

Papers in Australian Maritime Affairs

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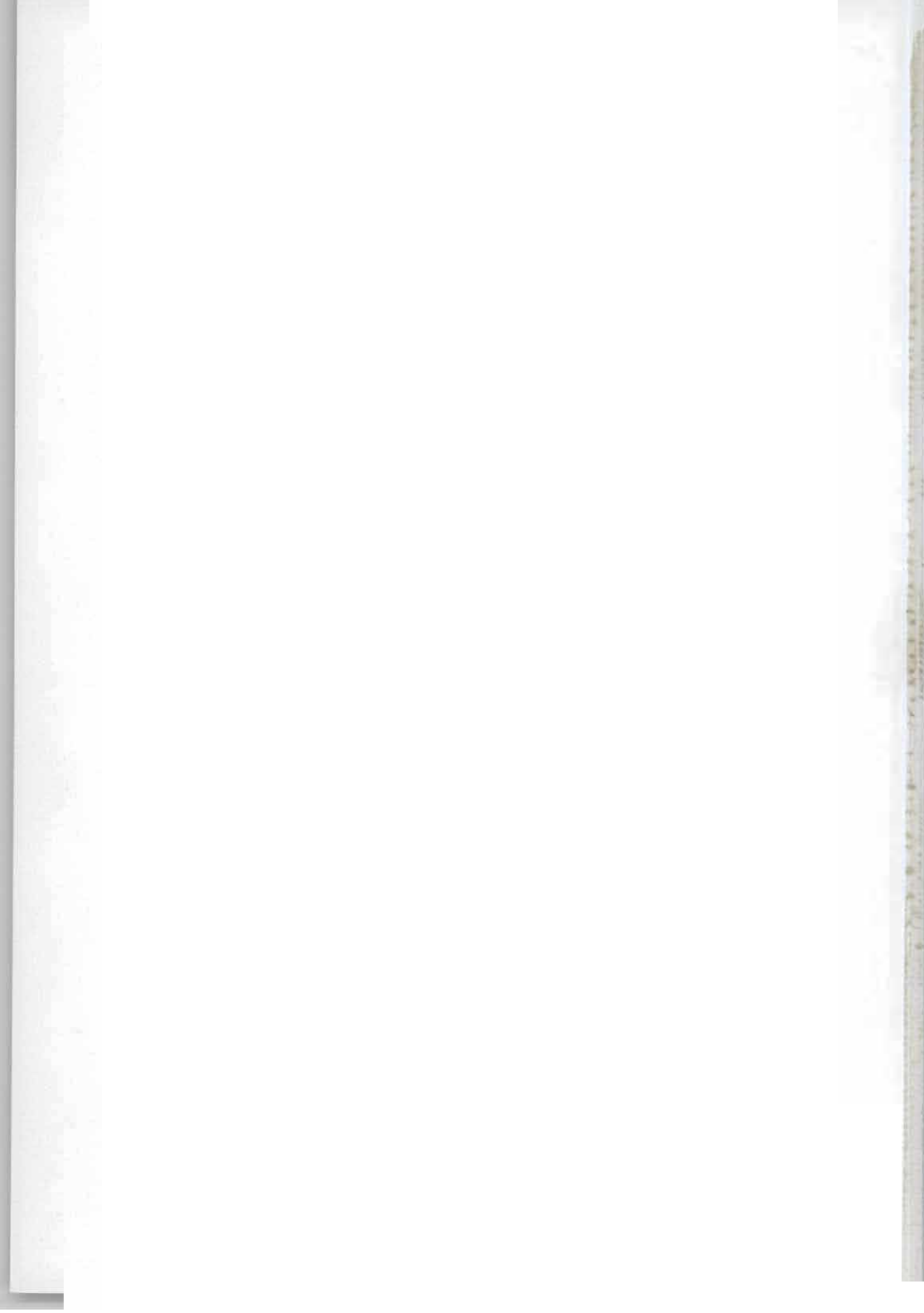


Royal Australian Navy
Maritime Studies Program



**Prospects for
Maritime
Aviation in the
Twenty First
Century**

Edited by David Stevens



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March 1999

General Editor

David Stevens

The 'Papers in Australian Maritime Affairs' series is a vehicle for the distribution of substantial work by members of the Royal Australian Navy as well as members of the Australian and international community undertaking original research into regional maritime issues. Papers will be drawn generally from manuscripts not scheduled for publication elsewhere but that nonetheless merit extensive distribution. An editorial board under the auspices of the Director General Maritime Studies Program considers candidates.

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Dedicated to the memory of Lieutenant Huw Ronald Paffard, RAN (1965–99)

At the time of his death Huw Paffard was providing valuable input into the operating procedures for the entry into service of the RAN's refurbished amphibious transport ships. These will form a key element of the ADF's maritime aviation capability in the 21st century.

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Sikorsky S-70B-2 Seahawks of HS 816 Squadron. (RAN)

Foreword

The RAN's Maritime Studies Program (MSP) continues to produce a level and quality of output, which belie its small size and limited number of staff. One of the more important aspects of its output is the publication of conference, seminar and workshop proceedings; most of which have received generous praise from reviewers around the world.

This latest volume represents the contributions from a range of Australian and foreign speakers who presented their thoughts to a workshop on the future of maritime aviation, held at the Naval Air Station, Nowra on 4 November 1998. In a sense, the publication of the proceedings may not be the most important outcome of the workshop. Quite possibly, the most important outcome was the opportunity taken by a significant number of active naval aviators to set aside their preoccupation with today's issues to focus, if only temporarily, on the future of their profession and how it might continue to contribute to Australia's security.

Even in looking to the future, however, we should not forget the lessons of the past. The conclusion of celebrations marking 50 years of Australian naval aviation only days before this workshop, and the conduct of the workshop in the Australian Naval Aviation Museum gave added impetus to consider what had occurred to naval aviation in those 50 years.

As is the case today, with new aircraft being purchased for the *Anzac* frigates, the *future* of naval aviation has always been bright. Nevertheless, as on many occasions in the past, the *reality* has lacked some of the expected lustre. The Fleet Air Arm was almost stillborn and was subject to financial stringency even in its very early years. Doomed to an early death in 1959, it survived, first through ASW helicopters and then with a rejuvenated fixed-wing force. The long and very nearly successful battle to replace the aircraft carrier, HMAS *Melbourne*, finally ended in 1983, and with it, operational fixed-wing aviation in the RAN. We are still seeing the results of subsequent efforts to establish and maintain a helicopter force: this time capable of operating from the great majority of Fleet units.

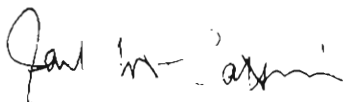
Clearly, one message, which can be taken from our history, is that however bright the future, it is never assured. This is especially important as we consider the future of maritime aviation in Australia; that is naval aviation and those elements of the RAAF wholly or partly devoted to maritime roles.

In our consideration of the likely future, we must concentrate on capability and avoid becoming too attached to platforms. The future is not a matter of whether we should ever have an aircraft carrier again, or of replacing the P-3s. It is very much a question of what capabilities we need to fight a war at sea. So, there must be, for example, questions about the need for surveillance, early warning, strike and anti-submarine warfare forces.

Once we agree on the range of capabilities which the future may demand, we can begin to examine how best to provide them—the platform problem. In doing so, we must be prepared to ask fundamental questions. In this case, for example; can aircraft provide the necessary capability? If so, should they be manned or unmanned; sea or land-based? Of course, such questions lead to others; including affordability of preferred options, and implications if they are not affordable.

The contributors to this volume provide a very useful foundation for anyone who wishes to consider the prospects for maritime aviation into the future. There is a broad range of views: encompassing the grand plans of the USN and the much more modest ones of the Australian and New Zealand Navies. These, in turn, compete for attention with Canadian ideas and the possibly revolutionary plans, which will soon be a reality in Britain.

A crucial issue for maritime aviation in Australia is that those active aviators, who attended this workshop, and their colleagues, should turn their minds regularly to the challenges of the future. By doing so, they will ensure that if it should be bright, then it will be.

A handwritten signature in black ink, appearing to read "Paul H. McCaffrie". The signature is fluid and cursive, with a large initial "P" and "M".

Commodore J.H. McCaffrie, RAN

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D.M. Stevens

David Stevens has been the Director of Naval Historical Studies within the Maritime Studies Program since retiring from the RAN in 1994. He is the author or editor of several books on maritime strategy and naval history including *Maritime Power in the Twentieth Century: The Australian Experience* (Sydney: Allen & Unwin, 1998) and *U-Boat Far From Home* (Sydney: Allen & Unwin, 1997).



Westland Sea King Mk 50A of HS 817 Squadron. (RAN)

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Abbreviations

AAAV	Advanced Amphibious Assault Vehicle (US)
ADF	Australian Defence Force
ADM	Advanced Development Model
AEW&C	Air Early Warning and Control
AFCS	Automatic Flight Control System
AIMP	Aurora Incremental Modernization Project (Canada)
AIMS	Advanced Integrated MAD System
AIP	Anti-Surface Warfare Improvement Program (US)
AOC	Air Officer Commander in Chief (UK)
ARG	Amphibious Ready Groups (US)
ASJIC	Australian Joint Intelligence Centre
ASuW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
AUSCANNZUKUS	Australia, Canada, New Zealand, United Kingdom, United States
C3I	Command, Control, Communications and Intelligence
C4I	Command, Control, Communications, Computing and Intelligence
CAG	Carrier Air Group
CEC	Cooperative Engagement Capability
CF	Canadian Forces
CMS	Communication Management System
CG	Guided Missile Cruiser
CGN	Nuclear Powered Guided Missile Cruiser
CINCFLEET	Commander in Chief Fleet (UK)
CN	Chief of Navy
COMAUSNAVAIR	Commander Australian Naval Aviation Force
CSA	Common Support Aircraft (US)
CSAR	Classification Synthetic Aperture Radar
CTOL	Conventional Take Off and Landing
CV	Aircraft Carrier
CVN	Nuclear Powered Aircraft Carrier
DAA	Defeating attacks on Australia
DCC	Defence Capability Committee
DD	Destroyer
DDG	Guided Missile Destroyer
DEPSEC S&I	Deputy Secretary of Strategy and International Policy
DFA	Department of Foreign Affairs
DFAT	Department of Foreign Affairs and Trade
DGI	Defence of Global Interests
DMS	Data Management System
DND	Department of National Defense (Canada)
DRI	Defence of Regional Interests

DRP	Defence Reform Program
DSTO	Defence Science and Technology Organisation
EEZ	Exclusive Economic Zone
ELE	Estimated Life Expectancy
E&MD	Engineering and Manufacturing Development
ESM	Electronic Support Measures
EW	Electronic Warfare
EWSP	EW Self Protection
EWTS	Electronic Warfare Training System
FAA	Fleet Air Arm
FCBA	Future Carrier Borne Aircraft (UK)
FFG	Guided Missile Frigate
FLIR	Forward Looking Infra-red
FY	Financial Year
GDP	Gross Domestic Product
GPS	Global Positioning System
HF	High Frequency
HMAS	Her Majesty's Australian Ship
HMS	Her Majesty's Ship
IBS	Integrated Broadcast System
ICS	Integrated Communications System
ILS	Integrated Logistic Support
INS	Inertial Navigation System
IOC	Initial Operational Capability
IRDS	Infra-red Detection System
ISAR	Inverse Synthetic Aperture Radar
ITAS	Integrated Tactical Avionics System
JHC	Joint Helicopter Command (UK)
JORN	Jindalee Over-the-horizon Radar Network
JRRF	Joint Rapid Reaction Forces (UK)
JSF	Joint Strike Fighter
JTT	Joint Tactical Terminal
LAMPS	Light Airborne Multi-Purpose System (US)
LANTIRN	Low-Altitude Navigation and Targeting Infra-red for Night
LCAC	Landing Craft Air Cushioned
LIDAR	Light, Detection and Ranging
LOTE	Life of Type Extension
LPA	Landing Platform, Amphibious
MAD	Magnetic Anomaly Detector
MAGTF	Marine Air-Ground Task Force (US)
MEU	Marine Expeditionary Unit (US)
MH	Maritime Helicopter
MHP	Maritime Helicopter Project (Canada)
MMA	Multi-mission Maritime Aircraft (US)
MPA	Maritime Patrol Aircraft
MRO	Military Response Options
NAA	National Archives of Australia

NAF	Naval Air Force
NAS	Naval Air Station
NATO	North Atlantic Treaty Organisation
NLIHT	Naval Lead In Helicopter Training
NSH	New Shipborne Aircraft (Canada)
NVG	Night Vision Goggles
OTCIXS	Officer in Tactical Command Information Exchange System
OT&E	Operational Testing and Evaluation
OTH	Over the Horizon
PAX	Passenger
PRO	Public Record Office, London
PNI	Protection of National Interests
PWD	Planned Withdrawal Date
R&D	Research and Development
RAAF	Royal Australian Air Force
RAF	Royal Air Force
RAN	Royal Australian Navy
RMP	Radar Modernization Program (US)
RN	Royal Navy
RNAS	Royal Naval Air Service
RNAS	Royal Naval Air Station
RNZN	Royal New Zealand Navy
SAR	Search and Rescue
SATCOM	Satellite Communications
SDR	Strategic Defence Review (UK)
SLAM ER	Standoff Land Attack Missile, Expanded Response
SLAP	Service Life Assessment Program
SLEP	Service Life Extension Program
SRP	Sustained Readiness Program (US)
SRX/SRS	Sonobuoy Receiver/Reference System
SSAR	Spotlight Synthetic Aperture Radar
STOVL	Short Take Off and Vertical Landing
TADIL	Tactical Data Link
TMD	Theater Missile Defense
T/M/S	Type/Model/Series (US)
TRU	Transformer Rectifier Units
UAV	Uninhabited Aerial Vehicle
UHF	Ultra-High Frequency
UN	United Nations
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
USW	Undersea Warfare
VCDF	Vice Chief of the Defence Force
VERTREP	Vertical Replenishment
VHF	Very High Frequency



A Douglas A-4 Skyhawk prepares to launch from HMAS Melbourne II. (RAN)

I Australian Maritime Aviation: A Strategic and Historical Context

David Stevens

The number of naval aviation titles on the market continues to increase, so in this presentation I will not go over the details of the who, what, and when of the Fleet Air Arm.¹ Instead I intend to briefly review some of the issues surrounding maritime aviation in the broader context of Australia's strategic thinking. Clearly, this involves not only a review of naval aviation, but must also take full account of the joint service aspects. Before I begin, therefore, I would like to recall just one period in the checkered history of RAN/RAAF maritime cooperation.

Please cast your minds back to the South West Pacific Theatre in May 1943. The Japanese tide had been turned in New Guinea, but the Allied Supreme Commander, General Douglas MacArthur, had yet to start the island hopping campaign that would carry him back to the Philippines. To maintain his offensive MacArthur needed a constant and secure supply of men, equipment and stores. All of these had to travel by sea. And, just as the Allies were interdicting Japanese supply lines, so to, the enemy attempted to cut MacArthur's communications. In fact May 1943 was the height of the Japanese submarine campaign. Despite a system of escorted convoys, eight ships had been attacked off Australia's east coast in less than a month. For an already overstretched domestic transport system any losses were unsustainable. Stockholdings were down to critical levels, and authorities held grave doubts over Australia's continued viability as MacArthur's arsenal, supply and repair centre.

