
DEFENCE

This chapter outlines Australia's defence policy and its defence relationships with other countries; the higher Defence organisation; defence personnel and equipment developments; the functions, organisations, staffing and training of the three Services; and the functions and activities of the Defence support organisations.

Further information on current defence planning and activities is available in the Defence Report and other publications of the Department of Defence, and in statements to the Senate by the Minister for Defence and the House of Representatives by the Minister for Defence Science and Personnel.

Current Defence Policy

In March 1987 the Government released its White Paper on the Defence of Australia which outlined a comprehensive approach to Australian security and a basis for future planning, force development and defence activities.

The policy of defence self-reliance emphasises the ability to defend Australia and its direct interests using our own resources. This policy is pursued within an international framework of alliances and agreements which reflect Australia's commitment to contribute to peace and stability.

The security of our immediate geographic region is of fundamental strategic importance to Australia, and the continued development of an independent defence capability enhances our ability to contribute to peaceful development within the region. Priority in defence activity is consequently given to areas in Australia's region and high value is placed on fostering defence relationships with the countries of South East Asia and the South West Pacific.

Australia's security prospects are favourable. Our relationships with our allies and neighbours are basically sound and we face no identifiable military threats. Nevertheless, our defence planning recognises the possibility that threats could arise, which would have consequences for our security. A high priority is given to the development of military capabilities in the Australian Defence Force (ADF) which will enable it to defeat more limited threats that could arise at shorter notice. Defence planning also aims to ensure that there are options for a future response to more serious challenges to our security.

Australia's security arrangements with the United States and New Zealand remain an important element of our defence policy. Although trilateral defence cooperation activities under the ANZUS alliance have been in abeyance due to the New Zealand Government's policy on visits by nuclear-powered and nuclear-weapon capable warships, the ANZUS alliance itself remains in force and continues to provide a background for a wide range of mutually beneficial bilateral defence cooperative activities with the United States. At the same time cooperative activities and projects undertaken with New Zealand continue to sustain Australia's close defence relationship with that country.

Higher Defence Organisation

The higher organisation of the ADF is dealt with in the *Defence Act 1903*, which provides that responsibility for the general control and administration of the ADF rests with the Minister for Defence. Under arrangements introduced in 1987, the Minister for Defence Science and Personnel has particular responsibilities within the Defence portfolio for the oversight of the Defence Science and Technology Organisation and ADF personnel matters.

The Minister for Defence has issued three directives laying out the responsibilities, both individually and jointly, of the Secretary and the Chief of the Defence Force (CDF). Under these directives the Secretary administers the Department of Defence and is responsible for advice to the Minister for Defence and the Minister for Defence Science and Personnel on policy, resources and organisation.

The CDF commands the Australian Defence Force and is responsible for advice to the Minister on the military aspects of ADF development including the size of the ADF and the balance within it in relation to strategic requirements.

The Secretary and the CDF are jointly responsible for advice on personnel policy requirements, including conditions of service, for the ADF; on promoting the efficient and economical use of resources within the ADF; for the continuing review of the adequacy of the organisation and administration of the Department of Defence and the ADF; and for recommending promotions and postings of two star officers and above, and the posting of one star officers to appointments which have more than single Service implications.

Major Defence Committees include the Council of Defence and the Defence Committee.

The function of the Council is to consider and discuss matters relating to the control and administration of the ADF and its respective arms referred to it by the Minister.

The Committee advises the Minister on:

- defence policy as a whole;
- the coordination of military, strategic, economic, financial and external affairs aspects of defence policy;
- matters of policy or principle and important questions having a joint Service or interdepartmental defence aspect; and
- such other matters having a defence aspect as are referred to the Committee by or on behalf of the Minister.

Defence Expenditure

The following tables give information about levels, categories and major items of defence expenditure.

DEFENCE FUNCTION EXPENDITURE, REVENUE AND OUTLAY, PERCENTAGE OF BUDGET OUTLAY AND GROSS DOMESTIC PRODUCT 1976-77 to 1989-90

	<i>Expenditure \$m</i>	<i>Less revenue \$m</i>	<i>Outlays \$m</i>	<i>Per cent of budget sector outlays</i>	<i>Per cent of GDP</i>
1976-77	2,221	72	2,149	8.9	2.5
1977-78	2,434	94	2,340	8.8	2.5
1978-79	2,658	90	2,568	8.8	2.4
1979-80	3,064	99	2,965	9.3	2.4
1980-81	3,656	166	3,490	9.6	2.5
1981-82	4,261	207	4,054	9.8	2.6
1982-83	4,940	239	4,701	9.5	2.8
1983-84	5,537	239	5,298	9.3	2.8
1984-85	6,229	291	5,938	9.2	2.8
1985-86	6,981	308	6,673	9.5	2.8
1986-87	7,579	370	7,209	9.5	2.8
1987-88	7,754	332	7,422	9.4	2.5
1988-89	8,171	391	7,780	9.5	2.3
1989-90	8,905	428	8,476	9.7	2.3

EXPENDITURE ON DEFENCE FUNCTION

	<i>1988-1989</i>		<i>1989-90</i>			
	<i>Achieved \$m</i>	<i>Per cent of Exp</i>	<i>Budget \$m</i>	<i>Per cent of Exp</i>	<i>Achieved \$m</i>	<i>Per cent of Exp</i>
<i>Major categories</i>						
Capital						
Capital equipment	1,778.571	21.8	1,863.252	21.5	1,908.050	21.4
Capital facilities	383.568	4.7	411.810	4.7	446.477	5.0
Total capital	2,162.139	26.5	2,275.062	26.2	2,354.527	26.4
Personnel						
Service	2,262.621	27.7	2,296.371	26.5	2,359.938	26.5
Civilian	676.885	8.3	658.890	7.6	666.386	7.5
DFRDB and Special appropriations	594.447	7.3	660.284	7.6	670.996	7.5
Total personnel costs	3,533.953	43.3	3,615.545	41.7	3,697.320	41.5
Defence cooperation	60.596	0.7	74.195	0.9	74.200	0.8
Other operating costs						
Maintenance stores	747.185	9.1	817.325	9.4	832.891	9.4
Equipment repair	278.954	3.4	319.282	3.7	326.947	3.7
Building repair	170.866	2.1	191.935	2.2	198.497	2.2
Administrative expenses and other services	990.035	12.1	1,070.452	12.3	1,092.734	12.3
Rent	31.709	0.4	76.095	0.9	74.374	0.8
Total other operating costs	2,218.749	27.2	2,475.089	28.5	2,525.443	28.4
Defence housing	195.487	2.4	230.134	2.7	253.229	2.8
Expenditure	8,170.924	100.0	8,670.025	100.0	8,904.719	100.0
Revenue	-433.807		-422.944	—	-427.126	—
Trust accounts	43.301		0.000		-1.322	—
Prospective wage and salary increases	0.000	—	80.000	—	0.000	—
Defence function outlay	7,780.418	—	8,327.081	—	8,476.271	—
Defence appropriations attributable to other functions:						
Cultural and recreation (Young Endeavour)	1.967	1.909	1.691		—	—
Revenue not attributable to Defence	—	—	-0.650		—	—

