

DSTO Timeline 1946 - 2007

1946 - British government formally requests Australia to receive its mission in regard to guided projectiles.

1946 - British Mission arrives in Australia headed by Lieutenant General J.F. Evetts, CB, CBE, MC (Senior Military Adviser to MoS). (9-10 April)

1946 - Final Report (Evetts Report) of British Mission received in London. (by 21 May)

1946 - Cabinet of Chifley Labor government approve British proposal for a combined guided projectiles project and a supporting developmental establishment.

1947 - Long Range Weapons Organisation (LRWO) comes into formal existence. (1 April)

1947 - Arthur Wills of the Aeronautical Research Laboratory, initiates a research program to develop a database on aircraft fatigue.

1947 - First trials at Woomera: parachute testing by Royal Aircraft Establishment.

1948 - Paper written by Arthur Wills — *The Life of Aircraft Structures* — published by The Institution of Engineers Australia.

1948 - Design and development of a sub-sonic unmanned jet-propelled target plane prototype begins following a series of meetings held in London between representatives of the British and Australian governments. Two versions designed and built by the Government Aircraft Factories and the Aeronautical Research Laboratories: a manned version 'Pika' (two only built) and an unmanned version 'Jindivik'.

1948 - Salisbury area formally passes into the hands of the LRWO. (29 March)

1948 - Salisbury 'welded into a single unit, the Long Range Weapons Establishment'. (September) LRWE formally comes into operation. (4 October)

1949 - Arthur Wills presents his seminal paper, *The Life of Aircraft Structures*, at the Second International Aeronautical Conference, New York. The paper explained, for the first time, the technique of determining aircraft fatigue lives.

1950s - Research begins into the ionosphere at Weapons Research Establishment, Salisbury.

1950s - Research on uncooled infrared sensors begins at Weapons Research Establishment, Salisbury, with work on devices called resistance bolometers.

1950–1962 - Alf Payne and W.W. Johnston, Aeronautical Research Laboratory, lead a pioneering research program into the fatigue behaviour of aircraft structures. Extending over a period of 12 years, 222 Mustang aircraft wings were tested. The research was the most extensive series of fatigue tests of a full-scale structure ever undertaken and the results were used as an authoritative reference by the aeronautical industry.

1952 - The first successful Jindivik test undertaken on 28 August 1952 from Evetts Field near Woomera, SA.

1952 - Development of Malkara, a heavy anti-tank wire-guided weapon system, begins at Government Aircraft Factory in collaboration with Aeronautical Research Laboratories, Fishermans Bend, and Weapons Research Establishment, Salisbury.

1952 - 'Wet' electrophotographic process that becomes the basis of the modern photocopying industry invented and developed by K.A. (Ken) Metcalfe and R.J. (Bob) Wright at Defence Standards Laboratories,

SA Branch–Woodville North. New technology patented in 13 countries by Commonwealth government, with firms in the United States, England, Japan and Europe licensed to use the patent. Over 90 patents taken out in Australia and overseas with royalties reaching one million dollars a year paid to the Commonwealth at the peak.

1953 - Dr David Warren, Aeronautical Research Laboratories, Fishermans Bend, invents the first black box flight recorder. Dr Warren and his team— Kenneth Fraser, Lane Sear and Dr Walter Boswell—spend the next several years developing the technology.

1954–1975 - The first firing trial using the Jindivik Mk1 as a target undertaken (1 October 1954) at Range E, Woomera, SA. Jindivik continues in service at Woomera until 27 June 1975.

Mid-1950s - Aeronautical Research Laboratories (Ron Cumming and Russ Baxter) and Department of Civil Aviation, Melbourne, begin work on T-VASIS (Tee Visual Approach Slope Indicator System) landing system. System adopted by Department of Civil Aviation after extensive evaluation both in Australia and overseas. First unit commissioned in Hobart in 1964 and subsequent units installed at major Australian airports during 1966-1967.

1957–1958 International Geophysical Year

1957–1977 - Jindiviks sold overseas: Sweden, United Kingdom, United States. To 1977, Jindivik made \$34 million in overseas sales.

1957 - Demonstration model of black box flight recorder produced by Dr David Warren and his team—not approved by Australian aviation authorities at the time.

1957 - Minitrack system—first American space tracking station—established in Australia at Range G, Woomera, during the 1957 International Geophysical Year.

1957 - Tripartite Technical Cooperation Program (TTCP) originates following agreement between President of the United States and Prime Minister of Great Britain to pursue defence initiatives in a collaborative fashion. (25 October) Canada joins soon afterwards.

1957 - Prototype of WRETAR (WRE Target Aircraft Recorder) designed and developed target camera manufactured by Fairey Aviation – 192 cameras made for initial production run.

1958 - Dr Warren's demonstration model of black box flight recorder received enthusiastically in Britain where the device taken for further development. Subsequently, English Ministry of Aviation announces that the recorder should be carried on all planes, at least for recording instrument readings.

1959 - Government approval given for development of Ikara, DSTO-designed ship-borne long-range anti-submarine guided weapon. (November)

1959 – Fish-eye lens camera designed and developed by Weapons Research Establishment for Jindivik trials.

