



Australian Government  
Department of Defence  
Defence Science and  
Technology Organisation

**DSTO**  
DEFENCE SCIENCE AND TECHNOLOGY ORGANISATION

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# DSTO PARTNERSHIPS

for Australia's wealth and security



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DSTO: Leading Science in Australia's Defence



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Receiving soundwaves through fibre optic cable (Hydrophone)



Joint Strike Fighter

## INTRODUCTION

### DSTO - CONTRIBUTING TO DEFENCE AND NATIONAL WEALTH

The Defence Science and Technology Organisation (DSTO) provides advice at all stages in the development of defence capability to ensure that Australia acquires the most appropriate equipment and that it can be supported throughout its life. DSTO also develops advanced technology solutions that meet Australia's special security needs or where the technology is not otherwise available. DSTO's expertise also supports national security through its involvement in Australian government initiatives on counter-terrorism and defence against chemical and biological threats. To achieve this, DSTO works closely with Australian industry and the science and technology community.

DSTO's research and development often leads to the creation of intellectual property that may be transferred to Australian industry for exploitation. Such intellectual property may also have wider civilian applications. By transferring its technology to Australian industry, particularly small to medium size enterprises, DSTO plays a significant role in creating jobs, generating national wealth and reducing Australia's reliance on overseas products and expertise. It also helps to build a stronger Australian defence industry.

The success stories outlined in this booklet illustrate the breadth of DSTO's industry relationships and how DSTO's collaboration with Australia's science and technology community strengthens the defence industry base.

I hope that the examples in this booklet will encourage more organisations to look at ways in which they can work with DSTO to strengthen their commercial prospects and to contribute to Australia's wealth and security.



Dr Roger Lough  
Chief Defence Scientist.  
June 2005



Armed Reconnaissance Helicopter



Defence Industry Study Course

### Enhancing the Relationship

DSTO's Science Industry & External Relations Branch is responsible for interaction with industry and the science and technology community at a national and international level. It contributes to Defence industry policy initiatives and the creation of national wealth by transferring intellectual property to industry and commercialising DSTO technology.

DSTO engages with Australia's industry and science and technology communities through a range of innovative and mutually beneficial arrangements.

They include:

- Centres of Expertise;
- Collaborative Agreements;
- Cooperative Research Centres;
- Industry Alliances;
- Memoranda of Understanding;
- Non-Disclosure Agreements;
- Research Agreements;
- Consultancy Services;
- R&D Contracts; and
- Technical Support Services.

DSTO is currently involved in:

- 17 industry alliances
- 78 collaborative agreements with industry, including 11 collaborative research agreements with universities
- 26 memoranda of understanding with industry, including 6 with universities.
- 78 agreements licensing its technology to industry.
- 10 Cooperative Research Centres.
- 7 Centres of Expertise in Universities.
- Numerous technical support services contracts, outsourcing between 9% and 10% of its annual budget.

The Science Industry and External Relations Branch includes the Business and Commercialisation Office (BCO).

### Business and Commercialisation Office (BCO)

The role of the BCO is to streamline and facilitate DSTO's interaction with industry and the science and technology community. It is also responsible for the commercialisation of DSTO's intellectual property and management of the Defence patent portfolio. It has offices within the two major DSTO sites in Melbourne and Adelaide. The BCO also manages DSTO's relationship with the Technology Transfer Advisory Group (TTAG) and the Defence Sciences Access Network (DSAN).

#### Technology Transfer Advisory Group (TTAG)

The Technology Transfer and Advisory Group (TTAG) has been established to maximise the commercialisation opportunities for DSTO's technologies. The TTAG comprises a panel of three industry representatives who provide independent technology and market analysis, and guidance to the Business and Commercialisation Office on potential DSTO commercialisation opportunities.

#### Defence Sciences Access Network (DSAN)

DSAN is an information exchange mechanism designed to encourage more collaboration between industry, particularly SMEs, and DSTO. It provides information on DSTO research, helps connect industry to DSTO and assists DSTO in seeking out industry R&D that may have Defence applications.