Both the Australian Navy and Air Force played a role in the protection of shipping. The RAN's operational commander, Commander South West Pacific Sea Frontiers, controlled convoys and shipping movements, while local commands allocated vessels for close anti-submarine escort. The commanders of RAAF Eastern and Southern Areas similarly allocated forces, and aircraft flew regular patrols over convoys and important shipping. Stealth was vital to avoid a Japanese attack. At night convoys steamed fully darkened and silent. Commanders sent all movement signals by light before sunset, and any ship careless enough to make smoke or sparks put the whole formation in danger.

Thus one can imagine the naval escort's frustration when they discovered that the Air Force's response to the increased threat level included regular flare drops over individual ships. The procedure had been implemented without warning, and though it undoubtedly enhanced the level of identification it also consistently advertised the

¹ Two recent books include the Australian Naval Aviation Museum's *Flying Stations: A Story of Australian Naval Aviation* (Sydney: Allen & Unwin, 1998) and S. Eather. *Get the Bloody Job Done: The RAN Helicopter Flight Vietnam* (Sydney: Allen & Unwin, 1998).

formation's presence out to 20 miles or more. Of course this was only one of many such problems that arose during wartime joint operations, but it graphically demonstrates the gulf that can exist between two services outwardly engaged on the same maritime task.

To avoid just this sort of unexpected conflict had been the Navy's objective since the earliest days of maritime aviation. Certainly, there should be no argument over the RAN's willingness to embrace aviation as an essential part of sea power. In fact from the RAAF's perspective, the Navy has often been too enthusiastic—over the years making several bids to take sole control of maritime aviation. Each time the Air Force has countered with reasoning based on a guiding principle of aerospace strategy: 'Unity of the Air'. The air environment, the RAAF argued, was indivisible, and the centralised direction of air power at the highest practical level led to its most effective application.² Still the RAN, in practice if not always in words, seems to have remained unconvinced. Not, however, about the need for unity, but about its context. After all, maritime strategists might be seen to have gone a step further than aerospace strategists and have sought continuously to obtain unity of command among all forces operating on, below or above the sea.³

The first steps

As early as July 1913, Australia's naval staff concluded that all Commonwealth services had to work together in the event of a threat from the north. The idea of 'separated strategies' they declared 'is a phantasm of suicidal tendency'.⁴ This statement was made three months before the Fleet first arrived in Australian waters and eight months before the first local trials of a floatplane. Yet RAN planners were already convinced that the exploitation of advanced technology, in the form of wireless telegraphy, the submarine and 'Water-plane', provided the means by which relatively feeble Australian forces could defend against invasion. Any aggressor's weakness lay in their long lines of communications. With effective reconnaissance, Australian forces could avoid the heaviest enemy units, concentrate force where necessary and attack at the most favourable points. Aircraft would act as the eyes of the fleet and by carrying bombs could also deter the enemy's troop transports.⁵

² AAP 1000, Royal Australian Air Force, *The Air Power Manual*, 3rd Edition (Canberra: Air Power Studies Centre, 1998), p. 52.

³ Thus Sir Herbert Richmond's famous dictum: 'Command of the sea is the indispensable basis of security, and whether the instrument which exercises that command swims, floats, or flies is a mere matter of detail'. H. Richmond, *Statesmen and Seapower* (London: Oxford, 1946), p. 136.

⁴ 'Strategical Report with some notes on the preparation for war' by Captain C.H. Hughes-Onslow, Second Naval Member, July 1913. Cited in D. Stevens (ed.) *In Search of a Maritime Strategy: The maritime element in Australian defence planning since 1901*, Canberra Papers on Strategy and Defence, No. 119 (Canberra: Strategic and Defence Studies Centre, 1997), p. 166.

⁵ I. Cowman, "'The Vision Splendid'": Australia, Naval Strategy and Empire, 1911–23', in *In Search of a Maritime Strategy*, pp. 43–66.

In spite of these plans, a major invasion has always remained the least likely of defence contingencies. Expert naval opinion instead argued that Australia's interests were most vulnerable—and could be attacked by a hostile power most decisively—through the interdiction of our maritime commerce.⁶ It followed that Australia's overriding defence concerns were not local, but the blue-water protection of its sea communications. Here, organic maritime aviation could again play an essential role. In effect extending a ship's operational horizon in terms of both detection and response.

During the First World War RAN ships operated with aircraft whenever possible and Australian vessels hosted some of the earliest experiments in maritime aviation. Moving rapidly from reconnaissance to directly offensive missions as aircraft performance improved, by 1918 RAN cruisers had flown armed patrols against enemy raiders in the Indian Ocean, cooperated with airborne spotters during naval bombardments in East Africa, and flown off quick reaction fighters to intercept shadows in the North Sea. By the end of the war no Australian cruiser captain doubted that organic air power added immeasurably to the versatility of his command.

Inter-war planning

Despite their usefulness, aircraft had thus far operated on an ad hoc basis. But back in Australia the Commonwealth Naval Board pushed for something more permanent, they regarded as 'unquestionable' the need to establish a Naval Air Service. The Board had only to refer to Australia's immense coastline to highlight that aircraft were far quicker and more cost-effective in local patrols than surface vessels. The war, moreover, had convincingly demonstrated the value of aircraft in anti-submarine operations, while in the event of direct attack, Australia needed fighters to engage machines launched from enemy aircraft carriers.

Planning in the immediate post-war period included an RAN aircraft carrier to take its place in the British Empire's Far East striking force, while 15 naval air squadrons distributed between Australia's major ports were to provide local defence through a combination of reconnaissance, strike, and control of the air.⁷ Aircraft thus offered a wide range of operational possibilities, but they also had limitations. Many of the latter—such as range and resilience—might be lessened as technology advanced, but aircraft could never offer the degree of presence inherent in a warship. Consequently, rather than seeking to replace its ships, the Naval Board instead stressed the synergistic effect of air power, claiming that in integrated operations an aircraft could increase the effectiveness of a cruiser by at least ten times.

The Army, though, were likewise convinced of the essential role of aviation, while during the war a third party had arisen that advocated the efficient use of air power by an independent Air Service. The Government had no intention of funding

⁶ N. Lambert, *Australia's Naval Inheritance: Imperial Maritime Strategy and the Australian Station 1880-1909*, Papers in Australian Maritime Affairs, No. 6 (Canberra: Maritime Studies Program, 1998).

⁷ A. Stephens, *Power plus Altitude: Ideas, Strategy and Doctrine in the Royal Australian Air Force 1921-1991* (Canberra: AGPS, 1992), p.16.

three, or even two separate schemes. The arguments surrounding the RAAF's establishment in 1921 have been well covered elsewhere.⁸ But essentially the Navy felt that air power brought a unique contribution to its responsibilities, and were extremely reluctant to lose single-service control. Threats to Australia, the Naval Board pointed out, must either occur at sea or come from the sea, and so the nation's defence was 'prima facie a naval problem'.⁹ Yet, as the Board consistently warned, a non-naval air service would almost certainly ignore maritime aviation in favour of its independent role.

Indeed, though the RAAF was explicitly subordinated to the Navy and the Army during the inter-war period, the struggle for control of maritime aviation endured. Service rivalries were magnified first by the Government's post-war policy of minimum defence expenditure, and subsequently by the impact of the Great Depression. To its credit the Air Force attempted to cover a variety of roles, but with all budgets drastically reduced, naval cooperation would never rate so highly as independent development. The few seaplanes the RAAF possessed during the 1920s were not embarked in the cruisers, and even plans to station them in Sydney for fleet cooperation were soon abandoned on economic grounds.

In the context of the times it is hardly surprising that most Australians saw no hope of either funding or organising an adequate defence. Instead, between the wars the nation placed its faith in imperial sea power in general, and the deterrent value of the British Main Fleet in particular. It followed that a major direct attack could be ruled out when considering preparations for Australia's defence. Locally the worst that might be expected were diversionary raids, and the nation's greatest vulnerability continued to be its sea communications. The history and ultimate failure of what is often referred to as the 'Singapore Strategy' is a separate subject.¹⁰ But whatever the plan's merits the RAN's involvement provides another useful illustration of different service perspectives.

HMAS *Albatross*

In 1925 the Commonwealth Government announced the local construction of a seaplane carrier, but like many procurement decisions the reasoning was more party political than strategic. In this case it was an afterthought, and reflected both the Government's desire to keep Cockatoo Island Dockyard employed and a means to deflect criticism from an earlier decision to construct two heavy cruisers in Britain.¹¹

⁸ C. Coulthard-Clark, *The Third Brother: The Royal Australian Air Force 1921-39* (Sydney: Allen & Unwin, 1991).

⁹ H.D. Wynter, 'The Strategical Inter-relationship of the Navy, the Army and the Air Force: An Australian View', *The Army Quarterly*, Vol. 14, 1927.

¹⁰ See for example Ian Hamill, *The Strategic Illusion: The Singapore Strategy and the Defence of Australia and New Zealand 1919-1942* (Singapore: Singapore University Press, 1981).

¹¹ See A. Wright, *Australian Carrier Decisions. The acquisition of HMA Ships *Albatross*, *Sydney* and *Melbourne**, Papers in Australian Maritime Affairs, No. 4 (Canberra: Maritime Studies Program, 1998), pp. 1-54.

Nevertheless, having obtained the carrier *HMAS Albatross*, the RAN sought to make best use of the asset.

During the early-1930s RAN War Plans envisioned Australia's best units operating with the British off Singapore. Particular responsibilities for *Albatross* and her seaplanes included countering any steps that Japanese submarines might take to contest the passage of the Strait of Malacca by the British Main Fleet. Thus the RAN played an integral part in the broader Far East maritime strategy, and by protecting shipping and supporting imperial forces the Navy firmly believed it was making a direct and effective contribution to Australian security.¹²

The RAAF and Army on the other hand remained focused on invasion and were unwilling to place so much faith in either the British Fleet or the impregnability of its bases. Differing service priorities were the inevitable result. Although under naval operational control the flight embarked in *Albatross* remained an RAAF unit and the aircraft were manned, serviced and maintained by Air Force personnel. As the full impact of the Depression struck, the RAAF reduced the *Albatross* flight from six to four aircraft. In vain the Fleet Commander protested that successful training would no longer be possible. With reduced capability and no early prospects of effective replacement aircraft *Albatross* paid off into reserve in 1933.¹³

Sea control and trade protection

The struggles for limited finance and continued debate over an appropriate level of local defence did little to engender cooperation between the Australian services. In fact, inter-service struggles at times led to the substitution argument—where technology is claimed to offer other, cheaper ways of doing things—being taken to extremes. In a 1930 defence review the Army and RAAF argued that mobile land forces in combination with an adequate Air Force provided the most cost-effective solution to Australian defence. Hence a separate Australian Navy had no need to exist. Unfortunately, among other matters this reasoning effectively ignored the RAN's broader role in the defence of trade. Although the RAAF suggested that aerial escort could provide sufficient protection for coastal shipping, commerce on the wider Australian Station was left to its fate.¹⁴

Such arguments were not new. In 1925 the Chief of the Air Staff had declared that air power alone could control Australia's sea communications.¹⁵ But from the Navy's perspective, the RAAF had never given any real thought to the problem, and

¹² See D. Stevens, 'The Royal Australian Navy and the Strategy for Australia's Defence, 1921-42', in *In Search of a Maritime Strategy*, pp. 67-86.

¹³ See R. Jones, *Seagulls, Cruisers and Catapults* (Hobart: Pelorus Publications, 1989), pp. 60-4.

¹⁴ For a recent analysis see M. Bailey, 'The Australian role in the development of a worldwide Imperial trade control and naval intelligence system 1919-39', in D. Stevens (ed.) *Maritime Power in the Twentieth Century: the Australian experience* (Sydney: Allen & Unwin, 1998), pp. 68-84.

¹⁵ Stephens, *Power plus Attitude*, p. 28.

certainly underestimated the difficulties. Sea control involves both sea *denial* and sea *use*, and though the RAAF unquestionably had a role in *denial* its ability to maintain *use* was far less certain. In the Naval Board's opinion using air power to force every doubtful vessel into port and drop a 'warning bomb' on any which failed to comply was simply not enough. Neutral merchant ships after all, were not obliged to respond, and even friendly ships were extremely hard to identify during the day and virtually impossible at night. Hence only a surface ship could provide effective sea control; complying not only with international law, but also offering a system of visit and search that did not disrupt the flow of friendly trade.¹⁶

The RAN thus maintained its role in trade defence and by the outbreak of war promulgated policy recognised the protection of sea communications as a combined Navy and Air Force function. Air Force tasks included reconnaissance and attack within range of shore based aircraft, while the Navy dealt with offensive and defensive action against enemy ships and submarines. Unfortunately, the earlier debates had left many issues surrounding doctrine, procedures, and command and control unresolved. The Naval Board, for example, held that trade defence was the primary role of the RAAF's reconnaissance aircraft, and on the eve of war sought assurance on Air Force cooperation. The Air Board, though anxious to assist, could not accept the principle of specifically allotting aircraft for one operational function.¹⁷ They wanted the freedom to move aircraft to wherever the threat existed, and were unable to believe that the service Chiefs in consultation would not agree on the most efficient disposal of forces. The Naval Board remained unconvinced, but let the matter rest and in the meantime placed added emphasis on the creation of machinery to coordinate local defence operations.

World War II

Australia entered the war with a command and control system that comprised three tiers, roughly corresponding to the strategic, operational and tactical levels of war. The nation was divided into a number of geographic areas running approximately along state boundaries, and in theory maritime operations were to be coordinated by the Naval and Air Commanders working together in a Combined Headquarters. In practice, however, the arrangements took little account of the existing domestic arrangements. Although the RAAF was organised on the basis of a number of geographical area Commands, the RAN used a far more centralised organisation based on Navy Office in Melbourne. The Navy allocated liaison staff to the headquarters, but operational control continued to reside elsewhere. The result was that Australia's strategic and operational level headquarters became purely Air Force operations rooms.

These systemic problems were never entirely resolved, but with the advent of MacArthur's Supreme Command in 1942 most local problems became irrelevant.

¹⁶ Minute, ACNS to CNS, 19 December 1938. National Archives of Australia (NAA): MP1049/5, 1821/2/78

¹⁷ Letter, Air Board to ACNB, 17 February 1939, NAA: MP1049/5, 1821/2/78.

Australia's subservient position in Allied strategy thereafter ensured that the three services usually worked within American command arrangements. Issues of local defence had not gone away, however, and once Japanese submarines began making their attacks, many unresolved issues reappeared. The different approaches taken by the RAN and RAAF to maritime warfare involved both tactics and operations, and they ranged from such basic matters as the identification procedures referred to earlier to more serious doctrinal differences.