1960s

Dr Noel Burley, Defence Standards Laboratories, Maribyrnong, invents the highly stable nickel-base alloy, thermocouple nicrosil/nisil, that is now universally known as the 'Type 'N' Thermocouple System'. Ultimately results in the technology being accepted worldwide and international standards revised.

1960 - Design and construction of Ikara begins at Aeronautical Research Laboratories and Weapons Research Establishment. Government Aircraft Factory, Royal Australian Navy and sub-contractors also involved. Testing undertaken at Fort Largs, SA.

1960 - Malkara Mk. 1 successfully tested at Woomera in September. Deliveries to Britain commence.

1960 - Following major aircraft crash, Australia becomes the first country in the world to make cockpit voice-recording in aircraft mandatory. Ultimately becomes mandatory in all major aircraft throughout the world.

1960 - Murchea tracking station established in Western Australia, especially for NASA's Project Mercury. Initially responsible to Weapons Research Establishment, station closes in 1963.

1960 - Island Lagoon tracking station established near Woomera, South Australia. Initially responsible to Weapons Research Establishment, station closes in early 1974.

1960 - British government cancels Blue Streak program in Australia. (13 April). ELDO (European Launcher Development Organisation) first mooted. ELDO included Britain, France, West Germany, Italy, Belgium, Holland and Australia and was focussed on developing, constructing and launching a test satellite into orbit from Woomera.

1961 - First trials on Ikara scale models carried out at Woomera, SA.

1962 - Alf Payne, Aeronautical Research Laboratory, invited by the United States Air Force to undertake research program on structural reliability in fatigue with Professor Freudenthal, a world authority in that field at Columbia University. Expertise gained applied to major fatigue investigation on the F-111 by USA and Australia.

1962 - First firing of three-stage Europa I rocket at Woomera under ELDO program. (24 May) In all, ten firing trials of Europa conducted at Woomera, last on 12 June 1970.

1963 - First full-size Ikara missiles launched at Woomera, SA. (April) First full-scale Ikara trials conducted from HMAS *Stuart* off Sydney. (August)

1963 - Laser Group established at Defence Standards Laboratories, Maribyrnong.

1963 - Carnarvon tracking station established in Western Australia replacing Murchea tracking station. Initially responsible to Weapons Research Establishment, station closes in 1974.

1964 - Production of Malkara ceases.

1964 - Weapons Systems Research Laboratory, Weapons Research Establishment, begins work on the Barra project initially known as Project Nangana. Task involved developing a new sonobuoy system able to be deployed from aircraft and helicopters to detect, locate and classify quiet submarines and surface ships.

1965 - Australia joins the Non-Atomic Military Research and Development sub-committee of the Tripartite Technical Cooperation Program (TTCP). New Zealand follows in 1969 at which time the organisation renamed The Technical Cooperation Program (TTCP).

1965 - Tidbinbilla Deep Space tracking station opens near Canberra, ACT. Initially responsible to Weapons Research Establishment, station remains in operation.

1965 - Orroral Valley space tracking station constructed in Australian Capital Territory. Initially responsible to Weapons Research Establishment, station closes in 1985.

1966 - First Ikara production version enters service on HMAS *Derwent*. (January)

1966 - First Sparta firing at Woomera, SA. (28 November)

1966 - Cooby Creek tracking station, near Toowomba, Queensland, opens in October. Initially responsible to Weapons Research Establishment, station closes in 1970.

1966 - Down Range Guidance and Telemetry Station built at Gove, Northern Territory, to provide the third stage of the ELDO Europa rocket with radio guidance during the last part of its flight.

1967 - Honeysuckle Creek tracking station, near Canberra, ACT, opens in March. Initially responsible to Weapons Research Establishment, station closes in December 1981.

1967 - Ninth and final Sparta firing at Woomera, SA, bringing an end to tripartite agreement between the United States, Britain and Australia.

1967

The Royal Australian Navy adopts Jindivik for target service at the Jervis Bay Missile Range.

1967 - First Australian TTCP panel meeting held in Melbourne (4-6 April) and Sub-Group meeting (10-14 April).

1967 - Barra sea trials—initially in St Vincent's Gulf, SA, (July and August) and later off Jervis Bay, NSW.

1967 - Design work on Australia's first satellite, WRESAT, begins—a joint venture between Weapons Research Establishment, Salisbury, and Physics Department, University of Adelaide. United States Department of Defense, NASA and Ministry of Technology, UK, provide assistance. (early 1967) WRESAT launched at Woomera, SA, 29 November.

1968 - WRESAT re-enters earth's atmosphere and destroyed by resultant high temperatures over Atlantic Ocean west of Ireland. (10 January)

1968 - First stage of transfer of Department's Central Office in Melbourne to Canberra completed.

1968 - First public firing of Ikara takes place from HMAS *Perth*, off Jervis Bay. (9 August) Delivery of modified Ikara systems to the Royal Australian Navy commences. (September) System withdrawn from Royal Australian Navy in 1991.