### Capability and Technology Demonstrator (CTD) Program

The CTD Program is an important component of Defence Industry Policy which seeks to generate and sustain Australian defence industry capability. The Program allows industry to demonstrate how advanced technologies might enhance ADF capability. New arrangements, including an annual funding increase and seed money allowing industry to further develop initial proposals, make it easier for companies and individuals to put their innovative solutions or ideas to Defence for assessment. DSTO coordinates the CTD Program on behalf of Defence.



Nulka Active Missile Decoy



Hawk Lead-in Fighter

## SECTION 1:

### DSTO TECHNOLOGIES TRANSFERRED TO AUSTRALIAN INDUSTRY

**DSTO transfers technology to industry through license agreements and by interacting with suppliers to support Australian Defence contracts. It can also assist Australian industry to market export products based on DSTO technology.**

**This technology transfer and assistance benefits the ADO by helping to create a sustainable, competitive Australian defence industry. Australian industry benefits from the introduction to new technology and defence markets, the development of spin-off products with civilian applications, and income from domestic sales and exports. DSTO benefits through experience gained during the widespread application of its technology, enabling it to enhance its research base.**

#### The Australian Minesweeping System (AMAS)

The Australian Minesweeping System exemplifies best practice in DSTO-industry interaction because it contributes to Australia's defence capability, engages industry as a partner and mutually shares risk, is genuinely collaborative, and generates commercial income and exports.

AMAS incorporates the DSTO-developed compact, self-powered sweep called Dyad that emulates the magnetic signatures of target vessels, causing sea mines to detonate safely. Further developed by ADI Limited, AMAS has earned over \$50 million in exports. The system is in service with the navies of Australia, Denmark, Indonesia, Japan, Poland, Thailand and the USA.

The British Royal Navy also acquired the Mini Dyad, which is at the heart of AMAS, and incorporated it into their Shallow Water Influence Minesweeping System (SWIMS) to undergo testing.

SWIMS was used in the 2003 war with Iraq to deal with the sophisticated Manta mines in the deep water port of Umm Qasr.

*"Both parties bring complementary domain skills to the table, both parties are prepared to continue to invest in product improvement and upgrade, and we have generated the cash flow necessary to maintain our momentum." Mr Jack Byrnes, General Manager, ADI Mine Countermeasures.*

#### Nulka Active Missile Decoy

This active missile decoy was developed in partnership with ADI Limited, BAE Systems Australia and the US Navy from an original DSTO concept. Nulka has revolutionised ship protection. When launched from the ship, Nulka can fly a pre-programmed flight path to entice sea-skimming missiles away from the target vessel.

Nulka is now deployed with the Royal Australian Navy, and the US and Canadian navies. As the prime contractor, BAE Systems Australia continues to explore the potential for marketing Nulka internationally.

#### Composite Bonded Repair Technology

DSTO invented and now leads the world in the use of adhesively bonded fibre composites to repair aircraft structures and arrest stress corrosion cracking. This technology has many advantages over traditional mechanical repair methods, such as bolting or riveting. Composites are lighter in weight, offer more uniform load transfer, seal interfaces to reduce corrosion and leakage, create minimal damage to the parent structure and facilitate non-destructive inspection.

Australian-owned private company, Helitech Industries Pty Ltd, was licensed to market and develop DSTO composite bonded repair technology. Helitech has been highly successful in marketing the technology world wide.

It is now used in commercial airliners as well as military aircraft belonging to the RAAF, US Air Force and the Belgian Air Force. The ongoing development and use of composite bonded repair technology has resulted in significant maintenance savings and life extension to the RAAF fleet.

#### Starlight

This unique DSTO world-first system allows users of secure computer systems to access insecure networks (e.g. internet) without compromising their own security. This technology has applications in both government and commercial environments. Tenix Datagate now markets Starlight under the brand name Veto.

It is now in use in the Departments of Defence and Foreign Affairs and Trade and is also in operation in the USA, UK, Canada and New Zealand. Starlight won a prestigious IT security competition as part of the combined World Congress on IT in 2002.