Air power is primarily an offensive weapon and as an institution the RAAF preferred what it regarded as 'offensive' to 'defensive' maritime tasks. Escort operations for convoys came under the defensive heading, and if given the opportunity the Air Force favoured offensive sweeps of focal areas and submarine datums using the maximum application of air power. The RAN in contrast, held that convoys possessed both defensive and offensive value. They provided not only a more difficult target, but also the best focal point. Although the Navy supported independent air operations it always pushed for the RAAF to first meet escort requirements. Both services claimed to be guided by the latest Atlantic experience, but post-war research has left little doubt that escort operations were the most effective measure.¹⁸

Such differences might not have arisen had all trade defence operations been the responsibility of one command, but because enemy operations had been sporadic there had been no definite effort made to assign air units to a coastal command similar to the United Kingdom's Western Approaches. Nevertheless, in early 1944 the RAN suggested that a dozen maritime aircraft should be given up for naval operational control. These together with surface forces were to be organised, trained and operated as a single tactical unit and made directly responsible to the Commander South West Pacific Sea Frontiers. With the war situation improving, however, the urgency had already gone and the integration of surface and air units under the one Australian maritime commander did not occur.¹⁹

The era of forward defence

From the end of the war until the early 1970s Australia worked to a strategic policy that became known as 'forward defence'. Like the inter-war period, Australians felt that alone they could not defend the country from a serious threat, and hence they again required the support of larger allies and the commitment of Australian forces to a broader alliance strategy. Unlike the inter-war period, however, all three services had an expeditionary role, and policy guidance required all forces to maintain much higher readiness levels. Still, though some continuity in strategic thinking remained, so

¹⁸ For what is regarded as 'the most powerful justification of the convoys system ever written' see BR 1736 (51) *Defeat Of The Enemy Attack On Shipping: A Study of Policy and Operations*, a volume of the Naval Staff History of the Second World War. A revised edition was published by the Naval Records Society as Vol. 137 in 1997.

¹⁹ For details see D. Stevens, 'South-West Pacific Sea Frontiers: Seapower in the Australian context' in D. Stevens (ed.) *The Royal Australian Navy in World War II* (Sydney: Allen & Unwin, 1996), pp. 87-99.

too did the problem of matching it to an affordable force structure. The lack of coordination existing within the Australian defence organisation only exacerbated the difficulties.

The end of the war had left the RAN in a vulnerable position. Its major units were obsolescent and no major construction projects were in progress. On the global stage, moreover, there at first appeared to be no maritime enemy. Some critics had already begun to argue that navies had become irrelevant. The immediate threat appeared to be the Red Army advancing over Western Europe, and air delivered atomic weapons provided a new strategic reality. For some it appeared that air power alone could be decisive, and its advocates could plausibly claim that while the use of sea power against a continental foe like the Soviet Union took time, strategic bombing could deliver an immediate 'knockout blow'.²⁰

In Australia there were similar debates, but the Government nevertheless decided to sustain the Navy as a credible contribution to mutual defence agreements. Naval planning envisaged a balanced task force centred on two aircraft carriers, which in the RAN's view had become the primary offensive naval unit. The acquisition of carriers would allow the Navy to conduct independent activity against a variety of threats and outside the range of land-based Australian aircraft. The story surrounding the acquisition of the carriers HMAS *Melbourne* and HMAS *Sydney* is examined in detail elsewhere, but it is apparent that the RAN severely underestimated the financial and manpower costs involved.²¹ Moreover, despite British assurances that the Australian light carriers could operate the next generation jet aircraft, it soon became clear that these would be heavier and faster than predicted. The carriers would thus require extensive modernisation to remain effective, and *Melbourne* suffered long delays and cost increases while building. Additional funds were not available to similarly modify *Sydney*, and after only five years of operations she was reduced to a training role.

The carriers and Australian defence

The carrier saga had many implications for Australia's maritime defence of which I will briefly consider just two. First, were the operational constraints imposed by the light fleet carrier design. These meant that the RAN soon found itself forced to accept that the carriers' primary role would be the anti-aircraft and anti-submarine protection of sea communications rather than front-line power projection. Although many in the Navy found the loss of an offensive role a major disappointment the shift gave the RAN a far more practicable part to play within the Cold War global alliance.

The Soviet submarine threat emerged as a planning consideration in the late 1940s, and with the expected introduction of hundreds of modern long-range, high-speed submarines, the Western Allies feared a worldwide anti-shipping campaign.

²⁰ G.W. Baer, *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990*. (Stanford: Stanford University Press, 1994), pp. 275-6.

²¹ *Australian Carrier Decisions: The acquisition of HMA Ships Albatross, Sydney and Melbourne*, pp. 113-61.

Allied grand strategy accepted the security of the sea communications that linked main support areas with combat theatres as one of its main pillars. Similar considerations influenced Australia's war planning, as along these sea-lanes would flow both the expeditionary forces and the products of the Australian support area. The establishment of the ANZAM (Australia, New Zealand and Malaya) area in 1949 followed by the signing of the Radford-Collins agreement in 1951 formalised Australia's primary responsibility for the protection of sea communications in her own area of strategic interest and gave the RAN a clearly enunciated role. The Navy's contribution to collective defence subsequently progressed through SEATO (South East Asia Treaty Organisation) and the Far East Strategic Reserve. Although only one carrier remained in the RAN's force structure, operating within alliance arrangements the vessel and its air group provided an unmistakable expression of Australian solidarity.

The second implication I wish to consider is the effect of the carrier acquisition on RAN/RAAF relations and cooperation. Unfortunately, I have yet to see any evidence that these were improved. Arguments over who should provide the air component again followed the pattern of the inter-war years. At first the RAAF supported naval aviation, but only under certain conditions. The Air Force strongly argued for unity of effort and maximum flexibility of employment through joint flying training and the unification of overall command. The RAN feared the withdrawal of operational control in national emergency, however, and stressed the uniqueness of naval service and the need to weld a ship's company into a single unit. In 1947 the Council of Defence accepted the naval arguments and the Government subsequently approved the plan for a separate Fleet Air Arm (FAA).

Having lost the battle for control, the RAAF thereafter decided that Australia was effectively operating two air forces, and the air staff did something of an about face. Their later arguments stressed the high cost of maritime air power, the vulnerability of aircraft carriers and the superiority of land-based over comparable carrier based aircraft.²² These arguments often ignored the different roles expected of carrier aircraft, and the synergy of a balanced task force, but disputes over Australia's ability to afford an aircraft carrier would punctuate the defence debate for more than thirty years.

Meanwhile the RAAF's maritime squadrons suffered their own series of problems. In the post-war period the front-line maritime force stabilised at two squadrons, but at first retained no anti-shiping strike capability as the FAA had largely assumed this role. This left anti-submarine warfare (ASW) as almost the RAAF's sole maritime task, and it took some time for the squadrons to become effective. Because of the highly specialised nature of the training the interim Air Force found it hard to stabilise aircrew drafting, and standards were not especially high. Matters were not helped, moreover, by the institutional dominance of fighter and bomber pilots.²³ Throughout the 1950s the RAN correctly perceived the maritime

²² Stephens, *Power plus Attitude*, p. 115.

²³ A. Stephens, *Going Solo: The Royal Australian Air Force 1946-71* (Canberra: AGPS, 1995), p. 412.

squadrons as very much the 'poor relation' or 'Cinderella' when it came to RAAF funding and support.²⁴

Not that most RAN officers tended to examine the subject of RAAF maritime air in detail. Those at sea normally viewed ASW as a close in affair, and relied on the FAA to provide direct air support. RAAF aircraft in contrast were employed on distant or indirect support by an area Maritime Headquarters (MHQ). The Naval and Air Commanders exercised joint operational control through these MHQs, but the effect was to limit direct inter-service dealings almost solely to the staff ashore.²⁵

Not surprisingly there developed a very large and very real difference between the FAA and the RAAF's maritime forces. Their organisation, operating methods, types of equipment, and maintenance systems were each unique. These disadvantages did not go unrecognised by Australian planners and the formation of a joint-service Sea/Air Warfare Committee was intended to engender the closest RAN/RAAF cooperation. As a practical measure in 1951 the Committee recommended Australia adopt British practice and establish a Joint Anti-Submarine School.²⁶ The School's aim was to study common doctrine, practice joint tactics and integrate joint requirements for weapons and equipment, and it soon established an excellent professional reputation.

The development of broader policy, however, was a slow process and not until 1955 did the Sea/Air Warfare Committee look at formulating a joint policy on all matters connected with the control of sea communications. Notwithstanding this progress, the RAN maintained its concern over the lack of resources allocated by the RAAF to anti-submarine forces and the operational difficulties caused by the division of control in the MHQs. In 1959 the Navy examined again the possibility of taking over what it called the RAAF 'Coastal command function'. The issue, though, did not advance. Not because the RAN accepted the RAAF's claims to the indivisibility of air power, but because the Navy realised its own organisation and resources were far too small to support the function.²⁷

Carrier replacement

In the meantime the RAN's maritime air power remained confined to *Melbourne*, with her original aircraft rapidly approaching the end of their useful lives. As the nature of the Cold War became clearer and the possibility of global war diminished the RAN found it harder to justify further operational development in aviation. Military developments in Indonesia, notwithstanding, in the face of a diminishing budget share the carrier led a precarious existence. A more fundamental influence in the 1960s,

²⁴ Paper, 'Assumption by the RAN of RAAF Maritime Function', 23 April 1959, NAA: MP1185/10, 5241/70/14.

²⁵ See 'Command and Control in the ANZAM Region' in *In Search of a Maritime Strategy*, p. 202.

²⁶ Paper, 'The Establishment of a Joint Anti-submarine School in Australia', SAWC, 22 February 1951, NAA: AA5799/1, 173/1951.

²⁷ Paper, 'Assumption by the RAN of RAAF Maritime Function'.

however, was the RAN's gradual move from a force centred on an anti-submarine carrier to one with a more general-purpose capability. Several important improvements were thus made to other areas of the fleet. The introduction of the *Charles F. Adams* class DDGs, for example, with their surface-to-air guided weapons and long-range air-warning radar, in some respects substituted for the obsolescent fleet air defence fighters. Likewise, the development and widespread fit of the Ikara missile system offered an all-weather, long-range, anti-submarine capability.

In spite of these developments the FAA did acquire some advanced capabilities of its own. In 1961 *Melbourne* received a boost with the decision to purchase Mk 31 Wessex anti-submarine helicopters. These offered a highly effective answer to the fast nuclear powered submarine that had so concerned planners in the 1950s. Later the increasing level of conflict in South East Asia and Australia's credit with the United States would allow *Melbourne* to receive another cost-effective enhancement with the introduction of S-2 Tracker and A-4 Skyhawk aircraft. An additional purchase of 10 Skyhawks in 1970 was even justified on the basis of a need for an 'offensive' role for the carrier. Later still, the Wessex were replaced by Mk 50 *Sea Kings*, but as the RAN entered the 1970s there could be no doubt that *Melbourne* was on her last legs. The replacement carrier project extended from 1970 to 1983 and eventually settled on the acquisition of a relatively small platform to operate ASW helicopters.²⁸

Much of the parliamentary debate still ran along party political lines. While in power the Liberal/Country Party Coalition stressed the proposed carrier's operational flexibility. They pointed to Australia's long sea routes and argued the need to ensure an adequate ASW capability outside the range of land-based aircraft. The Labor Opposition countered that the proposed carrier did not project 'sea-air power' and that evasive routing would offer sufficient protection to overseas shipping. Closer to home Labor returned to the arguments of the inter-war period, and suggested that submarines and land-based air power provided the most cost-effective means of national defence. All parties found the cost of carrier aviation daunting, but only the change to a Labor Government in 1983 put a definite end to the matter.

The subsequent decisions not to replace *Melbourne* and to disband the fixed-wing FAA, hit the Navy hard. In addition to the cultural shock there remained the practical problems surrounding the provision of air cover at sea and how best to deploy the *Sea Kings*. Many proposals were made, but appropriate solutions were not always found. Nevertheless, for many years the RAN had sought to improve the effectiveness of its maritime air power through the provision of more flight decks at sea. There were a couple of false starts to small ship helicopter operations during the 1960s and 1970s, but as *Melbourne* ran down the FFG acquisition gathered pace. With the arrival of the S-70B-2 *Seahawks* the RAN has since witnessed the acceptance of a helicopter capability as fundamental to modern surface operations. A single ship's operational horizon is now measured in thousands of square kilometres.

²⁸ Wright, *Australian Carrier Decisions: The acquisition of HMA Ships Albatross, Sydney and Melbourne*, pp. 165-74.

and its organic air power is integral to the effective function of sensors and weapons systems in virtually every aspect of maritime warfare.

Over the same period the RAAF's maritime capabilities have made a comparable series of leaps. The successive introduction of advanced long-range maritime patrol aircraft and updated equipment has made the RAAF an essential player in all forms of maritime operations. Furthermore, as professionalism in the squadrons has improved maritime issues have been taken more seriously by the Air Force organisation as a whole. Even the F-111, ordered in the 1960s as a strategic bomber, developed a maritime strike role in the 1970s and today remains the region's premier interdiction aircraft.

Self-reliance

Australia's strategic thinking has also undergone a fundamental change. Forward defence was never a complete success, and when combined with Allied withdrawal and the increasing political and military complexity of our region it became obvious that Australia's Vietnam era force structure had become seriously skewed.

Gradually Australian strategic planning began to reassert the primary requirement to defend the nation without outside help. Certainly, by the time of the 1976 Defence White Paper there was no doubt that force structure planning could not be based solely on expectation of overseas contributions. The pronounced shift towards self-reliance brought back into focus Australia's enduring geo-strategic setting. In particular, that enemy attacks would most likely be directed against, or come through our northern maritime approaches and offshore territories. As the 1987 White Paper remarked, the 'basic facts of geography highlight the fundamental importance for Australia of maritime forces capable of preventing an enemy from substantial success or control in those areas'.²⁹

The term 'maritime forces' included both naval and air forces, and though the terminology has continued to change the most recent defence policy papers have not fundamentally altered the underlying concepts. Whether part of layered defence, defence-in-depth, or depth-in-defence, the current ADF military strategies continue to have a clear maritime focus. Hence the priority given to maritime operations and capabilities has remained, and as we will hear later, the ADF's already formidable maritime aviation capabilities will be further enhanced in the future.

Conclusions

I hope that I have given you some insights into the way Defence has viewed maritime aviation in the past and highlighted a few of the recurring problems. We should remember that whatever its technological edge the ADF remains a small defence force. Although platforms must be inherently flexible the unnecessary duplication of

²⁹ *The Defence of Australia 1987* (Canberra, AGPS, 1987), p. 21.

capabilities is simply not affordable, and there must be clear and agreed arrangements for delivery of air support across command and environmental boundaries. The revised ADF command arrangements that began implementation in 1996 aim to achieve this through unity of command at the operational level.³⁰ One can only hope that they are achieving their aim, and that the business of control in the maritime environment is increasingly seamless.

Endorsed strategic guidance exists, and the ongoing promotion of joint operations bodes well, but this audience is far better qualified than I to assess how well the ADF's maritime air power operates today. In particular, I would ask you to consider whether we have yet moved far enough towards an all-inclusive maritime strategy. A strategy, moreover, that recognises the importance of both sea *use* and sea *denial*, and a defence culture that sees past the platform and concentrates instead on the capabilities it offers.