1968 - Towed array research and development begins in Australia—Royal Australian Navy Research Laboratory, Sydney, purchases an array named 'Towflex' from the Chesapeake Instrument Company.

1968–1974 - WREMAPS I designed by M.F. (Mike) Penny, Weapons Research Establishment, Salisbury. Leads team into developing the profiler to aid Department of National Development's Division of Mapping in its topographical survey of land surface profiles in Australia. In early 1970s, WREMAPS II developed out of WREMAPS I to produce an even more efficient system for use by Department of the Army, Royal Australian Survey Corps, to measure and record ground profiles from aircraft flying at altitudes up to 5000 metres above ground level. Fairey Australasia Pty Ltd ultimately appointed as licensed manufacturers.

1968–2020 - Scientific advice on F-111 to the Royal Australian Air Force commences at Fishermans Bend. Over the years, this has included structural integrity testing, bonded repair research, durability and damage tolerance analysis. With the planned withdrawal of the fleet in 2020, DSTO's expertise on life assessment and repair continues.

1969 - Experimental model of WREMAPS 1 constructed and installed into a Dakota aircraft. (Spring 1969)

1969 - Co-operative acoustic sounding program carried out between Weapons Research Establishment, Salisbury, and United States Environmental Science Services Administration under the Australia/U.S. Agreement for Scientific and Technical Co-operation.

1969–1971 - Captain Cook's cannon and some stone ballast raised from sea floor near Cairns, Queensland, taken to Maribyrnong, Victoria, and restored by Defence Standards Laboratories. Australian Prime Minister

John Gorton, hands the six restored cannon to representatives of the Commonwealth, Queensland, New South Wales, New Zealand, Britain and the United States. (1970) Same restorative process used by the Laboratories on the anchor discovered and lifted from the sea in 1971.

Early 1970s - Exploiting new computer technologies, scientists at Maribyrnong develop original 'rabbit ears' Australian Army Disruptive Pattern camouflage designs to match the Australian terrain. Following successful trials, Australian Army adopts design for use in Vietnam.

1970s – Work undertaken into variable-thrust, solid-propellant rocket-motor technology that could be used with guidance commands to enable a decoy to hover in controlled flight. Becomes known as Project Winnin and later forms basis of Nulka technology.

1970s - Materials Research Laboratories, Maribyrnong, design, build and operate the first electron-beam-controlled carbon dioxide laser, the first continuous wave laser operating at atmospheric pressure and the first laser using plasma injection.

1970s - Fully operational high-gain sonobuoys developed with assistance of Australian industry after 1971.

1970s – Five-year study between Weapons Research Establishment, Salisbury, and US Defense Advanced Research Projects Agency (DARPA) undertaken on long towed arrays. Project named 'Boolee'. Knowledge acquired results in decision to focus on research and development of thin-line towed arrays with Kariwari slim-line buoyant fibre towed array the outcome (1980s).

1970 - WREMAPS 1 installed in Grand Commander aircraft chartered by Department of National Development. (May 1970) Formal acceptance of the system occurs. (12 July) Department uses profiler for ten years.

1970 - Jindalee high frequency over-the horizon radar (OTHR) becomes a core DSTO research project developed to provide surveillance across Australia's northern sea and air approaches.

1971–1987 - Developing Jindalee from 'concept demonstrator' phase to proven operational capability continues (1971–1987) with funding for a scaled-up OTHR prototype approved (1971).

1971 - T-VASIS landing system adopted as the international standard.

1971 - Ken Metcalfe presented with an 'Excellence' Award by the Federation Internationale de l'Art Photographique, Brussels, for his work in electrophotography.

1971 - Advanced Engineering Laboratory, Salisbury, and Royal Australian Naval Research Laboratory, Sydney, undertake design study into British Type 177M sonars fitted to RAN 'River' class destroyers. Study outcomes influence Mulloka project that follows.

1972 - Proposal to develop new Australian sonar system—Mulloka—accepted. (early 1972)

1972 - Delivery of modified Ikara systems to the Royal Navy commences.

1972 – Initial investigations begin at Weapons Research Establishment into developing a technology that could be used by the Royal Australian Navy's Hydrographic Service to conduct hydrographic surveys of Australia's continental shelf. WRELADS (Weapons Research Establishment Laser Airborne Depth Sounder) project follows.

1972 – Dr Alan Baker and his team at Aeronautical Research Laboratories, Fishermans Bend, begin pioneering research and development into use of composite bonded repair technology to prolong fighter aircraft life. DSTO becomes recognised as world leader in the technology.

1973 - The Federation Aeronautique Internationale awards the Diplome d'Honneur to Aeronautical

Research Laboratories, Fishermans Bend, and Department of Civil Aviation for the invention and development of T-VASIS.

1973 - Research begins into the use of towed permanent magnets for mine sweeping purposes at Royal Australian Naval Research Laboratory, Sydney.

1974 - Mulloka prototype completed and fitted to HMAS *Yarra*.

Mid-1970s - First experimental over-the-horizon radar—Jindalee ‘A’—designed and built by DSTO, constructed at Alice Springs, central Australia.

1975 – First phase of WRELADS I program begins under leadership of Mr. Mike Penny.