MAJOR ITEMS OF INVESTMENT EXPENDITURE IN 1989-90

<i>Major capital Projects</i>	<i>Expenditure 1989-90</i>
	\$m
Six submarines	460.2
F/A-18 project and associated equipment	212.6
ANZAC Ships	201.1
Construction of 2 Fates	144.5
Seahawk helicopters	80.9
DDG modernisation	55.0
Blackhawk helicopters	53.9
Army light field vehicles	51.8
Basic trainer aircraft	45.3
HF and VHF single channel radios	38.9
Defence integrated secure communication network	31.0
F-111 avionics update	29.0
Army living-in accommodation—all States	27.6
Jindalee	25.6
Relocating of explosives factory—Albion	21.2
105mm Army field gun	20.3
Acquisition of 4 FFG frigates	19.6
P3C electronic surveillance measure	17.7
Laser airborne depth sounder	16.6
School of Military Engineering—Casula	14.6
Supply Systems Redevelopment Project	14.4
Acquisition of small arms	11.9
Helicopter facility—Townsville	11.9
21 Supply Bn warehouse—Moorebank	11.8
Medium trucks for Army	11.2
Army bridging	11.1
Trucks, tractors and semi-trailers for Army	10.7
Australian Defence Force Academy	9.8
Integrated weapons workshops—Garden Island NSW	8.4

AUSTRALIAN DEFENCE FORCE

The objective of the Australian Defence Force (ADF) is to plan, develop and maintain forces for contingencies within Australia's area of direct military interest and to defend Australia and its interests. The ADF is structured to be able to undertake current and foreseeable peacetime operational tasks as directed by the Government, deal effectively with the levels of credible contingency that could arise over shorter timescales, and provide a suitable basis for timely expansion to meet higher levels of threat if Australia's strategic circumstances deteriorated over the longer term.

The Chief of the Defence Force (CDF) commands the ADF and is the principal military adviser to Government. He exercises this command through a hierarchy of environmental commanders for maritime, land and air operations and through the Commander, Joint Forces Australia, who is appointed when needed.

The structure of the ADF continues to be refined as operational experience, including that arising from Exercise Kangaroo 89, allows further development of doctrine appropriate for the levels of credible contingencies that could arise over shorter time scales.

Increasing emphasis is being placed on the importance of an integrated approach towards ADF planning and development, and on effective joint operations. Accordingly, new organisations and procedures have been implemented in Headquarters ADF which have resulted in an improved capacity of senior staff in HQADF to address and formulate policy, by concentrating long term planning, programming, and force development staffs in a joint working environment within HQADF. This also allows for more direct ADF

involvement in Defence longer term planning, including military strategic planning, force development, force expansion and mobilisation, ADF preparedness and readiness, science and technology, and Defence facilities policy.

Royal Australian Navy

The aim of the Royal Australian Navy (RAN) is to raise, train and maintain seaborne forces structured to deal with credible maritime contingencies in Australia's area of direct military interest, generally as part of a joint force, and to provide a base for longer term expansion should this be required.

Higher organisation

The Chief of Naval Staff commands the RAN, subject to the command of the ADF by CDF. Principal staff officers to the Chief of Naval Staff are the Deputy Chief of Naval Staff, the Assistant Chief of Naval Staff (Personnel) and the Assistant Chief of Naval Staff (Materiel). Other senior officers of the RAN include the Flag Officer Naval Support Command and the Maritime Commander, Australia.

Ships of the Royal Australian Navy

Guided missile destroyers: *Perth, Hobart, Brisbane*; guided missile frigates: *Adelaide, Canberra, Sydney, Darwin*; destroyer escorts: *Parramatta, Stuart, Derwent, Swan, Torrens*; submarines: *Oxley, Otway, Ovens, Onslow, Orion, Otama*; amphibious heavy lift ship: *Tobruk*; landing craft heavy: *Wewak(a), Balikpapan(b), Tarakan(b), Labuan(b)*; Fremantle class patrol boats: *Fremantle(b), Warrnambool(b), Dubbo, Geraldton, Wollongong, Bunbury, Ipswich, Townsville, Bendigo, Whyalla, Gladstone, Cessnock, Launceston, Gawler, Geelong*; training ship: *Jervis Bay*; fleet oiler: *Success*; auxiliary tanker: *Westralia*; hydrographic survey ships: *Moresby, Flinders*; survey motor launches: *Paluma, Mermaid, Shepparton, Benalla*; oceanographic survey ship: *Cook*; interim survey vessels: *Betano(c), Brunei(c)*.

NOTES: (a) Operational Reserve. (b) Crewed by Reserves. (c) Landing craft heavy.

Fleet Air Arm

The RAN currently operates three different types of helicopter (Sea King Mk50/Mk50A, Bell 206B and Squirrel) and HS748 electronic warfare training aircraft from HMAS *Albatross* at Nowra, New South Wales. Seahawk helicopters are being trialed prior to introduction into naval service. The RAN also operates Jindivik pilotless target aircraft from the Jervis Bay Range facility.