*"The Interactive Link and Veto product ranges are an excellent example of how innovative research and development can be successfully transitioned into products and services that have potential to meet the needs of both the government and commercial sectors." Mr Paul Salteri, Tenix Group Managing Director.*



Barra sonobuoy



Battlemodel

## SECTION 1:

### Advanced Sonar Systems

DSTO has collaborated with Australian industry for over three decades to develop an Australian capability in advanced sonar systems that meets ADF requirements in a broad range of operational environments. This is exemplified by the Barra sonobuoy and Kariwara solid filled towed sonar array.

#### Barra sonobuoy

The Barra sonobuoy is deployed at sea to collect sonar data for the detection of submarines. It transmits this data to a maritime patrol aircraft, where it is processed to locate and identify submarines in the area of surveillance.

Australia and the UK have used the Barra sonobuoy since it was first sold by Australian industry in the 1980s. The associated Barra airborne acoustic processor was developed and manufactured in the UK.

#### New sonobuoy developments

Working with industry, DSTO has undertaken modelling, sea trials and the development of a novel air-deployable sonar transmitter buoy, and processor and display techniques to demonstrate the significant operational gains that can be achieved with an airborne active acoustic system. The system has been tested on board a P-3C Orion aircraft and an enhanced version is under development.

In 1997, DSTO and the ADF signed an alliance agreement with Thales Underwater Systems Pty Limited (TUS Pty) to exchange information on sonar systems technology and trends. This alliance has greatly benefited the Collins class submarine, allowing many new sonar functions supplied by other companies, including SMEs, to be implemented onboard the Collins.

Similar efforts under the alliance have improved the functionality of the TUS Spherion B anti-submarine sonar aboard the ADF's ANZAC frigates.

Today, the ADF, DSTO and TUS are cooperating to develop advanced sonars such as PETREL (the three-dimensional mine and obstacle avoidance sonar for frigates) and the TESS 2 Sonar Prediction & Performance Modelling.

### Towed arrays

The Kariwara towed array is a sonar device that can be used passively or as a receiver for low-frequency signals in an active system.

TUS has further developed DSTO's Kariwara technology under licence to produce new-generation solid towed arrays (SENTRY) for the world commercial seismic survey market. SENTRY generates export sales worth approximately \$40 million per year. TUS has also developed and secured export orders for the second-generation solid towed array, GUARDIAN. TUS has exported over 500 kilometres of towed arrays since 1996, making it the world's largest manufacturer of towed arrays.

"TUS wishes to acknowledge the DSTO and the Australian Department of Defence for industry policy initiatives that enabled Australian industry to develop civil applications and products based on Defence technology developed in Australia. TUS has now established a significant export business in marine oil and gas seismic survey systems, producing over 700 km of seismic towed arrays since 1996 generating sales of over \$320M, and employing over 200 engineers and production personnel." Thales Underwater Systems Pty Limited.

### Battlemodel

This is a powerful simulation tool to evaluate and develop defence systems, missions, tactics and strategies. It uses computer-based models to explore a range of scenarios in a simulated environment and examine various decision outcomes.

DSTO researchers initiated the BattleModel architecture, with KESEM International playing a major part in its development and refinement. BattleModel places Australia as one of the world leaders in the innovative use of simulation technology.

*"Our market research indicates that BattleModel can be adopted for use in the commercial world, addressing the need for improved corporate due diligence of large acquisitions, tender evaluations, and the review and development of operational procedures." David Chidgey, Managing Director of KESEM International.*



High Frequency Surface Wave Radar



Seamark

### Laser Airborne Depth Sounder

In the 1980s DSTO developed the Laser Airborne Depth Sounder (LADS) to measure the depth of coastal waters with greater efficiency and speed compared with conventional shipborne sonar methods.

LADS is a self-contained, transportable bathymetric survey system that uses a pulsed laser mounted in a fixed-wing aircraft. In the last ten years the LADS technology has generated over \$100 million for Australian companies and continues to find new international markets for different applications, especially in oil exploration and coastal survey work.

Tenix LADS Inc, the US subsidiary of the Australian-owned Tenix LADS Corporation, has recently signed a US\$12 million contract with the US National Oceanographic & Atmospheric Administration to survey US territorial waters around Alaska.