1975 - Sea trials of Mulloka medium-range active sonar system commence in March.

1975 - Australia enters an agreement with United Kingdom relating to Barra sonobuoy: Australian scientists design and manufacture the passive sonobuoy while United Kingdom scientists design, develop and manufacture the airborne processor. (9 August)

1976 – Government White Paper on Australian defence tabled in federal parliament. (4 November)

1977 - Royal Navy takes delivery of the thousandth Ikara missile.

1977 - AWA Limited awarded initial contract to produce Barra sonobuoys.

1977 – Royal Australian Navy seeks assistance from Materials Research Laboratories, Maribyrnong, to find an alternative material for the Depleted Uranium (DU) penetrator for the Phalanx, a close-in weapon system that was to be fitted to guided missile frigates to counter a threat from sea-skimming missiles. Research results in first suitable non-depleted uranium penetrator material developed for this application: environmentally friendly and some penetration advantages over the original depleted uranium alloy.

1977 – Royal Australian Air Force places request with Defence Research Centre, Salisbury, to investigate glide bomb technology — leads to General Test Vehicle (GTV) program, later known as Kerkanya.

1978 - Delivery of version of Ikara called Branik commences to Brazilian Navy. System phased out by 2004.

c. 1978 – WRELADS II under development — a more advanced system. Trials carried out between 1979-1984. System becomes known as LADS (Laser Airborne Depth Sounder) some time after trials.

1979 - Royal Australian Navy accepts prototype Mulloka sonar system as an operational unit. (17 August)

1979 - Contract to design and manufacture production model of Mulloka sonar system let to EMI Electronics (Aust). (December)

1979 - DSTO scientist John Curtin conducts a study exposing limitations in the Orion Electronic Support Measures (ESM) system. Goes on to play a major role in the development and redesign of a new ESM system, the ARL 2001, with AWA Defence Industries (now part of British Aerospace Australia) that has significantly enhanced the Orion’s maritime surveillance capability.

Late 1970s - DSTO scientists begin advising Australian Government on chemical disarmament and protection.

Early 1980s - Jindalee ‘B’ over-the-horizon radar constructed.

Early 1980s – Research begins at Aeronautical Research Laboratories, Fishermans Bend, into helicopter gearbox failure.

1980s – Tony Collins, DSTO Sydney, invents PIPRS (Ping Intercept Passive Ranging System), a technology that determines the range of active acoustic transmissions of the kind used in anti-submarine warfare to locate possible targets.

1980s - DSTO develops Seamark — a marine dye marker — as a safe, effective and longer-lasting alternative to flares and smoke signals for search and rescue at sea.

1980 – Project Winnin development study approved — later becomes known as Nulka.

1980 - First production Barra presented to the United Kingdom's High Commissioner for Australia. (25 February) Marks the beginning of deliveries of Barra sonobuoy to United Kingdom and Australian Air Forces and Navies.

1980 – Research begins at Materials Research Laboratories, Maribyrnong, into tracked vehicle elastomer and associated technologies. Includes a new rubber formulation and process to manufacture blended rubber stock for military tracked vehicles and other applications, and a road-wheel-tread rubber formulation.

1980 – Anglo-Australian Joint Project officially concludes. (30 June)

1981 - Following successful trials, Nulka hovering rocket motor developed in consultation with Explosives Factory, Maribyrnong, and Ordnance Factory, Maribyrnong (subsequently part of Australia's ADI Limited).

1983 - Royal New Zealand Navy adopts Ikara system when it acquires HMNZS *Southland* (ex HMS *Dido*) from Royal Navy.

1983 - LADS laser developed by Dr James Richards and his team.

1983 – Australian patent granted for The Pilot's Force Measurement Glove invented by DSTO's Dr Garth Morgan, William Menadue and Robert Clarke at the request of RAAF's Aircraft Research and Development Unit. (8 June) A world first for Australian engineers and an invention that revolutionised in-flight testing procedures.

1983 – Royal Australian Navy calls for expressions of interest for the provision of mine sweeping capability. Leads to development of AMASS (Australian Minesweeping and Support System).

1983 - Advanced Engineering Laboratory, Salisbury, in conjunction with Adelaide's Queen Victoria Maternity Hospital staff, develop Aeromed Retrieval Unit for evacuation of premature and sick babies from outlying areas in the state. (July)

Mid-1980s - David Forrester, Aeronautical Research Laboratories, Fishermans Bend, continues work into helicopter gearbox failure and becomes the first person to apply time frequency analysis to machine fault diagnosis. Wins international recognition.

1985 - Feasibility study into Kariwari slim-line towed array concludes favourably. (early 1985) Project Definition Study begins in partnership with industry to develop and test the technology. (late 1985)

1985 - DSTOs Dr Jim Sparrow initiates research into Thermoelasticity by studying stresses generated by different loads at different temperatures.

1986 - Minister of Defence, Kim Beazley, announces approval given for the design and development of the OTHR network.