Force structure

The force structure of the surface combatant force is based upon the development of three tiers of capability as set out in the 1987 Defence White Paper. The guided missile destroyers and frigates, of the *Perth* and *Adelaide* classes respectively, satisfy the first tier requirements. The River Class destroyer escorts currently fill the second tier of capability and have played a major role in maintaining Australia's presence in South-East Asia, deploying to ports throughout the region and participating in Five Power Defence Arrangements' exercises. The third tier capability is provided by the Fremantle class. These vessels, amongst other duties which included contributing to the Australian presence in the South-West Pacific and South-East Asia, maintained 1,885 days on patrol in the Australian Fishing Zone and made 45 arrests of foreign vessels illegally fishing in the Zone.

The Government's initiative to establish an operational navy based in two oceans has progressed with the leasing of the auxiliary tanker HMAS *Westralia*. Other elements of the RAN, including the submarine force and the mine counter-measures force, will eventually have operational units based on the east and west coasts of Australia.

Australian Army

The objective of the Australian Army is to raise, train and maintain ground forces structured to deal with credible land contingencies in the defence of Australia, its territories and interests, generally as part of a joint force, using both Regular and Reserve forces; and provide a basis for longer term expansion.

Higher organisation

The Chief of the General Staff commands the Army subject to the overall command of the ADF by the CDF. His principal staff officers are the Deputy Chief of the General Staff, Assistant Chief of the General Staff—Personnel, Assistant Chief of the General Staff—Materiel, Assistant Chief of the General Staff—Army Reserve and Assistant Chief of the General Staff—Logistics.

The Army is organised into three commands as follows:

- *Land Command*—commands all field army units of the Australian Army, both Regular and Army Reserve.
- *Logistic Command*—commands the principal logistic elements of the Army.
- *Training Command*—is responsible for all individual training and commands all Army training establishments and schools with the exception of the Royal Military College, Duntroon which is under the command of the Chief of the General Staff.

Military districts as listed below provide administrative support for the three commands and, in certain cases, act as intermediate headquarters for them. The military district headquarters also handle those matters in which both Commonwealth and State Governments are involved.

- *1st Military District*—the State of Queensland.
- *2nd Military District*—the State of New South Wales, less those parts included in 3rd and 4th military districts.
- *3rd Military District*—the State of Victoria and part of southern New South Wales.
- *4th Military District*—the State of South Australia plus a portion of south-western New South Wales.
- *5th Military District*—the State of Western Australia, less the Kimberley Local Government Area.

Force structure

The Army's structure must include highly mobile forces capable of rapid deployment anywhere within Australia, its territories and its area of direct military interest, and able to conduct protracted and dispersed operations in harsh terrain where the existing infrastructure and resources are sparse.

The Army combat force structure is based on provision of a ready deployment force, a manoeuvre force, ready deployment force augmentation units, expansion base force for higher levels of conflict and communication support forces. These forces include:

- ground surveillance and reconnaissance capabilities;
- a light air portable force, including an airborne (parachute) element, capable of rapid deployment within Australia and its territories;
- tactical battlefield air support and mobility, including helicopters;
- a force in support of the civil authorities capable of resolving high risk terrorist incidents;
- forces capable of following up initial deployments;
- forces of greater combat power to reinforce deployed formations if necessary; and
- forces capable of deploying to defend vital defence installations and national infrastructure.

Royal Australian Air Force

The function of the Royal Australian Air Force (RAAF) is the conduct of operations in the air for the defence of Australia and Australian interests.

Higher organisation

The RAAF is commanded by the Chief of the Air Staff (CAS) who is responsible to the Minister for Defence through the CDF for that command. He is assisted by the Deputy Chief of the Air Staff, the Assistant Chief of the Air Staff—Personnel, and the Assistant Chief of the Air Staff—Materiel, all located in Air Force Office Canberra.

RAAF commands

The RAAF is organised into three functional commands—Air Command with headquarters at Glenbrook; and Logistics Command, and Training Command, with headquarters in Melbourne. Air Command is responsible for the conduct of air operations and operational training. Logistics Command is responsible for logistics and maintenance of RAAF equipment. Training Command is responsible for the basic training of personnel. Air Command comprises the following groups: Strike/Reconnaissance Group (SRG), Tactical Fighter Group (TFG), Air Lift Group (ALG), Maritime Patrol Group (MPG), and Tactical Transport Group (TTG).

Aircraft

Air Command

SRG—F-111 (Amberley)

TFG—F/A-18 Hornet, Macchi, Winjeel (Williamstown, Tindal and Pearce)

ALG—C130 Hercules, Boeing 707, Falcon 900, HS748 (Richmond, East Sale and Canberra)

MPG—P3C Orion (Edinburgh)

TTG—Caribou (Townsville)

Training Command

Basic Pilot Training—CT4, PC9 (Point Cook and Pearce)

Instructor Pilot Training—CT4, Macchi and PC9 (East Sale)

Navigator Training—HS748 (East Sale)

Force structure

The Air Force structure reflects the need for air forces to be capable of conducting independent operations, as well as supporting maritime and land operations. The Air Force is to provide:

- national airspace surveillance and control together with broad area surveillance and a capability for air intercepts;
- combat aircraft for air defence and offensive air support;
- combat aircraft for reconnaissance and strike against maritime and land targets;
- a long range maritime patrol force for sea surveillance, maritime targeting and strike, antisubmarine warfare, aerial mine laying and search and rescue;
- an air transport force for strategic transport and air to air refuelling;
- a tactical air transport force to support land operations;
- transport aircraft for special transport operations such as VIP tasks and aeromedical evacuation;
- a search and rescue capability for RAAF and foreign military aircraft operating in the Australian area;

- a command and control organisation; and
- a logistics organisation for supporting the operation and deployment of forces.

Defence Personnel

The current manpower strategy continues to be sensitive to the need to preserve scarce manpower resources. The objective of this strategy is to promote the most effective use of all Defence personnel resources including Regular and Reserve personnel, civilians and contractors. Added to this the Government has directed that the Defence organisation move towards a new management philosophy. The influence of the Government's financial management improvement program, including program management and budgeting focuses on management for results. Program management and budgeting was introduced into the Defence organisation on 1 July 1990. The introduction of program management and budgeting will mean more responsibility and accountability for Defence managers.