³⁰ C.J. Oxenbould, 'In Search of a Maritime Strategy: The Maritime Commander's Perspective', in *In Search of A Maritime Strategy*, pp. 143–50.



An RAAF F-111 armed with two Harpoon anti-ship missiles. (RAAF)

2 The Future of Air Power in the Maritime Environment

Alan Stephens

It is important that I let you know from the very outset that the general thrust of my presentation is predicated on my belief that the way in which we think about, prepare for and conduct conflict is undergoing, or at the least is on the verge of, radical change; and that in the main, that change will be effected through aerospace capabilities.

Whether or not we wish to refer to this change by its common title of a 'revolution in military affairs' matters less than that we acknowledge the fundamental shifts which are occurring. Those shifts are occurring essentially because of the microchip, which in turn is making possible remarkable developments in intelligence, computing and communications systems—that is, in our ability to look, share, analyse and understand.

I believe that any attempt to prepare for the future should also embrace two additional pivotal developments: first, the emergence of the United States as the sole remaining superpower, an occurrence which gives America unprecedented power and authority;¹ and second, the rapid globalisation of international affairs, most notably in trade and financial markets. My point here is that I see both of those developments as forces for stability and good, a judgment which must affect my assessment of military affairs.

Against that background, I am pleased that the subject I have been asked to talk about is 'the future of air power in the maritime environment' and not something along the lines of 'the future of naval/maritime aviation'. Let me quickly add that I am aware that Commander Di Pietro is going to address precisely that topic later in the program and, as the Deputy Commander of Australian Naval Aviation, it is entirely proper that he should. But I think it will be more useful for the proceedings if, in the first instance, I try to sketch a broader picture of developments in military affairs, with special reference to aerospace activities in the maritime environment.

Let me caution, though, that I am not going to get too tied down in matters maritime. One of the distinguishing characteristics of modern air power is, after all, its relative disdain for specific operating environments. The combination of technology, in the form of advanced aerodynamics and engines and modern flight, navigation and weapons systems, and the innate ability to bypass geographic obstacles, have largely made the term 'environment' obsolete for the airman. Night or day, good or bad

¹ For a lucid examination of this as yet largely ignored subject, see Coral Bell. *The American Alliance and the Revolution in Military Affairs*. (Sydney: The Australian Centre for American Studies. 1998).

weather, over land or over sea—it is all fairly much the same. (In saying that, I do, however, acknowledge that the demand placed on aircrews for specific and diverse skills—precision strike, air combat, reconnaissance, anti-submarine warfare, and so on—within that single environment is probably stronger and more taxing than ever.)

The fact is that aerospace forces have become extraordinarily pervasive. At a conference convened by the Royal Australian Air Force in March this year in Canberra, the commander of the world's pre-eminent air power, General Michael Ryan of the United States Air Force, flagged the probability that, early in the 21st century, American forces will be able to 'find, fix, track, target and engage anything of significance in near real time', a capability which not only has profound implications for the conduct of conventional warfare, but which also should represent a major step forward in countering threats which hitherto have been far more difficult to contain, such as terrorism and international crime.²

Perhaps I could suggest that that particular development represents the first issue arising from my presentation, and that it is one which all military aviators, including those from navies, should take into account when they ponder their prospects into the 21st century.

I want to expand on my general theme of the growing influence of aerospace power on national security and military forces by referring to an article which appeared in *The Canberra Times* a few months ago.

'The Australian Army is in crisis', wrote retired army Brigadier Brian H. Cooper in July 1998.³ Better known for a series of reactionary articles on defence published elsewhere under the apt pseudonym of 'Genghis Khan', Cooper blamed an alleged army identity crisis on the combination of a flawed national defence strategy, which gives priority to air and sea forces over land forces,⁴ and inadequate defence spending generally. Whether or not Brigadier Cooper's description of the Australian Army's psychological condition was accurate is a matter of opinion, but if a series of apparently troubled attempts to redefine the place of land forces in the defence of Australia can be taken as an indicator then, at the least, the Army does seem to have been gripped by a degree of strategic and intellectual uncertainty in the recent past.⁵

Army historian and strategist Michael Evans unwittingly put his finger on his service's essential dilemma in a paper he wrote in February this year titled

² General Michael E. Ryan, 'New World Vistas: USAF Air and Space Power for the 21st Century', in Shaun Clarke (ed.), *Testing the Limits*, (Fairbairn: Air Power Studies Centre, 1998), pp. 13-24.

³ Brian H. Cooper, 'Constant reviews put army in crisis', in *The Canberra Times*, July 21, 1998, p. 9.

⁴ Department of Defence, *Australia's Strategic Policy*, (Canberra: Defence Publications, 1997).

⁵ For summaries of this, see Kevan Wolfe, 'Army 21 – A New Culture for the Australian Army', in *Asia-Pacific Defence Reporter*, May/June 1996, pp. 8–10; Kevan Wolfe, 'Regular Army and its Reserves – A Cultural Change Needed', in *Asia-Pacific Defence Reporter*, July/August 1996, p. 22; and Brigadier Peter J. Dunn, 'Time x Technology x Tactics = RMA', in *Defence Force Journal*, January/February 1996, pp. 11–18.

'Manoeuvre Warfare and Operational Art'.⁶ Dr Evans finished a section of his paper in which he argued that military (by which he meant 'army') thinking has become archaic, in comparison to the evolution of technology, by rhetorically posing his central question: 'How could twentieth century military practitioners direct the use of military power into a form which could meet political objectives without stalemate, attrition and huge casualties?' In the margin of the copy of his paper I saw, a previous reader had provided the answer in two words: 'Air Power'.

Please note, and let me emphatically stress, that the answer was not 'air forces', it was 'air power'. The distinction is crucial, as the issue here is not the relentless, corrosive inter-service rivalry which has blighted Western defence forces since the rise of air power in World War I but, rather, the effective application of *combat* power by *joint* forces. By the same token, let me emphatically stress another point: 'joint' and 'combined' do not mean 'equal': what they do mean is a rational mix of air, land and sea power in whatever balance produces the maximum combat effect.

The point which commentators like Brigadier Cooper have failed either to comprehend or accept in the face of compelling evidence is that in the course of the last eighty years (an extremely brief period, incidentally, in the history of warfare) the balance of the relative contribution made by land, sea and air power to the effective generation of joint combat power has been constantly changing, with the shift being away from massive, attritional, slow-moving, slow-acting, largely one-dimensional capabilities towards their diametrical opposite. If that evolution has eluded Brigadier Cooper, it has been crystal clear to those admirals and generals who, for the past half-century, increasingly have sought to replicate within their navies and armies the kinds of capabilities which originally were the prime preserve of airmen: capabilities which commit relatively few combat forces to achieve such outcomes as fast broad area surveillance, real-time reconnaissance, rapid reaction, control of the air, deep strike, and domination of the surface, all increasingly characterised by precision and high speed. A review of force structure developments in the land and sea arms of advanced defence forces since World War II will show almost without exception enormous growth in air power capabilities.

As the adage goes, what we do is far more revealing than what we say. It is no coincidence that in the Pentagon today the most bitter turf battle is being fought out between the United States Air Force (USAF), the United States Navy (USN) and the United States Army over who will own and operate the emerging missile capabilities associated with theatre deep strike and anti-missile defence—roles which in the past would have been regarded as the natural preserve of the Air Force and which we customarily have titled 'strategic strike' and 'control of the air'.

The fact is that we are now at the apogee of the era of 'traditional' or 'conventional' air power; that is, air power which is delivered primarily by piloted, air-breathing platforms. Again, however, let me qualify that judgment. My use of the term air power 'era' does *not* mean that air power is the weapon of only choice, or that air

⁶ Michael Evans, 'Manoeuvre Warfare and Operational Art'. (Canberra: Land Warfare Studies Centre, February 1998).

power can invariably play the decisive role across the full spectrum of activities which a modern defence force should be prepared to confront. Plainly, that is not the case. It is to say, however, that, right now, air power is the dominant battlespace force and the informed commander's weapon of first choice. Any joint force commander who in the first instance does not seek to base any campaign on air power's unique combination of speed, precision, reach, lethality and casualty minimisation had better have some good answers ready if alternative options are tried and fail.

Whether or not that power is projected by people wearing blue, white or green uniforms is irrelevant, as long as they do so effectively.

I want to return to the subject of battlespace dominance shortly, but first I want to relate the comments I have made so far more directly to maritime aviation. If you accept the argument I have made, you would also have to accept that, whatever form maritime aviation may take in the coming decades—fixed-wing, rotary-wing, ship-based, shore-based, space-based, whatever—the individual platforms, weapons systems and combat support base which comprise that 'maritime aviation' must reflect the characteristics I have just described.

Let me explain further by translating that generalisation into specific Australian Defence Force (ADF) capabilities. Within the setting identified by our current defence policy, which gives priority to defeating attacks on Australia, and then to defending our regional interests,⁷ an aircraft carrier, for example, is the antithesis of those characteristics. Indeed, I would suggest that the history of modern conventional warfare since the Falklands conflict in early 1982 indicates that the place of major naval surface combatants generally in wars in which both sides have access to adequate numbers of air-launched missiles is problematic. The one scenario which provides an exception to that rule would be conflicts in which surface combatants operate as part of an alliance fleet incorporating the United States, the only military power presently capable of providing the necessary extraordinarily complex and expensive air defence screen.

Again, that is a judgment which contains clear implications for the future development of maritime aviation.

Before you send out for the tar and feathers, let me try redeem myself, in part at least, by suggesting that we need to reflect on the setting against which I have made that judgment, namely, major conventional warfare; and that when we do so, we will see a central, continuing, and long-term place in Australian security planning for surface ships and naval aviation.

I believe it is proper that Australian defence policy should, for the time being, give priority to defending the homeland. These are uncertain times, following the collapse of the bipolar balance of power, the possible rise of regional hegemons with unpredictable agendas, and the unexpected onset of a global economic crisis. We need to be prudent in our defence outlook. But at the same time, 1998 is not 1942, and

⁷ *Australia's Strategic Policy*, 1997.

even the most xenophobic Australian would surely find it difficult to postulate a genuine military threat to our continent. I cannot accept that a world in which the Cold War has evaporated, in which Soviet communism has imploded, in which senior Chinese officials attend Australian and American military exercises, in which international and regional associations such as the United Nations, the Association of South-East Nations, and the North Atlantic Treaty Organisation have enormously enhanced constructive relationships, in which there is clear recognition that some kind of collective global economic responsibility is needed, and so on, is not a more stable place than it was half a century ago.

Personally, I think the possibility of the Australian continent being invaded or physically attacked by a foreign power is so remote as to be incredible. Also incredible is the notion put forward by some naval lobbyists of a sustained interdiction campaign against the sea lanes which are the life-blood of our international trade, a thesis which demands very large expenditures on otherwise questionable military capabilities. And in any case, faster, cheaper and more effective military responses than fighting a miniature battle of the Atlantic now exist to counter those kinds of pressures.

That is not to say there are no serious threats to our national well-being. On the contrary, there is; and they are numerous and diverse. It is far from original for me to suggest that the most likely of those threats will take the form of illegal migration flows, illegal fishing and other raids on our maritime resources, global terrorism, ethnic or 'tribal' violence (a category which could include the kinds of racial wars currently being fought in the former Yugoslavia, or the activities of urban street gangs), the proliferation of weapons of mass destruction, drug running, organised crime, introduced exotic diseases, and so on.⁸

In that latter view of the future, the defence/security equation changes significantly, as it is a view in which defence forces will be most useful when they are used to patrol, watch, monitor, protect and arrest; and those are jobs in which there is a central role both for corvette/destroyer sized vessels and their attendant aviation capabilities, some of which are presently resident in the Royal Australian Navy.

And to continue my bid for redemption with the naval community, we must also consider the third priority for ADF activities listed in *Australia's Strategic Policy*, 'supporting Australia's global interests'. Personally, I strongly believe that we have obligations as good global citizens, and that those obligations include forceful military action where appropriate. It is axiomatic that the ADF would only participate in such military actions as a member of a coalition, almost certainly under the leadership of the United States. Thus, once again, the defence/security equation changes, as a consequence of which so do force structuring considerations.

The recently-released British *Strategic Defence Review* provides a good example of the way in which emphasising global interests rather than local defence can

⁸ For the most original presentation of this argument, see Martin van Creveld, *The Transformation of War*, (New York: The Free Press, 1991). See also Graeme Cheeseman, 'Alternative Futures', in Clarke, *op. cit.*, pp. 55-76.

influence force structuring.⁹ The key features of the proposed changes to the British armed forces as a consequence of that review are threefold. First, joint operations will be the accepted *modus operandi*. Second, sustainability will be increased. And third (and this is the main point), because of the priority attached to off-shore operations, force projection will be considerably enhanced, in part through the planned acquisition of larger and more potent ship-based, offensive maritime air power capabilities.

Central to the concept of operations outlined in the British review, as I read it, is the assumption that the protection against missile attack which major surface units operating in high-risk environments must have will be provided by American forces. That same protection can also be assumed for any ADF units which might operate as part of a 'good global citizen' coalition force, but it cannot be assumed for contingencies associated either with the defence of Australia or regional interests.

Incidentally, while on the subject of the United Kingdom's *Strategic Defence Review*, I note that the document also announced the formation of a Joint Helicopter Force which will combine the battlefield air transport and attack helicopters of the three services, with the aim of strengthening jointery and improving operational effectiveness.¹⁰ I also note that while the Royal Air Force advocated the inclusion of all helicopters in the Joint Force, Army and Navy insisted on retaining some aircraft as single-service assets. Still, the initiative is promising, and seems to represent a genuine step towards true air power jointness, with its associated synergies and efficiencies.

A couple of minutes ago I said I would return to the topic of battlespace domination by modern air power; that is, by air power primarily characterised by piloted, air-breathing platforms. I shall now do so.

The point I want to make is that 'traditional' air power's current warfighting dominance is by no means permanent. Just as various other weapons systems have emerged, dominated, and then been consigned firstly to the second eleven, and ultimately to the rubbish bin of history, traditional air power assuredly has a use-by date. The next tranche of war-winners is already evident: some, like cruise missiles and space-based information systems, are already an established part of force structures; others, like uninhabited aerial vehicles (UAVs), micro air-vehicles, space-based weapons, and knowledge-control systems, are in their early days.¹¹ No air power professional can, however, ignore the implications of those developments.

There should be little doubt that, in time, UAVs will largely supersede manned platforms, at least for high-risk combat operations. The two vital questions at this stage are: when is that likely to happen; and when it does, what will be the consequences for those air services which for eighty years have defined themselves almost exclusively through the image of the man in the cockpit?

⁹ Ministry of Defence. *Strategic Defence Review*. (London: MoD, 1998).

¹⁰ For a detailed examination of this subject, see Martin Sharp. *Command and Control of Battlefield Helicopters*. (Fairbairn: Air Power Studies Centre, 1998).

¹¹ See Michael A. Dornheim. 'Tiny Drones May be Soldiers' New Tool'. in *Aviation Week & Space Technology*, June 8, 1998, pp. 42-8.