1986 - Australia and United States sign a Memorandum of Arrangement to undertake a full-scale

collaborative engineering development on Nulka active missile decoy. (August)

1986 - Royal Australian Navy nominates slim-line Kariwara towed array 'as Australian Government Furnished Equipment' for the *Collins*-class submarines. (December)

1987 - Federal government launches Policy Information Paper—*The Defence of Australia 1987*—placing a high priority on establishing a network of Over-The-Horizon-Radars. (March 1987)

1987 - Operational radar—Jindalee 'C'—handed over to the Royal Australian Air Force.

1988 - Royal Australian Air Force takes decision that a full-scale structural test on the empennage of the F/A-18 Hornet required in order to establish its economic safe life.

1988 - AWA Defence Industries (now part of BAE Systems) awarded contract for engineering development of the Nulka system and hovering rocket vehicle. ADI Ltd sub-contracted to develop and manufacture the rocket motor, and separate contract awarded to American company Sippican Inc. to develop the electronic payload for the decoy.

1988 - Minister for Defence Award for Achievement presented to Mr Mike Turner for development of a more flexible concept for minesweeping.

1989 - Towed Array Development Project Office established within Department of Defence to meet Royal Australian Navy's requirements for managing the development of Kariwara towed array technology. (early 1989)

1989 - BHP Engineering and its partner Vision Systems Ltd awarded contract for the construction of LADS, and trials of an operational version for the Royal Australian Navy. (May)

1989 - Project AuSAR (Australian Synthetic Aperture Radar) begins — in an advanced state of design by 1992.

1989 – ATM (Asynchronous Transfer Mode) — a joint development of DSTO and Telecom Research Laboratories, Melbourne — begins using the national civil telecommunications infrastructure in the development of the system.

1989 - Minister for Defence Award for Achievement presented to Dr Fred Earl for his work on the Jindalee over-the-horizon radar.

1989 - Jindalee team awarded CSIRO Gold Medal (for non-CSIRO work) for outstanding contribution to science.

1989 - Secretary of Defence Award for Achievement presented to Dr Malcom Golley for his role as a fundamental player in the development of Jindalee to operational capability.

c. 1989 – Pilot's Force Measurement Glove technology transferred to Normalair-Garrett Australia to undertake development and manufacture. Company markets the glove as the 'Control Stick Force Measurement Glove'.

Late 1980s - DSTO establishes research program to investigate the environmental impact of the anti-fouling biocide tributyltin (TBT).

Late 1980s – Prototype of PIPRS successfully tested. DSTO licenses SonarTech Pty Ltd to commercialise the system. The company subsequently supplies PIPRS equipment to Royal Australian Navy's fleet of Oberon class submarines and those of other navies around the world, including the United States. An enhanced system, the Submarine Acoustic Transistory Event Processing System (SATEPS), deployed in the Collins class submarines.

Late 1980s – DSTO scientists, Maribyrnong, begin work on side scan sonar surveillance.

Early 1990s - DSTO begins testing more than 150 anti-fouling products from all over the world with new and experimental products being evaluated and assessed under Australian conditions.

1990s - Co-planar Pumped Folder Slab or CPFS laser, based on laser-diode pumped solid state laser technology, invented, patented and developed by DSTO's Dr Jim Richards and Alasdair McInnes. Laser licensed for use in the improved Laser Airborne Depth Sounder (LADS) since marketed worldwide.

1990s – DSTO begins development into high frequency surface radar — evolves out of JORN technology.

1990 - DSTO licenses Australian-owned private company, Helitech Industries Pty Ltd to market and develop composite bonded repair technology.

1990 - Minister for Defence Award for Achievement presented to Dr Alan Baker for research into bonded composite repair technology and its application to RAAF aircraft.

1991 - Commonwealth awards Telecom (now Telstra) a prime contract worth \$860 million to design and construct JORN (Jindalee Operational Radar Network). Contract requires Australian production of more than 70 per cent of the contract value.

1991 - DSTO involved in first UN Special Commission inspection team to the Gulf to investigate Iraqi chemical weapons facilities. (June)

1991 – Dr Mark Anderson invents STUBS, a computer security program, precursor to the Starlight program.

1991 - Minister for Defence Award for Achievement presented to Dr David Oldfield for research into anechoic materials to make the Australian Collins class submarine harder to detect.

1992 - Minister for Defence Personnel Gordon Bilney launches LADS. Ceremony marks completion of its manufacture and installation in a Fokker F27 aircraft, and beginning of optimisation trials and acceptance tests program. (28 January)

1992 - Seamark marine dye licensed to Melbourne-based company Pains Wessex Australia Pty Ltd to develop, manufacture and market the technology world-wide.

1992 - DSTO and Australian company ADI Limited, sign license agreement to further develop AMASS technology.

1992 – Invention of Starlight, a unique, world-first system that allows users of secure computers to access insecure networks, such as the Internet, without compromising their own security — Dr Mark Anderson, principal inventor.

1992 - Minister for Defence Award for Achievement presented to Dr Stuart Anderson for his contribution to the Jindalee over-the-horizon radar, particularly its ocean surveillance and meteorological capabilities.

1992 – DSTO signs a licence agreement with Melbourne-based Mackay Consolidated Industries Pty Ltd to develop, manufacture and market DSTO's tracked vehicle elastomer and associated technologies.