Service personnel

The concepts of 'Trained' and 'Training Force' have been introduced. This approach to Service manpower numbers was created in 1987-88 as a more effective way of stating ADF manpower requirements, allocations and achievements. The Trained Force is designed to effectively meet the operational tasks required by the Government. The Training Force is conceived as a flexibly-sized element of the ADF whose main objective is to provide comprehensive pre-employment training to newly recruited cadets and trainees. When trained, these personnel are made available to the Trained Force to maintain its strength. This concept insulates the Trained Force from the influences of variable separation rates in ADF personnel.

DISTRIBUTION OF SERVICE PERSONNEL AND CIVILIAN STAFF BY PROGRAM AVERAGE STRENGTH 1989-90

Program	Australian Defence Force				
	Reserves	Trained force	Training force	Civilian	Total
Current Forces					
ADF Command	—	637	855	293	1,785
Navy	185	13,404	1,475	4,868	19,932
Army	2,886	27,298	2,856	6,210	39,250
Air Force	231	19,770	1,858	2,746	24,605
<i>Total Current forces</i>	<i>3,302</i>	<i>61,109</i>	<i>7,044</i>	<i>14,117</i>	<i>85,572</i>
Defence development	—	97	—	798	895
Defence support	—	45	—	3,873	3,918
Corporate services	—	530	—	5,134	5,664
Total	3,302	61,781	7,044	23,922	96,049

NOTE: The figure for Reserves shows the average number of full-time equivalent reserves for the year. For budget purposes, the average number of staff years is calculated from the number of training days used. Civilian figures include paid inoperative staff, part-time staff and casual labour expressed as full-time equivalents.

Defence Support Organisations

Acquisition and Logistics Organisation—ALO

The Acquisition and Logistics Organisation was formed in 1989 from the previously separate Capital Procurement Organisation and Defence Logistics Organisation. As well as capital, replacement and maintenance procurement, its other functions include Defence Facilities, contracting, computing and development of defence-related industry.

Major activities

The major activities during 1989–90 were:

Capital equipment procurement

- management of the acquisition processes for major capital projects including the Anzac ships, new submarines and Jindalee over-the-horizon radar; expenditure in 1989–90 was \$1,660 million; and
- completion of the F/A-18 contract with delivery of the last aircraft.

Industry policy

- execution of 16 manufacturing and marketing licence agreements with industry for technologies developed by Defence;
- industry surveys to identify barriers to Australian firms seeking Defence business (a report on the findings is expected by the end of 1990), and to determine the impact of defence offsets and other defence programs on Australian industry;
- rationalisation of Defence Required Support Capabilities for which special funding arrangements are made to Australian Defence Industries Pty Ltd;
- actions towards decommissioning, and return for local use, of the Albion Explosives Factory and Explosives Factory Maribymong sites;
- coordination or joint sponsorship of Australian participation in defence trade fairs in the US and Malaysia, and dissemination of material at the Canberra commercial exhibition AIDEX89;
- agreements with UK and Sweden for collaboration on selected equipment development projects; and
- effective management of Customs (Prohibited Exports) Regulations, with the issue of over 1,500 permits in 1989–90.

Australian membership of the Coordinating Committee for Multilateral Export Controls (COCOM), a non-treaty group of countries formed to coordinate controls on the export of strategically sensitive technology having both civil and military uses has issued several reference booklets, including:

- Doing Australian Defence Business;
- The Australian Defence Offsets Program;
- Australian Controls on the Export of Defence and Related Goods;
- Australian Controls on the Export of Technology with Civil and Military Applications;
- Reference Manual on Defence Intellectual Property; and
- Value Management Incentive Contracting.

Logistics

- promulgation of the Defence Logistics strategic planning guide;
- rationalisation of Defence warehousing;
- progression of the Supply Systems Redevelopment Project including the award of a contract for a commercial software package, establishment of a mainframe development environment and development of a local area network for the Army at Moorebank;
- establishment of a single Defence Quality Assurance Organisation;
- revision of Defence policy for the safe storage of ammunition and explosives;
- development of policy guidance for the contractual relationship between Defence and Australian Defence Industries Pty Ltd;
- development of procedures with civil transport organisations to use their resources in times of emergency;
- renegotiation of a Cooperative Defence Logistics Support Agreement with the US; and
- sale of the surplus Mirage aircraft and Centurion tanks.

Contracting

- arrangement of 2,372 contracts valued at \$5,016.35 million;
- implementation of Defence purchasing reforms consistent with the introduction of Program Management Budgeting on 1 July 1990, including production of policy manuals and commencement of training for up to 1,500 purchasing staff; and
- streamlining of senior structure of the contracting organisation under a Division Head.

Facilities and property

- development of strategic infrastructure in the north and west of Australia;
- rationalisation and relocation of facilities;
- upgrading of living-in accommodation;
- conduct of environmental impact studies in major Defence facilities proposals; and
- development of land management plans for major training areas.

**Defence Science and Technology
Organisation—DSTO**

DSTO is Australia's second largest research and development organisation employing some 1,150 professional scientists and engineers in its total staff of about 3,500.

DSTO assists the Australian defence community by providing specialist scientific and technological support. It provides scientific and technical advice on defence policy matters and on the selection and acquisition of new equipment and systems, including their suitability for operation in the Australian environment. It puts considerable effort into helping solve scientific and technological problems of the Australian Defence Force.

DSTO maintains an extensive scientific and technological base in defence related areas and collaborates with tertiary institutions and industry. It provides expertise and facilities to industry, and undertakes joint research with international partners in defence cooperation.

DSTO conceives new equipment devices or systems, and if necessary develops prototypes to operate in Australia's special physical and military environment. Noted examples are the Barra sonobuoy, Jindalee over-the-horizon radar and Kariwara towed array.

To help achieve these goals, DSTO has an extensive International Program. With about 100 cooperative arrangements in place across eight countries and a further 21 agreements under negotiation, DSTO receives substantial benefit in the sharing of the costs of research, enabling it to participate in relevant projects which would otherwise be completely beyond DSTO's financial reach. The knowledge gained in these international programs assists DSTO to tailor its research program and not duplicate that of other countries on topics of mutual interest.

As part of a major five-year restructuring begun in 1987, DSTO is involving industry early in the research and development of projects and is contracting out as much engineering to industry as possible.

In response to Government policy, DSTO is fostering a more commercial outlook to encourage the transfer of technology to the private sector.