Right now there is no need for pilots and observers to panic. While UAVs are already an integral part of a number of developed defence forces, primarily as surveillance and reconnaissance systems, they have a long way to go before assuming centre-stage.¹² Considerable technical challenges still have to be met in such areas as power plants, data transfer links, useful payloads, on-board power generation units, and artificial intelligence. To refer again to General Ryan, at least another twenty-five years of development will be needed before aircrew have to give serious thought to redundancy packages.¹³

At the same time, twenty-five years is not an excessive period in the defence acquisition cycle. Prudent air services will be planning now how they will absorb those vehicles into their order of battle, and what kind of people they will need to command, control and operate them, given that the work-force which has traditionally conducted those activities will not only be smaller, but also may not necessarily be the most suitable.

I suspect that inside the next decade, air services will start to look less for its future battlespace commanders towards people whose prime talent is the ability to physically manipulate a high-performance aircraft, and more towards people who have acute situational awareness skills, an expert knowledge of tactics, strategy, weapons effects and information technology, and strong leadership qualities.

I also want to comment on the enormous importance of space-based systems. Again, this clearly is one of the ways of the future and is something which no airman can ignore. The USAF, for example, could not operate the way it does without its space component. Further, it is the USAF's intention in the coming decade to try to move as much of their strategic surveillance and reconnaissance capability away from manned platforms into space, a development which, if it happens, will irrevocably alter the futures of large numbers of USAF and USN aircrew, as will the near-certainty that, sometime in the coming decades, weapons will be deployed in space.

But, as is the case with UAVs, this will not happen overnight. Although the USAF now officially describes itself as an 'air and space force' rather than simply an 'air force', and sometime in the future is likely to reverse that order to read 'space and air force', any such transition is many years away. Present indications are that today's traditional air power will have in the order of twenty, more likely thirty, years before it is superseded by more exotic forms of aerospace power.¹⁴

A good deal of my presentation has been concerned, either explicitly or implicitly, with knowledge operations. I want to make one last observation on this subject by mentioning an initiative which I think is one of the most important taken in Australian defence since the end of the Second World War, and which, once again, will have a major effect on all ADF air operations.

¹² For topical articles on UAVs, see 'New Roles, Reliability Boost UAV Demand', 'US Studies UCAVs for Risky Combat Missions', and 'US Navy Considers Vertical Takeoff UAVs', all in *Defense News*, September 14–20, 1998.

¹³ Ryan, *loc. cit.*

¹⁴ Ryan, *loc. cit.*

For the past decade or so, the RAAF's operational units have been organised as five groups—Fighter, Strike/Reconnaissance, Maritime Patrol, Air Lift, and Combat Support. Two months ago a new operational group was added—Surveillance and Control Group. It will be this organisation's job to oversight the collection of data, bring that information together, turn it into knowledge, and either use or distribute it rapidly and precisely.

Initially the RAAF will operate Surveillance and Control Group for the ADF. But I expect the results produced by the Group to become so valuable that, ultimately, it may become a national, as opposed to solely a defence, asset; that is, its product will be sought, and productively used, by other national organisations such as the police, customs, immigration, and security services. This would seem to me to be a compelling example of how the theory of knowledge warfare will be turned into practice, and how future developments in, among other things, ADF aviation, will be shaped.

If knowledge warfare has been a persistent theme throughout my paper, then so also has the ineluctable link between concepts of operations and technology. It seems appropriate to me, therefore, that the final point I shall make this morning deals with that issue. That point concerns the growing technological gap between the United States and its allies, a gap which threatens to reach alarming proportions, and which, in my opinion, is central to the future of the ADF and of Australian security.

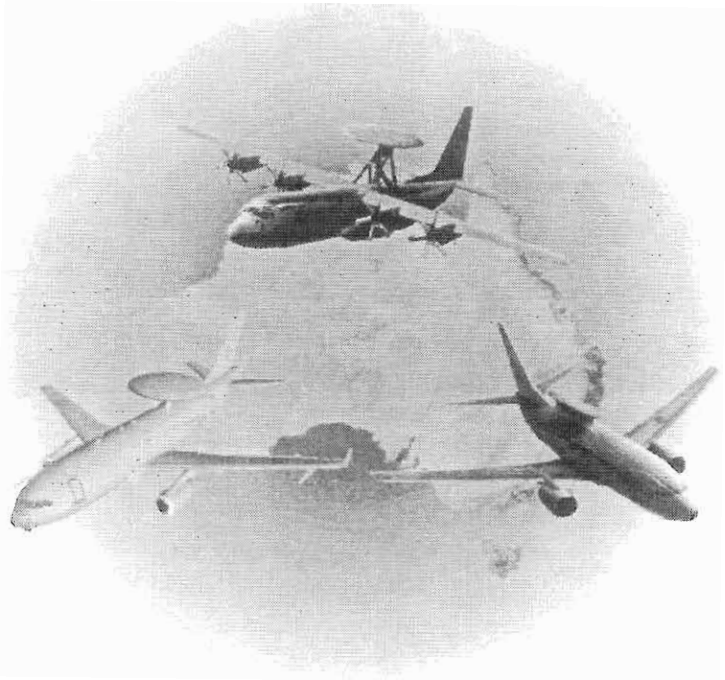
In many of the defence contingencies we plan and prepare for, complementarity with, and the support of, the United States is implicit. Yet as Britain's senior operational airman, Air Chief Marshal Sir John Allison, recently noted, the Americans seem likely to leave the rest of us far behind, to the extent that our military worth in coalition operations may become problematic. The fact of the matter is that none of the United States' allies could mount significant conventional warfare operations without the support of their mentor. To paraphrase Air Marshal Allison, at the global level American forces will do what they will, leaving the rest of us to do what we can.¹⁵ In my opinion, the technology gap is only going to widen over the coming quarter-century.

The difficulties this may create have been recognised in the United States, and steps have been taken to examine the problem, albeit only, I believe, with respect to NATO forces. And to its credit, the Australian Department of Defence reportedly is establishing a joint Office of the Revolution in Military Affairs as part of a continuing program to try to maintain interoperability and a genuine degree of technological parity with the United States.¹⁶

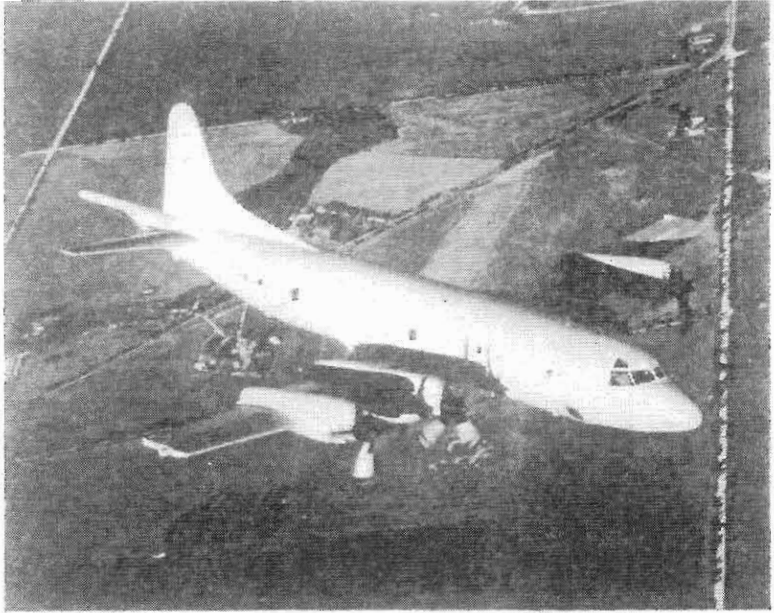
¹⁵ Air Chief Marshal Sir John Allison, 'Future of Air Power - A European Perspective', in Clarke, *op. cit.*, pp. 99-108.

¹⁶ 'US Allies to Face Growing Technology Gap', in *Defense News*, October 5-11, 1998, pp. 1, 34; and 'Australian Coalition's Re-election to Provide Continuity', in *Defense News*, October 12-18, 1998, p. 48.

This evolving challenge raises serious issues of sovereignty and national independence. Let me conclude by observing that, more immediately for this audience, it should also prompt military professionals to think very carefully about the capabilities they believe their forces-in-being possess right now, or might need in the future.



The three contenders for the Australian AEW&C contract. (RAAF)



RAAF P-3C Orion. (British Aerospace)

3 Panel Discussion

CMDR Brett Dowsing, Fleet Aviation Officer

In relation to UAVs, you outlined that the personnel that control these are likely to be of a different persuasion than they currently are. I agree with you. One of the important characteristics you brought out was leadership. Why 'leadership', in that sort of domain?

Dr Stephens

There was a very interesting article in the American weekly Defense News a few weeks ago, reporting on a Red Flag or a Cope Thunder—one of the large Air exercises the Americans host. Of particular note was the exceptionally effective part played in the exercise by a British AEW&C aircraft. Compared to other AEW&C operators the British had developed very aggressive tactics, and there was a description of how they 'fought' their aircraft, to the extent that they pushed the opposing air forces into a corner, where they were, to quote from the paper, 'slaughtered'. Now the essence of that was leadership. The British AEW&C people don't see themselves, as I understand it, as simply collectors and distributors of information. They're battlespace fighters, commanders, leaders: they are running the war. They're thinking about and developing their own aggressive tactics. The person I think will be the key in future aerospace operations—and whether he is Army, Navy or Air Force doesn't matter, and nor does the vision exclude fighter pilots I might add—will have those kinds of skills. They must be leaders because they will be fighting the battle not simply acting as a member of a processing system.

The leadership issue is crucial because there are powerful cultures within aerospace forces. It is no secret that all Air Forces are dominated by fast jet pilots. In my opinion that is a culture that must be changed, if the capabilities that I have been talking about are going to fully realised. Otherwise they will all sit back, I fear, and not get on board in time.

LEUT Huw Paffard, 817 Squadron

You have talked a lot about the new air power, air space, environment and the fact that in the future the USAF will be able to pinpoint, track, attack and kill things wherever they like. I just find, that having been involved in the Gulf War and Bosnia that there are misconceptions. In the Gulf War everyone said that air power reigned supreme and did an absolutely magnificent job, but having been on the ground and confronted a tank, that just wasn't the case. And it was very interesting in Bosnia that there were no cruise missiles used and that we had to extensively use piloted aircraft. Also that we had to have literally hundreds of thousands of troops on the ground to control the situation. We still didn't control the situation. To an extent we controlled only very narrow arteries, very precise areas, but still 90 per cent of the land there

could just be completely run over by one bloke with a Kalashnikov and an RPG 7. I sincerely believe technology can advance things, but I really think that in these sort of situations technology can have trouble combating all those blokes in caves, bush shelters and whatnot. We will probably end up just controlling highways and SLOCs etc. What is your view?

Dr Stephens

To take the Gulf War first. With respect, personally, I'd place more credence on the extraordinarily extensive, and I think largely objective, surveys that have been concluded in the last seven years than your particular experiences at one point on the ground.

Of course it was a complex business, and immediately after the war there were extravagant claims made for air power. But I really do think that it is incontestable that overall the air capabilities—whether they came from ships or soldiers with missiles, or air forces—were extraordinarily effective. I am not going to make claims for aerospace forces in Bosnia that are unrealistic. It's a complex political situation. I think the issues you're raising are valid, they also are issues which have to be assessed in the context of the situation there. What are the objectives? You can't disassociate what your capabilities are achieving from what your political objectives are. I'm simply suggesting that in Bosnia, given what a ghastly mess it is, that carefully defined limited objectives have been on occasions, been successfully achieved.

As to General Ryan's statement that American forces will see, track, target, etc., well, take that up with him. But he is on record as saying that this will happen. Indeed he is repeating his predecessor General Fogleman. It is a claim that the Americans are making without any qualifications.

LEUT Paffard

Sticking with that political point. You are probably going to have to have people in areas to have a political interface. You just can't do that with a UAV or some electronic controller. In unconventional operations like that, we will have to put people in, there has to be politics, and we have to have people interpreting our politicians thoughts face-to-face with people on the ground.

Dr Stephens

I don't disagree with that. How we will do it will change substantially, I think.

SQNLDR Bill Crompton, Air Force Headquarters

I think that the point just raised is vital for air power practitioners. I think we are guilty of situating the appreciation. In many cases we assume that the enemy will fight the way that we wish to do. It is true that we may destroy his air force, but then you are stuck with this person on the ground, or in the trees. With the continuing

urbanisation of rural life, I would suspect that air power is going to be of quite marginal utility against the alternative foe who is prepared to come out of the rubble and fight. We started to get like that at Monte Cassino in World War II, where the more bombs we dropped the more gun positions we made for the Germans. With some of these technological wonders we fundamentally unbalance our response capabilities, depending on the sort of war we are involved in.

Dr Stephens

You have raised several issues there, some of them misleading.

I am basically qualified as an historian, and what I am about to say may not be a good thing for an historian to say. But you have to be cautious in how you apply the lessons of history to the future. To compare Monte Cassino to 1998 is simply irrelevant. It just doesn't apply. I am inclined these days to suggest that, with air power history, we should look at what happened up to 1991, but then say OK, that's good, and move on; that is, we need to know our history but equally we don't need to try to apply it to today. I might add I am not alone in that view of history. It's something that Clausewitz suggested, that all wars up to, I think, the wars of Austrian succession, were misleading, if people tried to apply their lessons. Karl Marx argued the same thing in relation to history before the Industrial Revolution.

The other part of your question on urbanisation, guerilla warfare etc., is a huge issue. One consequence of the Americans' incontestable military advantage, which is largely based on aerospace capabilities, is that it drives potential enemies to asymmetric responses. The question you've got to ask yourself then is: when there is a finite amount of dollars to spend, by maintaining this incontestable advantage, they've at least closed off that option to potential aggressors. No one else, surely, is going to be as silly as Saddam Hussein in the next twenty years. The issue then becomes, how much money do you wish to spend to retain that incontestable advantage, and how much do we divert to try to cope better with the asymmetric response that we are going to see. Now, I don't speak for General Ryan, but my understanding is that this ability to see, target, track, etc., will be relevant to asymmetric responses.

CAPT Cris George, COMAUSNAVAIR

As perhaps betokened by this most recent weekend's celebrations [Fiftieth Anniversary of the FAA] many of us are still locked back in the 1980s with the carrier and the big air groups that were the order of the day back then. I'd like to draw some of the things you've said this morning to a finer point and ask for your comments upon our current order of battle. That is the types of aircraft that we have now and hope to get in the very near future, the way they are equipped, their appropriateness. I was very interested, though you only gave scant coverage, of your mention of the increasing role of what we would call the non-military role, the illegal migration, resource protection etc. Could you bring those two together? The order of battle we're currently getting in the Naval Air Force and its appropriateness to our foreign policy right now?

Dr Stephens

About five or six years ago I attended a seminar convened at Jervis Bay by Admiral MacDougall to discuss the future development of the RAN.¹⁷ The audience was predominantly navy officers, but there was a broad collection of people. Half way through the second day the subject of warfighting had not been mentioned once. And it was at that stage that a senior Navy operational commander said something to the effect: 'What's happening here, are we a coast guard or a Navy?' I've given you my opinion of the warfighting demands the ADF should be prepared to meet. My judgement is there won't be any in the Defence of Australia, but there will be as a good global citizen, and we should be prepared to meet those demands. That has clear implications for how we force structure. Whether or not the Navy wants to focus on coast guard roles is for the Navy to decide. Again in my opinion, the Australian people would get better value for our security dollar from that. I think those non-military threats are far more likely to cause us grief in the future than aggression by a foreign power.