1992 – DSTO's Dr Tom Ryall and Dr Albert Wong conduct pioneering research and develop FAST (Focal-plane Array for Synchronous Thermography), an infrared camera system designed for analysing stresses in metal and composite structures. First of its type in the world.

c. 1992 – DSTO and AWA Defence Industries develop to concept demonstrator stage the ALR-2002 Radar Warning Receiver — first such complex receiver to be designed and built in Australia to meet the RAAF's operational requirement for a replacement radar warning receiver for the F111 aircraft. Developed over a period of 15 months.

1993 - AMASS enters service with the Royal Australian Navy.

1993 – Royal Australian Navy accepts LADS for operational use. (8 October) LADS system ahead of any other comparable system in the world.

1993 - DSTO contributes to drafting the final text of the United Nation's Chemical Weapons Convention 1993.

1993 - ATM launched at DSTO open day, Salisbury, when words and video images swapped over an optical fibre link between Salisbury and Telecom Research Laboratories. (30 November) Link ultimately extended to Canberra and Sydney. ATM research becomes key part of the Defence Organisation Integrated Communications (DORIC) program.

1993–2003 - DSTO plays a highly significant role in the 'get well' and 'fast track' programs for the Collins Class submarines during construction. Includes research in areas such as noise reduction; signature reduction; high strength steel and welds; combat systems; shock trials; failure mechanisms for hoses; batteries; closed loop degaussing system; towed arrays; submarine acoustic transitory event processing system; the diesel engine; sonar systems; hull damage; flare trajectory; air quality; and smoke modelling.

1993 - Minister for Defence Award for Achievement presented to Dr John Ritter for his contribution to the development of high performance steel and welding techniques for the Collins Class submarine.

1994 - Department of Defence and AWA Defence Industries sign license agreement for Nulka Active Missile Decoy. (January)

1994 - Minister of Defence receives DSTO's first royalty payment of \$250,000 from Helitech Industries Pty Ltd for composite bonded repair technology. (April)

1994 - Vision Systems buys BHP's share of LADS business and establishes its subsidiary, LADS Corporation, to operate and maintain LADS under contract to the Australian Defence Force and to hold the licence to exploit the LADS technology commercially on the international market.

1994 - Project name of AuSAR changes to 'Ingara', an Aboriginal word for 'long way'. Ingara system used for first time in a military exercise and the following year used during Exercise Kangaroo 95.

1994 - Minister for Defence Award for Achievement presented to Mr Brian Andrews for his contribution in leading the development of the Defence Organisation Integrated Communications program.

c. 1994 – Research begins into the DSTO-developed computer software tool MEXANS (Maritime Exercise Analysis System).

1995 - Helitech Industries Pty Ltd, in collaboration with DSTO, develops a composite bonded repair for the United States Air Force C-141 Starlifter heavy transport aircraft.

1995 - Full-scale testing of major components of F/A-18 Hornet commences at Fishermans Bend under The International Follow-On Structural Test Project, a joint venture between Canada and Australia. On completion, 24,000 hours of test 'flying' in a specially designed rig that duplicated the stresses and loads

that an F/A-18 Hornet would experience in real flight had been carried out.

1995 – AWA Defence Industries (later taken over by BaeA) signs an exclusive agreement with DSTO to assess the world-wide market potential for Kerkanya technology. Soon thereafter, AWADI acquires the rights to commercialise the technology of the DSTO glide bomb design.

1995 - United States Navy acquires AMASS system (mid-1995) and begins trials under the United States Foreign Comparative Test Program.

1995 - Minister for Defence Award for Achievement presented to Dr Thomas Ryall and Dr Albert Wong for their pioneering research into thermoelastic stress analysis. The DSTO researchers were able to show that Kelvin's theory that had existed since 1853 was incomplete.

1996 - Australia signs a Memorandum of Understanding with the United States Navy on the joint production of Nulka decoys for Royal Australian Navy for use on its FFG- and ANZAC-class ships.

1996 - Minister for Defence Award for Achievement presented to Mr John Curtin for his contribution to improving the operational capability of the RAAF's Orion fleet with the development and installation of one of the world's most advanced ESM (electronic support measures) systems, the ALR 2001.

1996 - Royal Danish Navy acquires AMASS system (early 1996) — becomes the first European country to do so.

1996 – DSTO enters into a 10-year licensing agreement with Telstra Applied Technologies to develop and commercialise high frequency surface wave radar system — also involves AWA Defence Industries and GEC Marconi Systems. Advanced trials held in Darwin in 1998.

1996 – Starlight technology licensed worldwide to Tenix Group which later forms the company Tenix Datagate to commercialise the products.

1996 – Work begins on Theatre Broadcast System (TBS) one of first 'Compact Receive Suites' designed and developed at DSTO and built by Scientific and Engineering Services.

1996 – Shapes Vector, a prototype system to detect intrusions into computer networks, invented — principal inventor Dr Mark Anderson.