Structure

The DSTO laboratory structure consists of five mission-oriented laboratories with integrated scientific and engineering functions, as follows:

- Aeronautical Research Laboratory, based in Melbourne, with a Salisbury (SA) component;
- Electronics Research Laboratory, based in Salisbury, with a component in Canberra, ACT;
- Materials Research Laboratory, based in Melbourne, with components in Pymont (Sydney), Scottsdale (Tasmania) and Innisfail (North Queensland);
- Surveillance Research Laboratory, based in Salisbury; and
- Weapons Systems Research Laboratory, based in Salisbury, with a component in Pymont, NSW.

The DSTO Central office is located in Canberra ACT.

Natural Disasters Organisation—NDO

NDO has a number of responsibilities aimed at minimising the effects of natural disasters on the Australian community and provides infrastructure and training to cope with natural disasters. In discharging these responsibilities it:

- develops national counter-disaster plans and civil defence policy and plans;
- coordinates the provision by the Commonwealth of physical assistance to the States and Territories in the event of a disaster;
- operates the National Emergency Operations Centre;
- coordinates government and non-government disaster relief to Papua New Guinea and the South-West Pacific nations at the request of the Australian Development Assistance Bureau;
- directs Commonwealth support programs to the State and Territory Emergency Services;
- maintains fallout shelter survey expertise;
- directs the Australian Counter Disaster College in training and educating disaster managers and researching aspects of disasters and of disaster management; and
- manages Australian participation in the International Decade for Natural Disaster Reduction.

Wonga Walk, Dorrigo National Park (a World Heritage area). Photo by Geoff Biddle.



Common moss in rainforest gully. Photo by P. I.



Revegetation work is underway in the Henty Forestry Commission of Tasmania.



A classical pocket of monsoonal rainforest remnants in the Northern Territory surrounded by exposed 'dryland' sclerophyll systems. Photo by Diane Lucas and Jerome Russell-Smith.



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A wet tropics endemic butterfly, the Cairns Birdwing. Photo by J. Meade.



Tasmania, to rehabilitate rainforest stretches damaged by the construction of an exploration track. Photo by Noel Ryan.



Warm temperate rainforest, East Gippsland. Photo by Noel Ryan.



A pair of Northern Red-eyed Tree Frogs in Daintree lowlands, far north Queensland. Photo by Michael Trenerry.

SAFEGUARDING OUR RAINFOREST HEIRLOOMS

(This special article has been contributed by Bill Reed, consultant to the National Rainforest Conservation Program)

Although moist rainforests cover only about six per cent of the world's area, they contain well over half of the Earth's species of animals and plants.

These two bare statistics from the United Nations' World Commission on Environment and Development embody the wonder and the alarm we feel when we look at the health of our most lavish landform system—the rainforest ecosystem.

The wonder of rainforests is that they are such complex, interlocking systems that a small overall area hosts probably a minimum of five million, and maybe as many as thirty million, species of our inherited life forms.

The alarm is that we also know that somewhere between seven and ten million hectares of these supreme ecosystems are being cleared each and every year, with a further ten million hectares 'grossly disrupted'. This information comes from UN surveys done in the late 1970s. Since then the rate has accelerated, not decelerated.

What, then, is happening to our heritage of a living planet, to the marvellous variety of animals and plants handed down to us, when the key to their survival seems to lie in the very rainforests we are disfurnishing from our world at such a rate?

In Australia, we are trying to find the answer to this through new programs of conservation and balanced management of our rainforests. The need for their conservation is as urgent and necessary as anywhere in the world. The total Australian rainforest area might be small in global terms—its two million hectares represents less of an area than is uprooted in the Amazon basin each year alone—but its ratio of species to area is as impressive as that of any other rainforest. Furthermore, the Australian rainforests are unique in a number of important ways: their variety is unusual; the range of climates in which they have survived is exceptionally wide; and the number of plants and animals that are endemic to them and are still identifiable as being of very primitive stocks is scientifically exciting.

Most of the world's rainforests are found around the thin equatorial belt within such regions as the Amazon and Congo river basins, and the Indo-Malaysian region. However, there are also a surprising number of rainforest pockets that survive in quite arduous climatic conditions north and south of tropical latitudes. (This patchwork pattern of rainforests is very noticeable in Australia, where pockets occur over a surprisingly wide north-south range—from the north-west of Western Australia, down through Queensland, New South Wales, Victoria, and stretching into Tasmania.)

Unfortunately, this fragmented pattern has not helped the survival of rainforests in a world voracious for their wonderful hardwood timbers. Indeed, the collective system of rainforests is probably more under threat than any other ecosystem in the world. This is primarily because of the current clearing practices around the world of this invaluable natural resource each year.

The potential tragedy is that, if we persist with this current rate of clearing, we could well dispossess the world totally of its rainforests by the year 2000. The effect of this on the world's genetic diversity—and, in consequence, humankind's well-being—would be nothing short of catastrophic.

It is already accepted that the recent diminishing of our world stock of rainforests has been a major cause, directly or indirectly, of the extinction of more than 90 species of birds, 36 species of mammals, and an uncounted number of invertebrates in modern history—a situation that the British ecologist Dr Norman Myers considers the greatest spasm of mass extinction since life began.

After all, rainforests have been, and still are, the crucibles of our medical, agricultural and environmental welfare. In a real sense they hold the key to our genetic vault. Already this century, our scientists have used the rainforests genetic bank to improve such crops as bananas, sugar, cocoa, rubber and coffee—staple crops that are no different from any other agricultural crops in their need for consistent genetic boosts to improve yield, nutrients or disease resistance. The same is just as true for our animal sciences.

The oldest rainforests of all

It is against this vexing world-wide backdrop that the Australian Government instigated a range of initiatives designed to protect, conserve, rehabilitate and transmit to future generations environmentally-sensitive rainforest areas in the country.

Some of these programs are specific to rainforests themselves, and some impinge upon rainforests as part of an overall approach to broader ecological issues.

Of a specific nature is the Government's listing of particular rainforest areas either on the Register of the National Estate through the Australian Heritage Commission or upon UNESCO's World Heritage List. Where applicable, too, State Governments have given selected rainforests some form of limited-use status, such as national park or some equivalent reserve status.