LCDR Leon Voles, Lead Authority Aviation

Some of these theories are based on the idea that the US is the only super-power. There is a theory that in the 21st century there will be a polar-centric power, maybe five or six, and the shift may be into the Asian area and into our region. How do you see that and the emergence of perhaps China as an economic might and a super-power in itself, the threats around the Spratleys, and the ASEAN region? How do you see the development of our maritime aviation power and maritime power towards that appearance?

Dr Stephens

I don't see countries like China and India ever competing with the United States in our lifetime. There is just no comparison in the wealth and intellectual bases of the various countries. The United States has reached an extraordinary level of world domination and I think that we're fortunate that by and large the Americans are benign hegemon. It's good to have someone like that.

I think it's important for the coalition of nations of which Australia has been a long standing and respected member, and which is led by the United States, to maintain sufficient force projection capabilities to exert a presence, to play the good global citizen role wherever necessary. Clearly we're selective, we go in if we might lose our oil, we don't go in to places where reprehensible crimes are taking place. That's life, that's politics. Acting in some places, albeit selectively, is better than acting in none.

¹⁷ Editorial note: proceedings published as *Strategic Change and Naval Roles: Issues for a Medium Naval Power*. S. Bateman & D. Sherwood (eds). Canberra Papers on Strategy and Defence No. 102 (Canberra: Strategic and Defence Studies Centre, 1993).

So, I think it's essential that this coalition continues to be able to perform those roles. And I would like us to be a legitimate, respected, 'day-one' partner, not a second-rate, 'making-up-the-number partner'. So we must maintain the necessary capabilities.

LCDR Grant, Establishments Planning, Navy

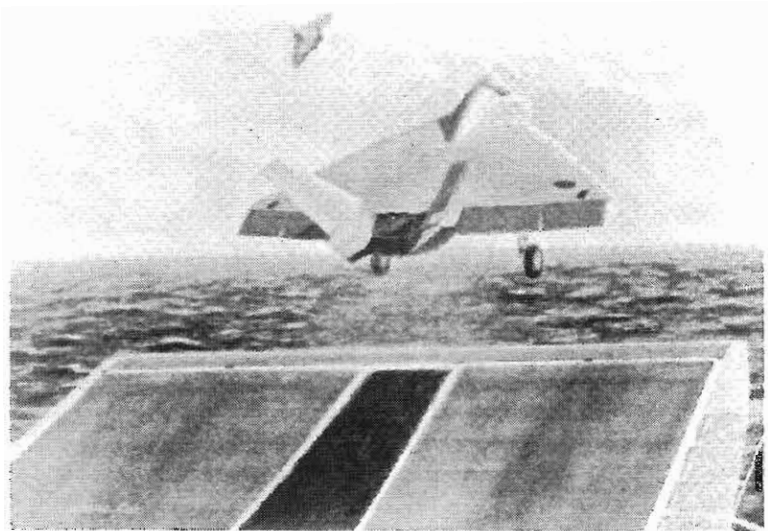
You have talked about the beginning of a new era in technological capability. You touched on the sort of people that are required to use that to the best effect. In all the research that you have been looking at, in what's been happening on that front, are we beginning to consider what sort of people we need to support that and make the best use of it behind the lines? Because at the moment we are going through a lot of change, organisational and personnel. In the way that we employ them and the way that we support our equipment. Are we thinking about that? And in terms of UAVs and the like, we have a window before they really become front line. What sort of window have we got to get the people to support this equipment?

Dr Stephens

I can only take that as an important comment, and add that we need to be preparing for these kinds of changes right now.



RN version of the Joint Strike Fighter. (Lockheed Martin proposal)



RN version of the Joint Strike Fighter. (Boeing proposal)

4 The United Kingdom

Commodore A.J. Lyall, MBE, RN

The UK's recent Strategic Defence Review (SDR) signalled a marked change in direction for the future of the Royal Navy's Fleet Air Arm, a change that will embrace much closer integration with the Royal Air Force and Army Air Corps, resulting in a capability which will more accurately be described as maritime rather than naval aviation. But before we look at exactly what this means, let us take a moment to set the present day and our aspirations for the future in context by taking a brief look back at history.

In 1908 the Admiralty responded to a certain Mr Wright, an American gentleman, thanking him for informing them of his progress in developing flying machines, but regretting that, at present, they could see no practical use for them in the Fleet!

Fortunately, three years later, wiser counsel prevailed and the story of naval aviation began in 1911 when a Mr Francis MacLean offered to instruct Royal Navy (RN) officers in flying, using his own machine. The Admiralty accepted the offer and, from some 200 volunteers, four were selected for a training program. Thus started the Royal Navy's association with air power.

A lesson quickly learned was that shore based aircraft, as they all were in the very early days, simply did not have the range or speed to support the fleet at sea. The answer lay in organic aircraft, initially in the form of seaplanes launched from trolleys and recovered from alongside the ship by crane, and later in operating aircraft from ships specifically designed to launch and recover aircraft while underway. The first proper deck landing occurred in 1917 on the foredeck of HMS *Furious*.

At the end of the First World War the Royal Naval Air Service (RNAS), as it was known then, had some 3000 aircraft and airships, and 56,000 people. But in spite of the burgeoning success and specialist skills of organic naval air operations, the assets of the RNAS (and indeed the Royal Flying Corps) were handed over to the newly formed Royal Air Force (RAF)—interestingly enough on April Fool's day 1918.

Suffice to say here that this did not prove entirely successful, and the RNAS was reformed in 1924 with a mix of RN and RAF personnel, and then placed totally under Admiralty control once more in 1937. It is interesting to note that naval or indeed maritime aviation has a real history of 'jointery', but that the key lesson is that, though it is not a black art in itself, it does require a high level of specialist skill and interface with the ship and maritime environment.

Strategic background

So with that little bit of history in mind, let us move on to the present day, the changed world order and the United Kingdom's response in terms of its Strategic Defence Review.

One of the major themes to emerge from the SDR was the recognition that, given the uncertainty and increasing risks of the post-cold war era, our forces would in the future have to be configured to work much closer together in joint operations to deal with a whole range of situations from peacekeeping and humanitarian duties, through crisis prevention and deterrence, and, if all else fails to conflict.

It was also clear that in order to nip crises in the bud, we would have to be able to move quickly to where that potential crisis was developing. All this led the SDR to conclude that we need to develop our forces to be able to deploy rapidly, to be able to sustain ourselves for considerable periods in the theatre of operations. And to be able to do all this without having to rely totally on shore bases and support from other nations. To meet this challenge a pool of Joint Rapid Reaction Forces (JRRF) will be formed to include assets from all three services. This high readiness pool will provide tailored force packages, which can be deployed quickly when required.

The maritime contribution to joint operations

The Navy is an inherently mobile and flexible force, already well able to adapt to the changing requirements highlighted by the SDR. It can operate independently of the support or permission of other nations, and it can influence events on land from great distance, or from close inshore. And this inherent capability is nowhere better epitomised than by the Fleet Air Arm and maritime aviation. But exactly how are we re-shaping our aviation capability for the 21st century?

Fixed wing aircraft and aircraft carriers

The SDR has recognised the increasing importance of crisis prevention and the likelihood that future operations will require armed forces to deploy away from their home bases to achieve this. When forces deploy we cannot be certain that they would have access to air bases on land in the theatre of operations, particularly in the early stages of a crisis. In these circumstances aircraft carriers offer political and military options (including the threat to deploy, or actual deployment of, offensive air power) which would otherwise be unavailable. The presence of a carrier can also offer a coercive presence, which may forestall the need for war fighting (as recently demonstrated in the Gulf).

In future, however, carriers will need to be optimised to support joint operations across the full range of capabilities. The current three ships of the *Invincible* class were designed primarily for Cold War anti-submarine operations. Whilst these ships have demonstrated their versatility by adaptation for a number of

other roles they are constrained by size and are unable to deliver the significant weight of offensive air power needed to influence events ashore.

Future carriers will need to be optimised primarily for offensive air support (both long range interdiction and shorter range close air support) for joint operations ashore. But they will also need to be able to provide air defence for strategic shipping and forces ashore, as well as being able to operate the whole range of defence helicopters (including the new army attack helicopter). If carriers are to deliver a significant weight of air power, they will need to be able to embark a significantly greater number of aircraft than that offered by the current carriers.

Pre-SDR planning assumed the construction of three carriers of around 24,000 tonnes, but the findings of the SDR, and operational analysis, suggest that ships of around 40,000 tonnes, capable of carrying up to 50 aircraft, would be more operationally effective and versatile than the smaller vessels. We have also determined that, given the larger size and with new technology and lower maintenance requirements, the required operational availability can be achieved from two carriers. Thus the SDR recommendation is to procure two larger carriers of around 40,000 tonnes, each with a capacity to deploy up to 50 aircraft for entry into service post 2010.

Coupled with this recommendation is the proposal to increase the number of future carrier borne aircraft (FCBA) from the previously planned number of 60 to up to 150, reflecting the capacity and capabilities of the larger carriers. Whether the FCBA will be a conventional take off and landing (CTOL) or short take off and vertical landing (STOVL) aircraft has yet to be decided, and a range of options remain for the type and number of aircraft to be operated. We do, however, have a strong interest in the concept demonstration phase of the US Joint Strike Fighter (JSF) program and particularly the STOVL version.

Along with this work, we have been examining the most cost and operationally effective means of commanding and manning the future carrier air groups.

During recent years, there has been increasing coordination between RN Sea Harrier FA2 the RAF Harrier GR7 communities. Regular deployments of RAF Harriers in aircraft carriers have proved the viability of operating the two types of aircraft together in a joint carrier air group.

In order to build on this success. The First Sea Lord and the Chief of the Air Staff made a joint proposal to replace the FA2 and GR7s with a common aircraft type (the future carrier borne aircraft) to be operated jointly by the two services. For this novel concept to succeed, however, there will need to be not only a common aircraft, but also common operating procedures, common maintenance practice, a common support organisation and the development of a joint culture between the RN and the RAF.

Despite appearing very similar, FA2 and GR7 Harriers are in fact very different. There is around only 10 per cent commonality in airframe and avionics and, while the FA2 is primarily an air defence fighter, the GR7 is a ground attack aircraft. Thus, although total integration of these current aircraft into a single force is impractical, closer harmonisation of the existing Harrier forces will pave the way towards a truly joint force for the future.

The new force will be known as Joint Force 2000 and the Secretary of State has very recently announced our intention to form the new command structure in 2000. And this is where the news gets really exciting and radical! In determining how Joint Force 2000 should best be structured it became obvious that we would need to decide whether it would be better to gather the force under the Commander in Chief Fleet (CINCFLEET) to have both the aircraft and ships under a single command (ie under the RN), or whether it would be more effective to have all fixed wing offensive aircraft under the single command of Air Officer Commander in Chief (AOC) Strike Command (ie under the RAF). You might be very surprised to learn that the Royal Navy is particularly keen on the RAF option!

Joint Force 2000 will be directly commanded on a day-to-day basis by an RAF air commodore, but the force will be part of a new fixed wing maritime group to be formed in RAF Strike Command. The group will also contain the Nimrod maritime patrol aircraft and will be under the permanent overall command of a Royal Navy two star officer (rear admiral) who will effectively be the new Flag Officer Maritime Aviation. The strength of this arrangement is that, for the first time, we will have an RN flag officer in a position to influence directly affairs in Strike Command. He will be responsible not only to both AOC Strike and CINCFLEET for the provision of fixed wing carrier air groups and for long range maritime patrol aircraft. But will also be responsible across the three services for all maritime aviation standards and practices. He will be the tri-service head of maritime aviation.

Before going on to describe how this all works in the round, let us look at how the rest of the Fleet Air Arm has been affected by the SDR.

Helicopters

Much discussion in the SDR centred on the scale and nature of the perceived submarine threat in the next century and the level and type of ASW forces we will need to counter it. There has been a marked shift in emphasis away from large-scale open ocean warfare (particularly ASW) to expeditionary operations in the littoral areas. Given this shift in emphasis, it was decided that we would not in future require the previously planned numbers of ASW helicopters, accordingly, the SDR assumed a reduction of 22 (from 66 to 44) in the planned purchase of Merlin helicopters with the cancellation of the second batch of aircraft.

This reduction in the size of the Merlin force has necessitated some amendment to the previous deployment plan, the main effect is that all Merlins will now effectively be deployed from ships and there will be none based permanently

ashore except in training and headquarters support squadrons. The Sea King Mk 6 helicopters at RNAS Prestwick will not be replaced by Merlin when they go out of service. The ASW requirements in the Clyde areas will be reviewed and essential tasks will be carried out on a case-by-case basis by Merlins earmarked from other areas such as training. The SAR task will continue to be fulfilled by Sea King helicopters.

Additionally a number of Type 23 flights planned to be equipped with Merlin will now have Lynx Mk 8 helicopters. The Lynx Mk 8 fleet size will be increased by the conversion of additional Mk 3 aircraft to ensure that all operational destroyers and frigates have an embarked helicopter flight.

The numbers of Sea King ASW and AEW helicopters, and Sea King Mk 4 commando helicopters have been unaffected by the SDR, although the latter will be included in the new Joint Helicopter Command.

Joint Helicopter Command

One of the basic thrusts of the SDR has been to maximise defence effectiveness through greater integration of service capabilities where it makes operational sense. We have touched already on the Joint Force 2000 for fixed wing aircraft, but our commando support helicopters will also join a new joint command. The Joint Helicopter Command (JHC) will be formed by October 1999 to bring all battlefield helicopters (including RN commando helicopters, Army attack helicopters, and RAF support helicopters) under a single joint command and organisation. The new JHC will help maximise the utility of this very busy helicopter fleet by coordinating tasking, engineering support, spares, stores and training.

The JHC will be embedded in the Army's Land Command and will also encompass the new airborne assault brigade. It will be commanded by a two star officer on a rotational basis, the first one being an RAF air vice marshal who is currently engaged in setting up the command structure.

Restructuring the Naval Air Command

So, with the RN fixed wing aircraft moving to Joint Force 2000. With our commando support helicopters coming under overall land command, and with Flag Officer Naval Aviation shifting his flag to RAF Strike Command, the Fleet Air Arm is facing a root and branch re-structure.

The current Naval Air Command as we presently know it will disaggregate. While, the two star and part of his headquarters will move to RAF Strike Command as previously described, the remainder of naval aircraft (AEW and ASW Sea Kings and Lynx helicopters) will be brought under an RN commodore and staff under the overall command of CINCFLEET at the Fleet Headquarters in Northwood. Meanwhile, the RN will also be required to contribute a cadre of staff to the JHC in

Land Command, including on an occasional and rotational basis a two star commander.