1996–1997 - DSTOs Brian Rebbechi carries out work into gearbox condition analysis on the Aircraft Mounted Auxiliary Drive (AMAD) gearbox of the F/A-18. His work leads to the redesign of the gearbox ultimately saving Royal Australian Air Force and United States Navy millions of dollars in operational costs.

1997 - Minister for Defence Award for Achievement presented to Mr David Graham for leadership management and technical expertise during the International Follow-On Structural Test Project (F/A-18 fatigue test).

1997 - RLM Management Company, a 50:50 joint venture of Lockheed Martin and the Tenix Group (formerly Transfield Defence Systems) assumes full management responsibility for the JORN project.

1997 – First three Kariwara towed arrays delivered by industry: one for further trials and development, other two for trials with the first two submarines of the *Collins* class.

1997 - DSTO and Australian Defence Force sign alliance agreement with Thales Underwater Systems Pty Limited (TUS Pty) to exchange information on sonar systems technology and trends. Alliance benefits Collins class submarine and the TUS Spherion B anti-submarine sonar aboard the ANZAC frigates.

1997 - DSTO develops a Long Range Ultraviolet (UV) Stimulator for electronic warfare testing and

training by the Australian Defence Force.

1998 - Within a period of 18 months, DSTO in collaboration with Australian Army, develops Rain Gear using a DSTO-developed fabric. Worn over a soldier's normal gear, the Australian-made rain gear permits a soldier to keep dry in the rain whilst allowing perspiration to be freely evaporated into the outside environment. The technology transferred to Australian industry.

1998 - New-generation LADS Mk II, built by Vision Systems in a \$24 million research and development program, commences commercial operations.

1998 - DSTO licenses Long Range Ultraviolet (UV) Stimulator technology to Elettronica Systems Ltd, and Australian company, Vision Abell (now part of Tenix Defence Systems Pty Ltd).

1998 - Minister for Defence Award for Achievement presented to Dr Mark Anderson for work in information security.

1999 - DSTO and BAE Systems sign a technology licence agreement for Anti-Ship Missile Simulation Software incorporated into a Nulka Tactics Generation Model.

1999 - Nulka in full production for Royal Australian Navy, United States Navy and Canadian Armed Forces. (by May)

1999 - Contract to provide JORN to the Commonwealth novated from Telstra to RLM Management Company. (October)

1999 - Licence for gearbox vibration monitoring technology bought by American company Chadwick-Helmuth, world's largest producer of aviation vibration analysis equipment. Licence allows Chadwick-Helmuth to commercialise DSTO technology and market the product worldwide.

1999 - DSTO's Dr Roger Neill convenes first international conference in Sydney — Shallow Survey 99 — focussing on high-resolution surveys in shallow water.

1999 - High Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) Project Arrangement (PA) signed. Negotiated under the auspices of the Deutch-Ayers Memorandum of Understanding, the PA authorised the joint development and testing of the Global Hawk HAE UAV system which included the implementation of new sensor and system capabilities for maritime surveillance and improved mission flexibility based on DSTO research and advice.

Late 1990s - Project Arrangement 10 (PA-10) a bilateral research, development and engineering program undertaken between Australia and the United States Army on aircraft survivability begins. One of the largest defence research and development projects undertaken between the two nations and extends over a period of six years.

2000 - DSTO works jointly with CSIRO developing a high-tech vest to help keep soldiers and emergency workers cool in the searing temperatures of deserts, mines and major fires.

2000 - The P-3 Service Life Assessment Program, a major international collaborative effort, involving DSTO commences at Fishermans Bend. The program involves full-scale fatigue tests and associated analysis on the complete P-3 Orion aircraft. The data provided will enable the RAAF to safely manage the structural integrity of the fleet until the planned withdrawal date of 2018.

2000 - Tenix Defence Systems Pty Ltd acquires Vision Systems' defence business, including LADS Corporation, and company renamed Tenix LADS Corporation Ltd. (June)

c. 2000 – Starlight Interactive Link products first in Australia to obtain formal certification to the highest security standards possible (E-6 level) under Department's Australasian Information Security Evaluation

Program and in 2000 were one of only a handful of products in the world to have achieved this standard.

c. 2000 - DSTO designs and builds a military imaging laser radar, known as LADAR, as a concept demonstrator for battlefield surveillance — emerges from the highly successful LADS (Laser Airborne Depth Sounder) technology.

2000 - Royal Society of Arts Hartnett Medal presented to Dr David Warren in recognition of his work as inventor of the Black Box flight recorder.

2000 - Minister for Defence Award for Achievement presented to Dr Chris Norwood for his outstanding scientific leadership and his contribution to the management and control of noise and vibration in maritime platforms, particularly the Collins Class submarine.

2001 - Royal Aeronautical Society Lawrence Hargrave Award presented to Dr David Warren and his team — Ken Fraser, Lane Sear and Dr Walter Boswell — in recognition of their work on the Black Box flight recorder. (February)

2001 - Global Hawk makes international aviation history by successfully completing the first non-stop flight across the Pacific Ocean by an autonomous aircraft. Flies from Edwards Airforce Base, California, and arrives at RAAF Base, Edinburgh, South Australia, on 23 April 2001. Remains in Australia for six weeks where its system integrated with a DSTO-developed ground station to allow Australian operators to control aspects of the Global Hawk sensor operations and to analyse the imagery data collected by its sensors while flying around Australia.