*"LADS can survey shallow waters up to 20 times faster than survey ships and at 30% of the cost, and that's creating business worldwide." Tom Spurling, General Manager, Tenix LADS Corporation.*

### UV Stimulator Missile Approach Warner Technology

The DSTO developed Long Range Ultraviolet (UV) Stimulator is used by the ADF for electronic warfare testing and training.

DSTO licensed the new technology to UK electronic warfare specialist, ESL Defence Ltd and Australian company, Vision Abell (now part of Tenix Defence Systems Pty Ltd). This followed a collaborative agreement between the two companies to share marketing and production responsibilities.

Tenix Defence Systems and ESL Defence Ltd have since extended the DSTO technology and developed the long-range Mallina UV Stimulator, which can operate at ranges of up to six kilometres. Long Range UV Stimulator units have been sold to Germany, the Netherlands, South Africa, the UK and USA.

### High Frequency Surface Wave Radar

This technology was developed by DSTO in the late 1990s and further developed by Daronmont Technologies as Surface-wave Extended Coastal Area Radar (SECAR). It has been formally accepted by the Australian Government for trial. The High Frequency Surface Wave Radar (HFSWR) enables over-the-horizon detection of both ships and aircraft allowing Defence and Customs to better monitor Australia's northern coastline.

### Tracked Vehicle Elastomer and Associated Technologies

DSTO and the Melbourne-based Mackay Consolidated Industries Pty Ltd have a license agreement under which the develops, manufactures and markets DSTO's tracked vehicle elastomer and associated technologies. This includes a new rubber formulation and process to manufacture blended rubber stock for military tracked vehicles and other applications. It also includes a road-wheel-tread rubber formulation.

Mackay's track links, which include rubber components produced using DSTO's formulation, are now in service with the ADF. These track links have proven to last approximately twice as long as earlier imported track links used by the ADF.

*"Mackay's significant expansion in the defence industry over the last 10 years has been the direct result of its close involvement with DSTO in material development programs." Mr R Paton, Chairman Mackay Consolidated Industries.*

### Seamark

DSTO developed this marine dye marker as a safe, effective and longer lasting alternative to flares and smoke signals for search and rescue at sea. The DSTO developed marine dye will last for more than one hour in moderate seas, far longer than conventional marine dyes.

The technology was licensed to Melbourne-based company, Pains Wessex Australia Pty Ltd. The product is now sold in several countries including France, Hong Kong, Ireland, the Netherlands, New Zealand, Singapore, South Africa and the UK.

*"At an early stage, DSTO scientists were readily available to assist in product improvements and advice. This has enabled Pains Wessex to devote its manufacturing and marketing skills in the promotion of the product." Mr Charles Tegner, Pains Wessex Australia's Managing Director.*

### Jindalee Operational Radar Network

The successful handover in April 2003 of the Jindalee Operational Radar Network to the Australian Defence Force capped 40 years of DSTO's pioneering research on the ionosphere, and hardware and software developments for signal processing and frequency management.

Australian industry has been involved in the development, operation and maintenance of the Jindalee system from the earliest days of the experimental test-bed sites near Alice Springs.

JORN is a significant contribution to broad area surveillance of Australia's strategic northern approaches. It also serves civilian purposes such as weather forecasting and the prevention of illegal entry, smuggling and unlicensed fishing.



*Nuclear, Biological and Chemical Protective Suit*



*Tracked Vehicle Elastomer and Associated Technologies*



*Coiled arrays*



*Laser Airborne Depth Sounder*



One Piece Chemical and Biological Suit



Intelligent Agents

## SECTION 2:

### AUSTRALIAN TECHNOLOGIES DEVELOPED COLLABORATIVELY WITH DSTO

**DSTO maintains strong relationships with other Australian research and development organisations, working with them whenever appropriate skills exist outside DSTO.**

**This interaction not only ensures optimal use of Australia's public research and development resources but also helps to broaden Australia's science and technology capabilities for both defence and civilian applications.**

#### Biosensors to Detect Potential Biological Warfare Agents

The threat of terrorism and the use of biological weapons has increased the need for rapid detection of potential biological agents.