Three of Australia's World Heritage areas contain either a majority or a substantial part of rainforest. These are the Wet Tropics of Queensland, the Australian East Coast Temperate and Subtropical Rainforest Parks in north and central New South Wales, and the Tasmanian Wilderness. In these, Australia has committed itself to a major international treaty which obliges it to conserve, preserve and protect well over one million hectares.

There are also many projects that have general relevance to the conservation of rainforests in the wider range of government initiatives in national programs, either administered by Federal, State or local governments or through community and landholder groups.

The major arms of the Federal Government's initiatives are the National Conservation Strategy, Greening Australia (which includes the One Billion Trees program), the National Biological Diversity Strategy (which includes the Endangered Species Program, the Save the Bush Program and the environmental data base), Landcare and the Australian National Parks and Wildlife Service.

With specific regard to rainforests on a national scale, however, the Government's principal conservation vehicle is the National Rainforest Conservation Program (NRCP). Implemented in 1986, it is an overview strategy which aims at the protection of the whole of the rainforest panorama in this country and in its external territories of Christmas, Cocos-Keeling, and Norfolk Islands.

One of the NRCP's first tasks was to identify not only the rainforest areas to be protected, but also to define what exactly a rainforest was. This was not as easy as it would seem, because very little had been done in the study of rainforest ecology, biology or zoology. There was a reason for this.

Until recently, it was thought that rainforests were somehow 'alien' to the Australian landscape. Rainforests mainly thrived in the tropical north, and seemed more suited to the Asian-Pacific image of high rainfall and humidity, and not to the hard-leaved type vegetation, like gums and wattles, which seemed so rightly 'Australian'. Therefore, the pundits speculated, rainforests must have been recent invaders across the land bridge that, in fairly recent geological times, connected this country with New Guinea.

However, the evidence quickly mounted that this could not be so. It was not just that rainforests had evidently adapted themselves to various climatic conditions (the temperate rainforests of New South Wales and the subtemperate rainforests in Tasmania) which bore witness to longer local habitation than was ever imagined. It was other irrefutable evidence, such as the discovery in north-east Queensland's Wet Tropics of no less than fourteen of the world's nineteen known families of surviving ancient angiosperms or flowering plants, and the existence of animal species older than anything that occurred in the forests of our neighbours to the north.

These ecosystems are not foreign to the Australian landscape at all. They are, in fact, older 'natives' than gum trees. They show us what the primordial rainforests of Gondwana were actually like.

But they do more than that, for it is now realised that, literally out of them, developed the vegetation of Australia today—our great acacia, eucalypt, paperbark and mangrove forests. In them are intimations of the beginnings of the marsupials, of the age of flowering plants, of the development of song birds upon the Earth and of how the continents broke apart.

Indeed, we can now acknowledge that the wet tropical rainforests of north-east Queensland are surviving fragments of actual Gondwana forests and, as such, are among the oldest rainforests on Earth.

For a long time, too, there was some confusion about the actual definition of a rainforest, since there was a considerable difference in appearance between the lush, broad-leaved coastal rainforests and those deep in the Tasmanian cool temperate wilderness, or those *stunted on exposed mountain tops*. Were these 'true' rainforests too?

What is a rainforest?

Whether it be a mainly deciduous monsoon rainforest or a beech-dominated cold-climate rainforest, there are obvious differences that distinguish a rainforest from other types of forests.

One of these is the closed canopy structure of an undisturbed rainforest. This can be dense, where tree crowns are tightly interlocked, or quite mottled to give a quite dappled forest floor. Whichever, the forest system is 'closed', as against being 'open' like a eucalypt woodland. And it is under this closed-canopy situation that rainforest animal and plant species grow, compete and specialise.

This canopy system is the prime cause of those other sensual rainforest characteristics, such as the continuously-high humidity, the soft light and the blunting of temperature extremes.

Then there are the characteristic plants that are rare or absent in other forest types. These include the epiphytes, such as tree orchids; the parasites, such as the magnificent fig trees; the lianes; the variety of mosses and lichens; the ferns, vines and palms; and the trees with special life forms like buttressing of their root systems, strangler figs, flower-fruit that grow out of the trunks and not from branches.

Both the canopy and the understorey systems can be indicative of the type of rainforest they are by the number of layers of which they consist. In the warmer, moister, protected areas, a canopy might often consist of two or more layers of trees and/or a number of tree species. The cooler or higher from sea level you get, the less rich in species are the rainforests and, in consequence, the layers can be reduced to even a single layer.

Where and what type?

There is quite a large number of different types of rainforest in Australia. These occur throughout a wide geographical range, stretching in an arc from the north-west to the south-east through some 6,000 kilometres.

As varying in both structure and floristics as they seem, however, our rainforests form part of a whole that has been whittled away until only one quarter remains of what was standing at the beginning of our European history.

A great deal of what does remain tends to inhabit steep or difficult terrains denying bulldozers the easy access that was possible to lowland and tableland rainforests. These latter types made quick way for coastal development, forestry or agriculture. So much so, that if we could gather all the rainforest in Australia, we would have an area of no more than 70 kilometres in diameter on the mainland and only about 38 kilometres in diameter in Tasmania.

Broadly speaking, the rainforests in Australia range from being monsoonal (north Australia), tropical (Queensland, above 18° latitude), subtropical or warm temperate (Queensland and New South Wales, approximately between 18° and 33° latitudes), dry rainforest (New South Wales), cool temperate (Tasmania), wet sclerophyll with well-developed rainforest understorey in Victoria.

The monsoon rainforests

The monsoonal regions of north Australia are characterised by a number of different types of vine rainforests, or vine thickets.

These are generally medium-leaved systems and are distributed in generally small patches over a surprisingly wide range of country.

There are the evergreen rainforests with canopies up to 35 metres; these can change from being complex in structure around permanent water to quite simple structures in sandstone terrain. There is also the semi-evergreen or deciduous type that survives in seasonally dry conditions, such as coastal dunes.

The wet tropical rainforests

This type contains the most luxuriant communities of rainforests, especially around the wet and humid lowland areas of north-east Queensland.

