Software Engineering, Computer Systems
C++ programming, Object-oriented design principles, Software development

This project would suit a student interested in computers and programming and software
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<td>SVS WCMD 03</td>
<td>EDINBURGH</td>
<td>Software development of Missile Simulation Environments</td>
<td>The Missile Modelling, Simulation and Analysis group has developed a number of software architectures, libraries and tools to assist in the modelling and simulation of weapons. Some of our key products include: MECA (Missile Engagement &amp; Coverage Analysis) - This application allows analysts to create custom scenarios with multiple entities and weapons, and then analyse the performance of the weapons. Mars (Modelling Architecture Standard) - Used by modellers to define and build weapon models and components in C++. SAA - Supports rapid application development, through maximizing the reuse of components whilst minimizing the integration effort of those components. - Progy - Supports development in multiple build environments through providing a generic framework for defining software project structure, from which specific development environment solutions may be generated. The project will involve performing software development tasks on these products to enhance the modelling and simulation capability of WCMD. The primary goal is to develop high-priority features for use by modellers and warfighters in support of Defence operations and tactics development. The student will complete the scholarship program with improved C++ programming skills and a greater understanding of and ability to apply Software Development best practices. The student will also have the opportunity to be involved in group discussions, software meetings and other activities within the Missile Modelling Simulation and Analysis Group.</td>
<td>- Develop an understanding of the MARS architecture. - Writing software documentation. - In discussion with stakeholders, develop a prioritised list of features and software changes. - Use software design skills to develop solutions and/or designs for the new features or software fixes. - Use software programming skills to implement the solutions, including developing associated unit tests and documentation. - Apply good software engineering principles such as version control and change control to the tasks. - Work in a team environment of WCMD staff and software contractors.</td>
<td>Engineering</td>
<td>Computer Science, Software Engineering, Computer Systems Engineering.</td>
<td>C++ programming, Object-oriented design principles, Software development experience (design, implement, test), Configuration management (Subversion or similar).</td>
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<td>SVS WCMD 04</td>
<td>EDINBURGH</td>
<td>Statistical analysis of weapon simulations</td>
<td>Weapons Capability and Analysis group uses modelling and simulation to analyse the capabilities of ADF weapons systems. Software tools are designed and built in-house using either C++, Simulink or MATLAB. The project will allow the student to develop and test novel methodologies for designing experiments and analysing data from weapon engagement simulations. The outcome of the project will be to optimise the information gained from weapon simulations in maritime, air or land environments. Research into design of experiments, statistics. Implementation of methods in C++ or MATLAB. Documentation of findings.</td>
<td>- Writing software documentation. - In discussion with stakeholders, develop a prioritised list of features and software changes. - Use software design skills to develop solutions and/or designs for the new features or software fixes. - Use software programming skills to implement the solutions, including developing associated unit tests and documentation. - Apply good software engineering principles such as version control and change control to the tasks. - Work in a team environment of WCMD staff and software contractors.</td>
<td>Statistics/Applied Maths/Engineering Design of Experiments Monte Carlo Methods Regression analysis Bayesian inference</td>
<td>MATLAB, C++, Excel skills are desirable</td>
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<tr>
<td>SVS WCMD 05</td>
<td>EDINBURGH</td>
<td>Use of Colour to Influence the Detection of Military Symbols</td>
<td>The colour and shape of symbols used in military tactical displays can have a significant influence the ability of operators to detect the presence of new entities and changes to existing entities. The project aims to develop and test a set of colours that produce equivalent detection performance for all symbols within a range of symbol sets. Design, conduct and analyse an experimental study to evaluate the extent to which various colours influence symbol detection performance across a range of symbol sets.</td>
<td>- Writing software documentation. - In discussion with stakeholders, develop a prioritised list of features and software changes. - Use software design skills to develop solutions and/or designs for the new features or software fixes. - Use software programming skills to implement the solutions, including developing associated unit tests and documentation. - Apply good software engineering principles such as version control and change control to the tasks. - Work in a team environment of WCMD staff and software contractors.</td>
<td>Experimental psychology, perception and decision making</td>
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