In response, DSTO and the Australian Membrane and Biotechnology Research Institute (AMBRI Ltd) undertook collaborative research to develop an autonomous device to detect aerosols containing biological warfare agents, based on AMBRI™ technology.

Success in this capability and technology demonstrator program is expected to lead to a product that would be suitable for service with the ADF and other defence forces.

#### Chemical Biological Combat Suit

DSTO and Australian industry worked together to develop a Chemical Biological (CB) suit that was more suited to hot and humid environments and also met the ADF requirements for durability and functionality.

DSTO worked with an Australian company, Melba Industries, to develop a breathable tri-layered fabric that had the chemical adsorbent as the middle layer. As a result the new ensemble is comfortable and manufactured as a single garment instead of an overgarment.

Melba Industries has continued to work with DSTO and is the sole source provider of the CB Combat Suit to the ADF. Collaborations between DSTO and Melba Industries are continuing and a second-generation suit with enhanced properties is a likely outcome.

#### Advanced Landmine Detection Systems

In collaboration with industry DSTO is developing this leading edge detection system to clear anti-vehicle landmines from unsealed roads and landing areas.

The Rapid Route & Area Mine Neutralisation System (RRAMNS) received funding under the Defence Capability and Technology Demonstrator Program and involves DSTO, Minelab Electronics, Tenix Defence Systems Pty Ltd and ADI Limited.

It incorporates an industry-built world-first patented metal detector array and a DSTO-developed imaging system. The detection system will be quicker, safer and more affordable for clearing anti-vehicle landmines.

#### Intelligent Agents

DSTO is a world leader in the use of artificial intelligence in the form of intelligent agents to represent human decision-making in combat simulation software. This technology enables DSTO to assess the effectiveness of ADF capabilities under simulated combat conditions. These assessments are then used to make informed decisions about current ADF capabilities and priorities for future development.

DSTO and Agent Oriented Software Pty. Ltd. (AOS) have collaborated on the continued enhancement of graphical tools to make the development of intelligent behaviours in simulation easier. AOS has incorporated the graphical tools into its core product, 'JACK Intelligent Agents™', to form an enhanced graphical development environment suitable for military analysts. JACK is an environment for building, running and integrating realistic, multi-agent systems using a component-based approach. JACK provides the ability to model reasoning behaviour according to the well-established Belief Desire Intention (BDI) model of artificial intelligence. AOS has commercialised the capability to model team-based military operations in their 'JACK Teams' software. Both the Graphical User Interface and teaming technologies were developed collaboratively with DSTO.

*"AOS' close collaboration with DSTO has been instrumental in the development of JACK and in our success as a company. An opinion from DSTO carries a lot of weight, particularly in international defence markets. This is illustrated by the adoption of JACK by QinetiQ Limited in the UK, based on DSTO's experience with the product." Dr Andrew Lucas, Managing Director Agent Oriented Software.*



Cormorant Mine Lift Bag



Comparative Vacuum Monitoring Of Aircraft Structures

## SECTION 3:

### AUSTRALIAN TECHNOLOGIES DEVELOPED WITH DSTO ASSISTANCE

**Australian industry can access DSTO's unique research expertise and facilities, particularly where there are potential benefits for Defence. This collaborative arrangement benefits everyone. Defence benefits from the development of a sustainable and competitive Australian defence industry. Industry benefits from exposure to DSTO's research base, introduction to defence markets, and income from domestic sales and exports. DSTO benefits through experience gained while providing support to industry and allowing it to enhance its research base.**

#### Cormorant Mine Lift Bag

DSTO developed the Cormorant Lift Bag as a safe and reliable method of removing underwater explosive mines. It is capable of lifting heavier underwater objects from greater depths than conventional recovery systems. The technology was developed by DSTO and the Royal Australian Navy in partnership with two small Tasmanian companies Liferaft Systems Australia and Fiomarine Industries Pty Ltd. The Cormorant Lift Bag is deployed on Australia's six Huon class Coastal Minehunter ships.