In this region of rugged mountains and sweeping valleys are found the hardwood giants that have avoided the saw teeth, amongst all the wonders and colour hues of the rainforest of legends.

Characteristically, these forests have densely closed canopies that can be 40 or 50 metres above ground. Beneath is the understorey of the smaller trees and saplings waiting for a break in the canopy. If the canopy remains undisturbed and unbroken, the forest floor will be quite bare of plants, rotting logs, litter, humus and suchlike; if incomplete, the understorey will be quite complex and competitive.

Vines, too, will vary according to disturbance or not, and to such factors as elevation, soil quality, climatic aspect and exposure. In places—where, for example, the eastern slopes of the coastal range have been recently hit by a cyclone—the rainforest is so draped by the faster growing vines that it seems shrouded with a choking green web.

Yet these tropical rainforests can be differentiated from the equatorial rainforests of South America and the Indo-Malaysian regions. Even in some of the wettest country in the world, between Tully and Cape Tribulation (in north Queensland), there is a dry season each year when the rainforests will become almost parched, even to the extent of some of the trees wilting.

Indeed, it largely depends on the length of this Dry as to whether the Australian rainforest can be classified evergreen, or semi-evergreen or deciduous. Apart from these two broad divisions, rainforest communities are further classified as to whether they are complex or simple in structure; large-leaved, medium-sized-leaved, or small-leaved; ferny or vines according to rainfall, drainage, soil fertility, shelter, and height above sea level.

Because of the vast changes to all these factors in such a rugged and mountainous terrain, there has evolved no less than 13 broad categories, further divided into 27 communities in the north-east region of Queensland.

The subtropical rainforest

This rainforest is the major rainforest form that occurs on fertile soil under fairly high rainfall and moderately warm temperatures. It has two basic types: warm subtropical rainforest and cool subtropical rainforest.

Warm tropical rainforests suffered greatly through clearing for development over the decades, because it best developed along the lush alluvial coastal plains. Cool subtropical rainforests occur on higher altitudes, generally, but contain fewer species of animals and plants.

Both types have medium-to-large leaf sizes and characteristically show strangling figs, palms, large woody vines, epiphytes and stem buttressing. These are widespread in south Queensland and northern New South Wales.

An unusual derivative of the subtropical rainforests is the littoral rainforest. Small stands of this occur on coastal headlands and sand dunes. In relatively sheltered places, it grows as low, dense, wind-sheared thicket.

The dry rainforests

The 'dry' rainforests are also known as Araucarian notophyll vine forests or semi-evergreen vine thicket forests, and are generally found on fertile soils under drier conditions. They are of fairly simple structure, normally with two distinct tree layers—a lowish closed canopy above which is a sweep of higher emergents not generally recognised as rainforest trees. Some of these emergents are likely to be such trees as hoop pine, lace bark, teak, ash, silky oak, fig and koda.

You won't find many palms or epiphytes like orchids in these forests, but large vines are fairly common. Mosses and ferns can be scarce in one patch, but quite common in another, especially if it is a cool, montane environment.

The warm temperate rainforests

These are also known as simple notophyll (medium-size) vine-fern forests. They are generally more simple in structure and species than the subtropical rainforests.

Frequently, the canopy is of only one or two emergent species with medium-to-small leaf size. There is very little buttressing of the root system and most of the trees, many of them coachwood, have slender trunks. There is very little visual evidence of palms or woody vines or orchid-like epiphytes. However, small, wiry vines are quite common as are ferns, lichens and mosses.

A characteristic of these types of rainforests is the white ghostly look of the tree trunks. This is caused by the great abundance of epiphytic lichens.

Warm temperate rainforests have a wide north-south area of distribution, from the Atherton Tableland in north-east Queensland right down to East Gippsland in Victoria. They are generally found on higher ground and in poorer soils than subtropical rainforests in the north, but tend towards better soils at lower altitudes at the southern stretches of their range.

The cool temperate rainforests

These are small-leaved (microphyll) moss or fern forests. Their northern range is from the Lamington Plateau in southern Queensland, extending through New South Wales and Victoria to the wilderness of Tasmania.

These communities have an even more simple structure and are normally associated with a single species occupying whole areas of canopy. Even at the lower levels, there tend

to live only a few species. Palms are rarely seen, but ground ferns, mosses and lichen are plentiful.

A major characteristic of cool temperate rainforests is the prevalence of tree ferns (particularly the well-known soft tree fern), and the occurrence of antarctic beech and pinkwood. Here, delicate growths of rich green cloak damp rocks or drape their long curly tangles over tree branches.

In Tasmania, rainforest is usually defined as a system with trees higher than eight metres and dominated by such species as myrtle-beech, sassafras, celery-top pine and King Billy Pine.

Cool temperate rainforests are entirely evergreen, the deciduous dwarf beech being the only exception. This endures in Tasmania, where, in late autumn, it throws its stunning red, gold and orange display against the backdrop of icy highland lakes and towering mountains.

The wet sclerophyll forests

These are forests that have eucalypts as canopy trees, but whose understorey is comprised mainly of well-developed rainforest plants. They occur mainly in Victoria and Tasmania.

This association of sclerophyll and rainforest types is a curious one that relies upon opportunity, rather than on a competitive basis. For example, as wet sclerophyll forests mature, the eucalypt emergents gradually become more sparse and are replaced by rainforest trees.

At this stage, these forests are called mixed forests. In fact, if nature or man left them undisturbed, it would be seen that the mixed-forest stage is a midpoint in the evolution of the forests' becoming full rainforests, with all the eucalypts being displaced. For one thing, the shade-intolerant eucalypt seedlings just cannot survive rainforest competition.

This evolution only rarely comes to fruition over the ages, and, basically, the reason for this is fire. Whether infrequent wildfire or fire planned regime by humans, fire destroys the rainforest plants and encourages the eucalypts. The forests then return to the point on a continuous pendulum swing we call 'wet sclerophyll', with eucalypts in dominant vitality.

They then begin to age; the rainforest species begin to reassert themselves in undisturbed conditions; and the pendulum moves the other way. If fires are too infrequent, the eucalypts will die out and the system becomes rainforest. If natural or man-made fires are too frequent for rainforest recovery, the forests will remain wet sclerophyll—or even become open woodland.