2001 - DSTO, Royal Australian Air Force and the Institute for Aerospace Research, National Research Council, Canada, jointly awarded the Von Karman Award by the International Council of the Aeronautical Sciences for the F/A-18 Hornet fatigue project under The International Follow-On Structural Test Project.

2001 - Within a six-week period, DSTO designs, develops and transfers the subsequent technology to industry of desert camouflage uniforms for use of Australian troops being deployed to Afghanistan. The suits rolled off the production line with three days to spare.

2001 - Minister for Defence Award for Achievement presented to Dr Jackie Craig for outstanding contribution to the development of the Australian Defence Organisation's imagery capability.

2002 - DSTO and Tenix sign a Technology and Product Licence, ensuring Tenix Industries access to Starlight technology up to at least 2012.

2002 - Minister for Defence Award for Achievement presented to Dr Graeme Egglestone for introducing a range of world-leading protective combat clothing for Australian soldiers.

2003 - Phases 3/4 of fully-fledged JORN Defence network operationally released to Royal Australian Air Force by contractors on 2 April 2003 and formally accepted in May 2003.

2003 - Tenix LADS Inc, the United States subsidiary of Tenix LADS Corporation, signs a US\$12 million contract with the US National Oceanographic & Atmospheric Administration to survey territorial waters around Alaska.

2004 - Minister for Defence Award for Achievement presented to Dr Todd Mansell for his work in information fusion, network centric warfare experimentation and combat systems engineering, especially in assisting Navy and DMO in the acquisition and replacement of the combat system for the Collins Class submarine.

c. 2004 – High frequency surface wave radar technology further developed by Daronmont Technologies as Surface-wave Extended Coastal Area Radar (SECAR) — formally accepted by Australian Government for trial.

c. 2005 - DSTO and Melba Industries develops a lightweight Chemical Biological (CB) suit suited to hot and humid environments and meeting the Australian Defence Force requirements for durability and functionality.

2005 - DSTO and BAE SYSTEMS, manufacturer of the Royal Australian Air Force's Hawk Mk. 127 Lead-In Fighter, enter a commercial business agreement to conduct comprehensive fatigue testing on the aircraft. To be the largest full-scale fatigue test ever conducted by DSTO, the testing is being conducted at DSTO's H.A. Wills Structures and Materials Test Centre at Fishermans Bend.

2005 - Starlight Interactive Link granted highest possible level of security certification by the National Information Assurance Partnership in United States — first time that any security device receives Evaluation Assurance Level 7 certification.

2005 - Secretary of Defence Award for Achievement presented to Paul Amey for his exceptional contribution in the transitioning of the Jindalee radar capability into the broader Jindalee Operational Radar Network (JORN) system.

2005 - Secretary of Defence Award for Achievement presented to Owen Williams for outstanding performance in developing tools and techniques for the design and testing of infrared systems and missiles.

2005 - CDF/Secretary's Environment and Heritage Award (inaugural) presented to John Lewis and his team for their work in anti-fouling paints for the Navy. 'The team's success in developing a replacement antifouling compound for use on ships' hulls is an outstanding, internationally recognised contribution to the protection of the marine environment.'

2005 - DSTO and Australian Security Intelligence Organisation (ASIO) sign Memorandum of Understanding establishing a framework by which DSTO can provide science and technology support to ASIO via consultancy services, conducting research and developing specific technical capabilities.

2005 - DSTO and ASC Pty Ltd (formerly Australian Submarine Corporation) sign a three-year industry alliance agreement to improve submarine-related technology and innovation.

2005 - Minister for Defence Award for Achievement presented to Dr Tony Lindsay for outstanding contribution to defence science in the fields of electronic warfare modelling and simulation, advanced countermeasures development capabilities, and photonics. Dr Lindsay led PA-10 for six years.

2006 - DSTO and Australian Shipowners Association collaborate in Commercial Vessels Biofouling Project to determine risk posed by niche area biofouling on commercial vessels.

July 2006 - Ceremony held in Ottawa, Canada, to mark the conclusion of The International Follow-On Structural Test Project between DSTO Australia and Canada.

2006 - Australian ASRAAM (Advanced Short Range Air-to-Air Missile) Software Support Capability (AASSC) established by DSTO.

2006 – Unmanned Aerial Vehicle trials undertaken over Australia's North West Shelf.

2006 - DSTO and US Air Force sign a \$70 million agreement to advance research in hypersonic flight. The HIFIRE project, an eight-year program, is one of largest collaborative ventures between DSTO and United States. University of Queensland and University of New South Wales at the Australian Defence Force Academy also involved.

2006 - DSTO team involved in one of largest and most complex maritime electronic warfare trials undertaken by participating countries — TAPA (TTCP Advanced Project Arrangement) — and conducted in Hawaii under the auspices of The Technical Co-operation Program (TTCP).

2007 - DSTO signs an agreement to establish a Chair in Hypersonics at The University of Queensland.