At first sight it will appear to many that these changes add up to the demise of the Fleet Air Arm. But in fact, the reverse is probably true. Of course, with major change comes risk but the opportunities are legion. The advent of the new carriers and a much greater number of fixed wing aircraft underpins the future. The positioning of the fixed wing force within the RAF Strike Command poses no threat but means that, at the very highest levels, the RAF will be committed to carrier aviation. But the presence of an RN two star as the group commander ensures that we have the influence and direction to ensure that maritime aviation, and all that goes with it, is given the correct level of representation across the three services.

Conclusions

To conclude, organic maritime air power has been part of our armed forces inventory, in one form or another, continuously for the past 85 years. Although it has been provided principally by the Royal Navy, it is not an exclusive club and we welcome the additional capabilities that the other services and the new joint organisations can bring to the embarked maritime environment. The Navy also welcomes the opportunity to contribute with the experience, knowledge and hard-won skills built up over those 85 years.

The future of maritime aviation remains firmly rooted in plans for larger aircraft carriers and a new generation of fixed wing aircraft. Joint organisations and commands will help ensure that we make the most cost and operationally effective use of our aircraft, and that we take maritime aviation in good shape into the 21st century.

5 United States Naval Aviation: Preparing for the 21st Century

Captain Rivers Cleveland, USN

As Naval Aviation moves into the 21st century we will continue to reflect the realities of the modern world; the challenges to execute multiple missions, globally, with a tailored force is a test of our vision and capabilities. Competition for resources has driven us to seek a balance of affordable, multi-mission platforms, systems, and weapons. New technology, blended with new aircraft will enable us to sustain a warfighters edge, with greater lethality, increased reliability, and enhanced survivability.

Reducing the T/M/S (Type/Model/Series) and transitioning to multi-mission platforms will provide Naval Aviation with a greater mission flexibility, and cost-effective maintenance/logistics.

Enduring Realities for the United States

- Global interests;
- maritime nation;
- reduced overseas bases;
- dangerous world;
- need for flexibility;
- tight budgets;
- leverage of high technology; and
- higher expectations for mission success and survivability.

US Naval Aviation

'Providing a robust and credible forward presence through flexible response and dominant power projection'

Naval Aviation Vision Statement

US Naval Aviation is a multifaceted and versatile warfighting team, consisting of Navy and Marine Corps people, aircraft, organizations, and facilities. Operating from sea and shore bases, Navy and Marine Corps aviation performs a wide range of missions throughout the world. In combination with cruise missile-equipped ships and submarines and the ground combat and combat service support elements of Marine Air-Ground Task Forces (MAGTFs), Naval Aviation can project decisive, dominant military power from the sea.

Navy Sea- and Land-Based Aviation

Within Naval Aviation, the Navy possesses a large and varied force of combat and support aircraft. We are organized into four main communities:

- Carrier Battle Groups;
- Marine Amphibious Groups;
- Long Range Maritime Patrol; and
- Special Missions.

Whether sea- or land-based, the Navy's aviation communities and their aircraft are key elements in the service's ability to achieve its operational and tactical objectives. Most US Navy ships have the capability to support air operations and all naval vessels can be serviced by helicopters.

Surface Combatants and Naval Aviation

Surface combatants such as cruisers (CG and CGN), destroyers (DD and DDG), and frigates (FFG) are capable of launching and recovering the SH-60B Seahawk and other helicopters. Naval Aviation extends the sensor range of these ships, which in turn enhances the capability of shipboard weapons systems. The Light Airborne Multi-Purpose System (LAMPS) combines the SH-60B Seahawk with computer-integrated shipboard equipment to expand the range and capabilities of surface combatants for anti-surface warfare (ASuW), undersea warfare (USW), surveillance, and targeting missions. The tactical options generated by the real-time exchange of data between warships and these helicopters give naval commanders greatly enhanced ability to control the battlespace, especially in crowded littoral regions.

Carriers and Carrier Aviation

Experience shows overseas presence—being there—is clearly the best way to do business. In regions where the United States has significant interests, it is imperative that the United States provide tangible evidence of its commitment, and the means to defend those interests. Our presence and crisis-response centerpiece continues to be the aircraft carrier. The aircraft carrier is a self-contained, self-supporting system that is ready for action immediately upon arrival in crisis areas, independent of overseas bases, infrastructure, or the permission of foreign governments.

To support a continuous forward presence in the 'strategic hubs' of the Mediterranean Sea, Indian Ocean, and western Pacific Ocean would require 15 aircraft carriers. Presently, a force of 12 aircraft carriers (11 active and one operational reserve) meets this requirement at an acceptable level of risk. The current carrier replacement plan, depicted in the accompanying chart, shows how the Navy will preserve and modernize its carrier force in the future

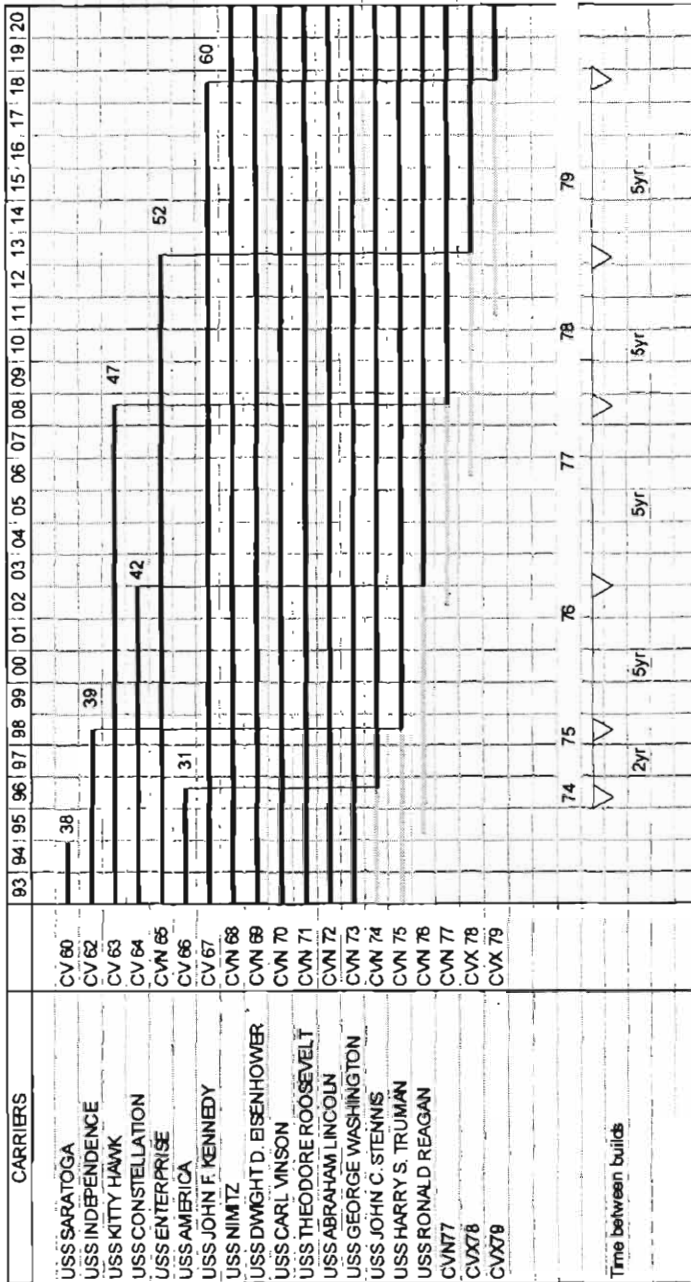


Figure 5.1 – USN Carrier Building Schedule

Over the next decade and a half, the Navy will make the transition from today's *Nimitz*-class carriers to a new carrier class that builds upon new technologies and concepts. The ships of this class will be in service well past the mid-point of the 21st century.

A comprehensive plan to modernize our aircraft carrier force for the next century is based on a dual-track strategy. This strategy includes the modernization of existing carriers and the addition of new ships to the force, creating a phased replacement plan that maintains essential capabilities and force structure. The 'near-term' element of the dual-track strategy is the procurement of the tenth and final *Nimitz*-class carrier, CVN 77, in FY 2002. Scheduled for commissioning in 2008, CVN 77 will replace the conventionally powered USS *Kitty Hawk* (CV 63) after 47 years of service. CVN 77 will be a 'smart' transition ship, incorporating new technologies resulting from research and development efforts that are currently underway.

The second element of the dual-track strategy is the design of an entirely new class of aircraft carriers, now referred to as CVX. CVX is being designed on a 'clean sheet of paper', but will retain the core capabilities resident in our carriers today. CVX will feature improved characteristics in selected areas, such as launch and recovery equipment, flight deck layout, C4I systems, information networks and propulsion systems. These ships also will incorporate features that will make them more affordable to operate. The lead CVX will be procured in FY 2006, and will enter service in FY 2013.

The reshaping of our force structure has had a significant impact on the number, focus, size and capabilities of our air wings. Currently, the Navy operates ten active and one Naval Air Reserve carrier air wings. These are multi-purpose wings, consisting of strike-fighter, reconnaissance, surveillance, electronic combat, anti-submarine, tanker, and search-and-rescue capabilities. In the coming years, carrier aviation's capabilities will increase, even as the composition of its air wings change. The Navy is in the process of 'necking down' the number of aircraft types that fly from carrier decks. Instead of flying a larger number of aircraft types, each optimized for a narrow range of missions, the service is moving toward a smaller force that consists of more capable and more lethal multi-mission aircraft.

F/A-18. Programmed improvements to the original Hornet A/B/C/D variants provide significant warfighting enhancements in the near term, including GPS, Link 16, AIM-9X Sidewinder/Helmet Mounted Cueing System, Combined Interrogator Transponder, Joint Direct Attack Munition/Joint Stand-Off Weapon delivery capability, and a Digital Communication System for close air support. The aircraft's weapons, communications, navigation, and Defensive Electronic Countermeasures systems will also continue to be upgraded.

The introduction of the F/A-18E/F Super Hornet to the Fleet in 2000 will provide critical growth capacity, weapon bring-back improvements, survivability enhancements, and range/payload improvements, all of which are required to keep the strike-fighter force lethal and viable well into the 21st century. There will be extensive

commonality with weapons systems, avionics, and software between F/A-18 variants. The infrastructure needed to support the Super Hornet will build upon existing organizations. Ultimately, the F/A-18E will replace older F/A-18s while the two-seat F/A-18F will replace the F-14. The lethality, flexibility, reliability, and survivability of the F/A-18E/F will make it the right aircraft to fulfill the majority of missions associated with regional and littoral conflicts.

F-14. The F-14 Tomcat continues to be the Navy's premier long-range fighter. The Tomcat's 'Roadmap for the Future'—a plan to incorporate significant performance improvements over the next four years—makes the Tomcat a superb complement to the Navy's current F/A-18 Hornet aircraft. The F-14 will enable the Navy to maintain the desired force structure of 50 strike-fighter aircraft on each carrier deck until it is replaced by the F/A-18F Super Hornet.

The Tomcat is being configured as a potent precision strike-fighter with the incorporation of the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system. With LANTIRN, the Tomcat has an accurate, autonomous designation and targeting capability for the delivery of laser-guided bombs. This system is effective during day or night, and at high altitudes. The first LANTIRN-equipped Tomcat squadron, VF-103, deployed in June 1996 on board *Enterprise* (CVN 65), and all deploying battle groups will now have LANTIRN-capable Tomcats.

Joint Strike Fighter (JSF). The JSF will complement the F/A-18E/F and replace the F/A-18C/D. It is a 'Day one' strike fighter with a single engine/single pilot and very low observable configuration. The focus of the JSF effort is to reduce the costs of developing, producing, and owning these aircraft. The program is accomplishing this by facilitating the Services' development of fully validated, affordable operational requirements, and by lowering technical risk by investing in and demonstrating key leveraging technologies and operational concepts prior to the start of Engineering and Manufacturing Development (E&MD).

In November 1996, designs from two contractors—Lockheed Martin and Boeing—were selected to compete in the JSF Concept Demonstration Phase. This phase will feature flying concept demonstrators, ground and flight demonstrations, and continued refinement of weapon system concepts. Both contractors will demonstrate their design's commonality and modularity characteristics, STOVL hover and transition to forward flight, and low-speed handling qualities. Pratt and Whitney is providing engine hardware for the concept demonstration phase, while General Electric continues its technical efforts to develop an alternate engine source for production aircraft. The Concept Demonstration Phase is designed to lead to an affordable and low risk transition to the E&MD phase in 2001. The first operational aircraft will be delivered in 2008.

The JSF is being designed to meet the requirements of four different customers:

- US Navy:
 - Stealthy, multi-role strike fighter aircraft to complement the F/A-18E/F.
- US Marine Corps:
 - Multi-role, Short Take-off/Vertical Landing (STOVL) aircraft to replace AV-8B and F/A-18A/C/D.
- US Air Force:
 - Multi-role aircraft to replace the F-16 and A-10 and complement the F-22.
- Royal Navy:
 - Supersonic STOVL aircraft to replace the Sea Harrier.

This joint approach to the JSF's development is anticipated to produce significant savings when compared to the costs of separate programs. The government and industry team is converging on a design concept which, when coupled with other technology 'building blocks', will result in continuing US technological superiority at an affordable price.

E-2C. The E-2C Hawkeye is the Navy and Marine Corps airborne surveillance and command-and-control platform, providing battle management and support of decisive power projection at sea and ashore in a joint architecture. In addition to current roles, the E-2C has an active and extensive upgrade and development program to fully prepare it to be a critical element in an overall joint theater and missile defense program.

The Hawkeye force is keeping pace with changing tactical environments via two major upgrades: the E-2C Group II upgrade, and the Radar Modernization Program (RMP). The most advanced Hawkeye variant, the E 2C Group II which is in production today features:

- Extended radar range (40 per cent greater than previous E-2 aircraft)
- Improved overland detection capability Color displays JTIDS, GPS and voice satellite communications.

The next upgrade, the Hawkeye 2000, will install a Mission Computer Upgrade and Cooperative Engagement Capability (CEC), enhancing the E-2's capabilities in the multiple threat environment anticipated in the 21st century. The Mission Computer Upgrade will improve target detection and tracking, and enable the incorporation of CEC.

In turn, CEC equipped Hawkeyes—the E-2C is the first aircraft in the US aviation arsenal to incorporate this system—will significantly extend the engagement capability of surface forces. The CEC equipped Hawkeye is the key to early cueing of the Aegis weapons system, dramatically extending the lethal range of the Standard missile against airborne low-altitude, low-radar cross section targets.

The Radar Modernization Program is developing an advanced demonstration radar for the Hawkeye that will bring over-the-horizon precision, overland detection and tracking to the battle group. This, coupled with CEC, will fully integrate the Hawkeye into the Theater Missile Defense (TMD) and Cruise Missile Defense role. This precision tracking capability in conjunction with the Aegis and Standard missile will allow the battle group to deploy an organic, theater-wide cruise missile and theater ballistic missile defense umbrella for protection of high priority defended areas and US and coalition forces. Additionally, the E2's systems are fully interoperable with the Airborne Warning and Control System and ground-based systems so that transition to a full joint architecture can occur seamlessly and smoothly.