*"Our experience with the Australian Department of Defence was limited, therefore we required a certain level of assistance and guidance throughout (and on most aspects of) the project. The involvement of DSTO from the outset was extremely valuable and commenced with establishing the original scope of supply, to negotiating technical aspects with the Department of Defence and finally testing the finished product to the satisfaction of all concerned, including our own personnel and sub-contractors." Mike Grainger, Managing Director Liferaft Systems Australia.*

#### Comparative Vacuum Monitoring Of Aircraft Structures

Western Australian inventor, Ken Davey, approached DSTO in 1996 proposing a system for detecting cracking in aircraft using a simple stick-on sensor and the comparative vacuum monitoring (CVM) principle. DSTO trialled the system by incorporating it into existing test programs, enabling its refinement.

Structural Monitoring Systems Ltd (SMS) has further developed the patented CVM method into a laboratory system for automatic, real-time control for detecting structural cracks. The SMS sensor is presently being used on DSTO's F-111 fatigue test. DSTO and SMS are also working together to assess the long-term environmental durability of the system, an essential part of its certification for aircraft application.

The two organisations are now collaborating to determine whether the CVM method can effectively detect and monitor failures in composite material structures.

SMS now has systems operating in laboratories in Australia, Europe and the USA.

#### Fiobuoy

DSTO provided technical support to Tasmanian inventor Mr John Fiotakis, and his company Fiomarine Industries Pty Ltd, during the development of Fiobuoy, the world's first self-releasing submersible marine buoy that can be used to retrieve practice mines during military exercises without the need for navy clearance divers.

Mr Fiotakis was originally developing the device for the Tasmanian fishing industry but as a result of cooperation with DSTO, Fiomarine now has a niche market in Defence for its new product, and the ADF has a cost-effective means of retrieving practice mines during exercises.

"Our involvement with DSTO over the last few years has helped in sourcing new applications for the Fiobuoy, which has increased our product range and marketing opportunities," Mr John Fiotakis.

#### Manufacture Of C-130J Flaps

DSTO assisted Hawker de Havilland (now owned by Boeing Australia Limited) by providing structural testing expertise and facilities during the design and manufacture of flaps made from composite material for the C-130J Hercules aircraft. Hawker de Havilland is the sole worldwide supplier of these components, which can be retrofitted to earlier C-130 models.

DSTO's support to Hawker de Havilland was critical to the success of this venture. The mutual participation of DSTO and Hawker de Havilland in the Cooperative Research Centre for Advanced Composites Structures provided the long-term research and development base that led to this success.

Both DSTO and Hawker de Havilland have benefited through this cooperation. Hawker de Havilland has enhanced its ability to support ADF aircraft through airframe maintenance and modification. It has also expanded the range of capabilities that it can market to the international aerospace industry. At the same time, DSTO has enhanced its skills in evaluating airframe structural integrity and its knowledge of modern aircraft materials and engineering data applicable to ADF aircraft.



*C-130J Hercules*



*Fiobuoy*

## SECTION 4:

### DSTO TECHNOLOGIES LICENSED TO INTERNATIONAL ORGANISATIONS

**DSTO supports Australian-owned companies or companies committed to Australia when licensing its technologies. However, there may be circumstances where no Australian company has the technical or marketing expertise to further develop the technology. There may also be significant benefits for DSTO and Defence in licensing its technologies to an overseas-based organisation. These include access to an enhanced research base and the opening up of new market opportunities.**

#### Helicopter Gearbox Diagnosis Technology

Technology developed by DSTO to monitor the health of helicopter gearboxes won international recognition in 1999 when the licence for the technology was bought by US company Chadwick-Helmuth, the world's largest producer of aviation vibration analysis equipment. The licence allows Chadwick-Helmuth to commercialise the DSTO technology and market the product worldwide.