The push-pull with associated forests

In fact, this pendulum swing of rainforest dominance over, and subordinancy to, neighbouring forests has been a feature of the remarkable survival of the Australian rainforest remnants.

Looking back to the time when it broke away from what was left of Gondwana some 90 million years ago, the Australian continent became a kind of life raft for rainforests, because it drifted northwards to warmer climates at the same time as the world was cooling. In this way, the Australian rainforests were sheltered from what might have been disastrous falls of temperature.

In more recent geohistorical times, the rainforests were able to survive the last great ice age (which lasted until only about 8,000 years ago) by being able to retreat into sheltered, well-protected refuge areas, or what are referred to as *refugia*. It was out of these refugia that the rainforest expanded when conditions become favourable again, perhaps because of fewer fire surges or local climate warming. And it was back to the refugia that they contracted when conditions favoured the eucalypt-type or pine-type systems.

Here was, and still is, a natural push-pull cycle with their traditional forest neighbours—a vital concomitancy that is the natural order of things and which came to be mutually beneficial.

We might try to define a rainforest in botanical terms, but, for the animals which move from rainforest to bordering sclerophyll or mangrove forest, the definition is meaningless. Even for survival of the rainforest plants, their system's close affinities with neighbouring systems can be life-necessary. Fire, for example, can do irreparable damage to a healthy rainforest; yet, if that rainforest is surrounded by a fire-liking sclerophyll forest, then what would have been a devastating blaze will be likely to follow the 'tinder path' of the latter, rather than irreparably wound the rainforest.

Traditionally associated forestal systems, then, are of vital importance to not only the health, but also to the very survival of the rainforest systems and their animals and plants. These are the tall, open sclerophyll forests, the open woodlands, the mangrove forests, the melaleuca or paperbark swamps. They form life-supporting corridors into and around the rainforests, which may mitigate the effects of fire, or be home to a species' particular seed-disperser, and so forth.

They are also part of the rainforests' domains through expansion, just as much as the rainforests are part of their domains through contractions. All are interdependent, and all therefore have to be looked at in relationship to rainforest welfare through conservation measures.

It is because of such factors that, for example, the Wet Tropics World Heritage Area of Queensland incorporates sclerophyll, mangrove and paperbark systems that make up one-third of its total 9,000 square kilometres. The associated forests are important to the very health of rainforests there; without them the Wet Tropics rainforests, as a composite living organism, would have been exposed and vulnerable—as indeed would have many of their living inhabitants which exist along the blurred lines of their margins.

It is also why some of the projects funded by the National Rainforest Conservation Program are ones which, on the surface, might seem to have only a tenuous connection to actual rainforest salvation.

The National Rainforest Conservation Program—NRCF

Very soon after the extent, variety and vulnerability of Australia's rainforest mosaic became scientifically evident, the Government moved to cast a protective screen over this valuable national resource.

In 1986, it announced its primary weapon against further degradation as the NRCF by allocating \$22.25 million not only to preserve rainforests, but also to conserve them in a way that took account of their ecological, genetic, cultural, natural heritage, scientific, economic and recreational values.

The Program arose out of the recognition that diminishing rainforests had been the cause of much friction across all levels of society in previous years. Without an agreed strategy, confrontations between economic-health and environmental-welfare proponents were likely to continue.

One result of this realisation was the conference which the Government convened in Cairns in 1984 to uncover the range of community attitudes towards conservation of our tropical and subtropical rainforests. By recognising the need for rainforest protection through Commonwealth policy, the meeting clearly demonstrated that a cooperative approach to rainforest sustainability was indeed possible.

The outcome of this was a Working Party comprising officers from most State and Federal environmental agencies, together with representatives from the relevant peer groups from the private sector. The Group presented its landmark report—a crystallisation of previously disparate and intractable viewpoints—in September 1985. Here, for the first time in matters

of rainforest protection, the Government had an agenda of possible and practical policy options that could be undertaken. This was the sapling from which the National Rainforest Conservation Program grew.

Through the Program, the Government wanted to engender specially-funded projects involving research, surveys, rehabilitation, land acquisition, visitor centres and public information.

With the participation of Queensland in 1990, the Program now covers all Australian States and Territories, including external Territories. The projects range from the large-scale to the small-scale, from involving a local community in conserving local rainforest patches to studying the interaction between flying foxes and the rainforests, from boardwalks for the disabled to major educational information centres.

Almost 200 projects have been funded since the establishment of the Program, and of them, perhaps the saving of the rainforest patch within the limits of the town of Robertson, New South Wales, might be most typical.

The saving of Robertson's rainforest

Robertson is a small town in the Illawarra region of New South Wales. It is a proud and elegant centre, visited by many people each year, and not the least for its potatoes, cheese and pie shop.

Within the actual town limits is a small five hectare patch of rainforest, called Robertson Nature Reserve, which, together with a few other patches on nearby private land, is all that is left of a once extensive 2,500 hectare stretch of both warm and cool temperate rainforests, known as the Yarrawa Brush.

With the funding help of the NRCP, the NSW National Parks and Wildlife Service got together with the local people to form a bush regeneration group within the town. The primary object of the group was to save the central remaining section and to encourage the local land owners to take measures for the other remnants against grazing and exotic-weed depredations.

Meeting regularly to plan, to weed and to carefully restore the degraded areas of the reserve, the group managed to turn around the catabolism of this isolated rainforest remnant to such an extent that, in 1989, they won the coveted 'natural areas managed by Government Authority' section in the State's Tidy Towns Competition.

The cooperation at all levels proved such a success that the NRCP gave further funding to enable access and education of the reserve for all people. A 600 metre loop track was installed with wheelchair access in mind; then interpretative signs were posted and leaflets printed to explain the natural features. Nor did the group forget the importance of the landowners; for them, it produced a pamphlet on the best ways to regenerate their rainforest islands.

The loss of the Yarrawa Brush has been averted.

Of course, it matters that only a small proportion of its one-time glory stands as its monument. But that is better than nothing. The little that is left is also a monument to the changing social attitudes that now put a high priority on avoiding the destruction, or at worse, the impassive neglect, of our land's living bounty of rainforests.

And that, with due governing equilibrium, is what the National Rainforest Conservation Program, as a major national conservation tool, exemplifies.