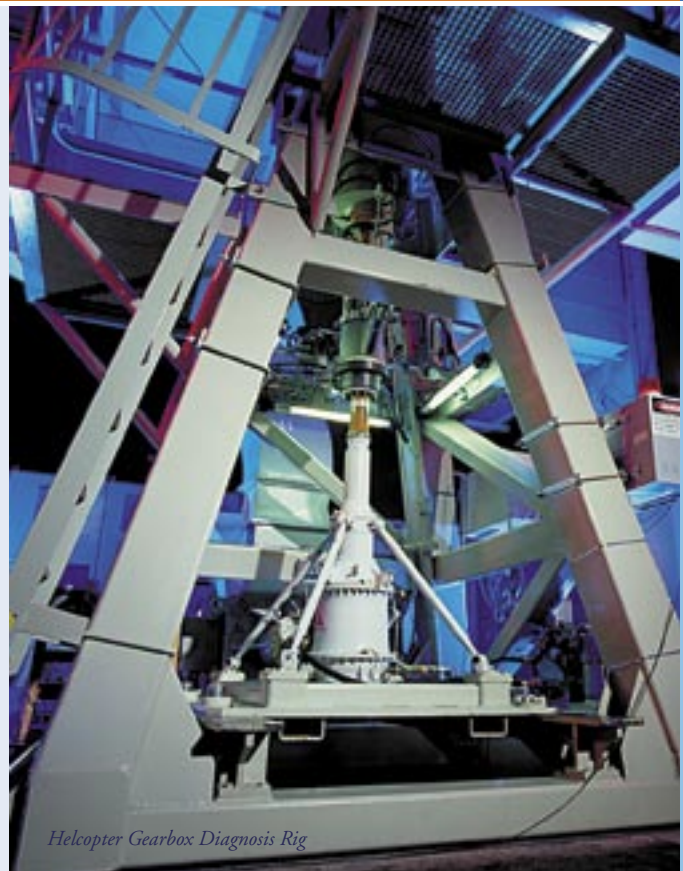
The licensing arrangement with Chadwick-Helmuth (which supplies aviation vibration analysis systems for 85 per cent of the world's helicopters, including ADF aircraft) enables DSTO to influence the future direction of health monitoring systems and to have a greater input in maintenance and safety policies. This influence will strengthen as the product becomes standard equipment in helicopters.

#### MEXANS

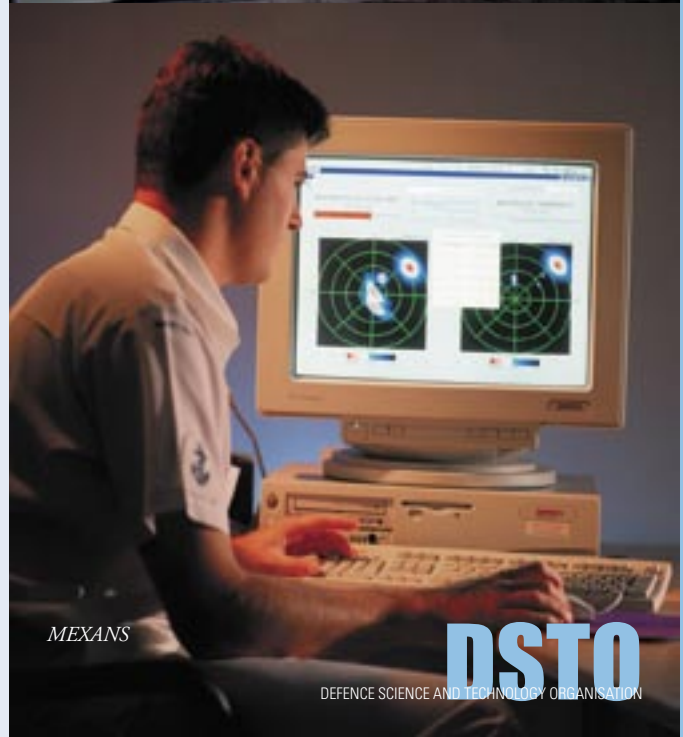
MEXANS (Maritime Exercise Analysis System) is a DSTO-developed software tool that supports the analysis of recorded data from maritime platforms and systems.

The ADF uses MEXANS to quickly analyse exercises – a task that once took many months.

The Canadian Navy has purchased a three-year, research and development licence for MEXANS, and its experience will further assist DSTO to develop the software. MEXANS has also attracted interest from the Royal Netherlands Navy, US Navy, NATO and industry.



*Helicopter Gearbox Diagnosis Rig*



*MEXANS*





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