Common Support Aircraft (CSA). The CSA will be the Navy's 21st century airborne surveillance and support aircraft. One common carrier-based, multi-mission airframe will replace the S-3, ES-3, E-2 and C-2 aircraft currently in service. Current investments in E-2C production, ongoing C-2 service life extension, and service life extension plans for the S-3 and ES-3 aircraft are needed to ensure that current airframes achieve the 2015 service life goal. Based on current fleet utilization rates and projected support aircraft inventories, the CSA will require a 2012 initial operational capability at the latest. Efforts are being explored to determine if an accelerated profile is feasible.

Helicopter Master Plan

The Helicopter Master Plan sets forth the following taskings:

- Develop a helicopter force structure to meet present and future requirements until FY 2020 in the ASW, ASuW, mine warfare, combat search and rescue, special operations, and vertical replenishment mission areas;
- Reduce costs and infrastructure;
- Make Naval Reserve forces mirror active Navy forces; and
- Support air station search and rescue, range support, and other miscellaneous missions.

The Helicopter Master Plan:

- Replaces the Navy's CH-46, H-3, H-1 and HH-60H with the CH-60;
- Reduces seven different T/M/S to two
 - H-2/3/46/60B/60F/60H to CH-60 and SH-60R;
- Produces a modern, mirror-image active and reserve helo force;
- Accelerates procurement to 18/year-FY00; and
- Lowers cost of ownership/increases warfighting capability and flexibility.

CH-60. The Navy will procure sufficient numbers of CH-60 helicopters to replace the CH-46D Sea Knight, HH-60H Seahawk, and H-3 Sea King. The CH-60 is the future

aircraft for combat search and rescue, special operations, and logistics helicopter forces in the Navy.

SH-60B. The SH-60B Seahawk is the air component of the LAMPS Mk III weapon system integrated with the Navy's surface combatant forces. Seahawks have exceeded all Fleet requirements since their first deployment in 1984. The primary missions of the Seahawk are ASW and ASuW. It also supports secondary missions of electronic warfare and command, control, and communications, as well as the traditional helicopter roles of search and rescue and logistics. The SH-60F Seahawk, a specialized variant embarked in aircraft carriers, provides close-in undersea warfare protection to the battle group.

SH-60R. The conversion of all SH-60B and SH-60F helicopters to SH-60R or SH-60R(V) will provide a true multi-mission helicopter force. The SH-60R upgrade involves the remanufacture of existing Seahawk variants into an aircraft that will carry the Navy's tactical helicopter community through 2020. Along with a Service Life Extension Program for the airframe, the SH-60R will incorporate an advanced multi-mode, Inverse Synthetic Aperture Radar (ISAR), the Airborne Low Frequency (dipping) Sonar, and an upgraded computer suite that will significantly improve the multi-mission ability of the SH-60 weapons system.

HH-60H. The HH-60H is also assigned to carrier air wings and performs the missions of combat search and rescue and special operations warfare support. Capable of executing either mission from air-capable ships as well as from unprepared sites ashore, the incorporation of FLIR coupled with Hellfire missiles and an enhanced survivability package.

Maritime Patrol Aviation

The maritime patrol force is a land-based facet of naval air power, having global reach while still maintaining a small logistical 'footprint'. With their ability to conduct ASuW, USW, surveillance, and mining operations, forward deployed P-3C aircraft provide continuous, multi-mission support to joint task forces and naval task groups at sea. Operating in support or independently these aircraft are an important, element in our naval forward presence posture.

The P-3C Orion provides effective undersea warfare, ASuW, and C4/ISR capabilities to naval and joint commanders. The current force of 12 active and eight reserve squadrons supports the theater and fleet commanders requirements for 40 P-3Cs continuously forward-deployed. Orions provide long-range, high-endurance support to aircraft carrier battle groups and amphibious ready groups.

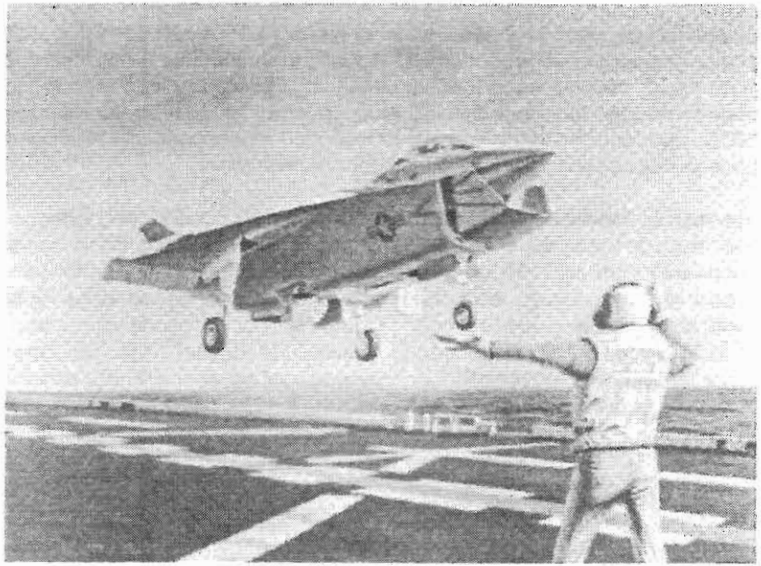
P-3C Update III. The conversion of remaining P-3C aircraft to the Update III digital system architecture will result in one common fleet (active and reserve) configuration. Update III is the baseline configuration required to use advanced sensors and weapons. This program will enhance interoperability, replace obsolete components, and reduce support costs of maintaining varied avionics-configured airframes.

Anti-surface Warfare Improvement Program (AIP). The AIP will provide an enhanced sensor and weapon capability. The program includes the incorporation of the Stand off Land Attack and Maverick missiles, survivability enhancements, an advanced imaging radar, and electro-optic sensors. Other upgrades include improved C4I, and provisions for the near real-time connectivity of surveillance/reconnaissance data with battle group and national command decision makers.

Inventory Sustainment. There are two funded service life-sustainment programs in place that will extend the P-3C's service life to 50 years. They are the Sustained Readiness Program (SRP) and the Service Life Extension Program (SLEP). SRP is a material condition upgrade which will redress corrosion areas and allow the P3 to extend the current projected fatigue life of the airframe (20,000 hours). Long term, the SLEP will certify the airframe for an additional ten years of fatigue life. These service life extensions will delay the requirement for a follow-on aircraft—the notional Multimission Maritime Aircraft (MMA)—until approximately FY 2015.



USS Carl Vinson leads the pass in review off the coast of Hawaii, signifying the finale of RIMPAC 98. (USN)



USN version of the Joint Strike Fighter. (Boeing proposal)



USMC version of the Joint Strike Fighter. (Lockheed Martin proposal)

6 United States Marine Corps

Lieutenant Colonel Stephen LeBlanc, U.S. Marine Corps

Today, I have a few minutes to speak on a subject that is near and dear to my heart—Marine Aviation. I should first begin by saying that the United States Marine Corps is a department of the US Navy as our official seal testifies. We are truly oriented toward conducting operations from the sea working off US Navy ships of all kinds.

I am a Marine helicopter pilot by trade, but I am a designated Naval Aviator. All Marine pilots train in Navy flight schools and Navy Flight training squadrons. We learn from the very beginning to operate on and around the shipboard environment

As Captain Cleveland stated, the prosperity of the United States hinges upon safe and open sea-lanes and regional stability throughout the world. We must have the capability to project power from the sea and to maintain a forward military presence throughout the world.

One way that we do this is with Amphibious Ready Groups (ARG) which are Naval Expeditionary Forces. They are combined USN and US Marine Corps forces, task organized and made up of various naval ships, aviation assets and land forces. More specifically, each ARG has approximately five navy ships carrying about 2100 marines and 2000 sailors. There are three to four ARGs, afloat for six months at a time, sailing throughout the world 365 days a year ready to respond to a variety of taskings.

These ARGs are capable of responding to directives from our National Command Authority and can conduct operations that range from non-combatant evacuations (such as in Liberia) and humanitarian operations (such as in Somalia) to port and airport seizures, combat search and rescue and maritime interdictions. These ARGs stand ready at the sharp end of the sword. They are the first to fight and often the force of choice for our National Command Authority.

How does Marine Aviation fit into this strategy?

First and foremost, Marine aviation exists solely to support the infantryman's mission. We are a supporting arm. We are all infantrymen from the start, no matter what your specialty—pilot, aircraft mechanic, artilleryman or combat engineer—everyone begins their time in the Corps learning the skills of the infantry. I spent six months training as an infantry platoon commander before reporting for Flight School. This common thread promotes a unique focus and understanding throughout our Corps.

More specifically, the composition of each Marine Expeditionary Unit (MEU, the Marine portion of the ARG) can be task organized to fit the most likely mission profiles, but the typical make-up of a MEU's aviation element aboard the naval ships includes the following mix of helicopters and fixed wing jets:

- 12 CH-46s
- 4 CH-53Es
- 4 AH-1Ws
- 2 UH-1Ns
- 8 AV-8s

These aircraft support a reinforced battalion equipped with amphibious tracked and wheeled armored personnel carriers, combat engineers, logisticians, communicators, artillery, air defence and even main battle tanks when needed. The total force is approximately 2100 marines. It's a small but potent force capable of short duration medium intensity operations.

Examples of missions that we flew during my last deployment with a MEU included:

- Humanitarian Relief in Somalia.
- Cordon and Search Ops in Somalia/Direct Action (snatch warlord) in Somalia.
- Forward Presence through Joint/Combined exercises with the French, Spanish, Kuwait, UAE and Saudi Arabian Defense Forces.

The Marine Corps is currently 174,000 strong in active forces. In terms of numbers of aircraft the following figures give you an idea of the total size of Marine Aviation:

• F/A-18 A/C/D HORNET	350
• AV-8B HARRIER	175
• EA-6B PROWLER	20
• CH-53E SUPERSTALLION	160
• CH-16E SEA KNIGHT	239
• AH-1W SUPER COBRA	147
• UH-1N HUEY	107
• KC-130 HERCULES	75

The plan is to reduce the overall number of different type/model/series aircraft with the introduction of replacement aircraft that are multi-role capable such as the Joint Strike Fighter (JSF) and tiltrotor technology (Osprey). Until then many upgrades are being done to ensure the airframes last until the introduction of the JSF and Osprey.

Future operations conducted from the sea and into the littoral waters will be risky and dangerous due to the proliferation of low cost underwater mines and surface

to surface (land to sea) missiles. Operations will have to be conducted from over the horizon (OTH). And in an unpredictable manner using surprise, speed, and flexibility to keep the opposition back peddling. Frontal assaults against fortified beaches are most likely not the preferred method of entry in the future.

The key for Marine Aviation lies in the capabilities that tiltrotor technologies and the MV-22 Osprey bring to the amphibious force. Sure the design has been around for a few decades now, but not until the advent of the new stronger yet lighter composite materials, fly-by-wire technology, lighter metals and today's advanced, powerful engines could the tiltrotor be a viable reality.

In concert with our Advanced Amphibious Assault Vehicle (AAAV), the Landing Craft Air Cushioned (LCAC) and the heavy lift CH-53E which can aerial refuel—true OTH can be a reality providing the Commander of the Amphibious Task Force with many alternatives.

Some of the details pertaining to the MV-22 Osprey include:

- the first squadron will stand up in 1999;
- approx 350 aircraft buy (US\$40 million each);
- replaces medium lift helos;
- 24 combat loaded troops/10 000 lbs external load;
- cruise speed 240 knots; and
- *self deployable/shipboard compatible.*

Once again, I thank you for the opportunity to give you a short brief on Marine Corps aviation, how it fits operationally into the US Navy/Marine Corps team and where our future initiatives and priorities are taking us. It's an exciting time to be a part of maritime aviation and it's been a pleasure to be with you today.



Kaman SH-2F Seasprite. (RNZN)

7 New Zealand

Commander R. Edwards, RNZN

My task is relatively simple as New Zealand's prospects for the next thirty to forty years can be found by taking a look backwards. Backwards to the mid-1960s. This is when we took delivery of the first Westland Wasp helicopters and P3-B Orions.

As part of the *Leander* class frigate project seven wasps in total were purchased, beginning in 1966. This was supplemented in the mid-1980s through the purchase for spares, of three ex-Royal Navy airframes in non-flying condition.

The Wasp, although somewhat rudimentary by today's standards, served the RNZN well over the thirty years it was in service. Only three were ever lost: two from crashes in the Hauraki Gulf and one after ingesting a tarpaulin at Taupo airport. As a result of these losses, one of the attrition airframes was restored to flying condition. Such a low attrition rate is testament to the skills of the pilots, and Air Force technicians, both ashore and afloat, who are responsible for the maintenance of Navy aircraft.

However, as with all things military, these aircraft were not designed to last forever, and in 1988 Project Amokura was established to find a replacement helicopter. After a protracted process, including a delay caused by the 1996 general election, the Government agreed in March 1997 to the selection of the Kaman SH-2G Super Seasprite as the Wasp replacement.

The Wasp undertook its last operational role in Bouganville, and then in April 1998 was retired from service. RNZN service that is; except for two retained for the Navy and Air Force museums, all others were purchased by Westland for support of Malaysia's Wasp fleet.

Four Kaman SH-2G helicopters at a cost of around \$NZ300 million have been ordered, and are due for delivery in mid-2000. The package includes the aircraft, training and missiles. As our mission profile is different, we did not demand the same sophistication as the RAN. Hence there are differences between our respective acquisitions.

In the weapons package, we have opted for the Maverick missile, for commonality with the Air Force, and Mk 46 torpedos (for the time being). There are also differences in the avionics and command and control components. Another important element of the package is the supply of four SH-2F models, to bridge the gap between the retirement of the Wasp and arrival of the SH-2Gs.

So where are we at?

Four 2Fs, between 11 and 24 years old, have been restored and are now flying. Noting the complexity jump from Wasp to 2F is significant, we have established the following priorities:

- Aircrew and groundcrew training;
- embarked training;
- embarked helo ops for SAR, VERTREP, PAX Transfer and Surveillance; and
- embarked helo ops for the purpose of the purchase agreement.

We needed to learn to walk before we attempt to run. HMNZS *Te Kaha* and *Canterbury* have completed SAT AIR, but first-of-class flying trials are likely to be delayed until next year. This has occurred for a number of reasons:

- A delay in delivery of the air frames;
- poor training packages (they had to be reworked by us);
- the second airframe had much worse corrosion than anticipated; and
- we have had some difficulty getting spares support.

I must emphasise that none of the reasons are attributable to Kaman. They have met their contractual obligations fully at every step.

Despite these minor problems, *Te Kaha* will embark a 2F for her next operation in November 1998, which will include a Raoul Island resupply and a Southern Ocean patrol.

And what of the future?

A mid-life upgrade, commencing in financial year 2012–2013 is scheduled. What this will entail is still to be determined. Conversion of the tanker *Endeavour* for Seasprite helicopter operations, is still being considered. The conversion plans for *Charles Upham* provide for Seasprite deck space, but not hangarage. Consideration is also being given to fitting the Magic Lantern laser minesweeping system. And finally, a proposal for a fifth 2G has been raised, and is likely to proceed.

Which brings me to the other maritime aviation capability, one not owned by the Navy.

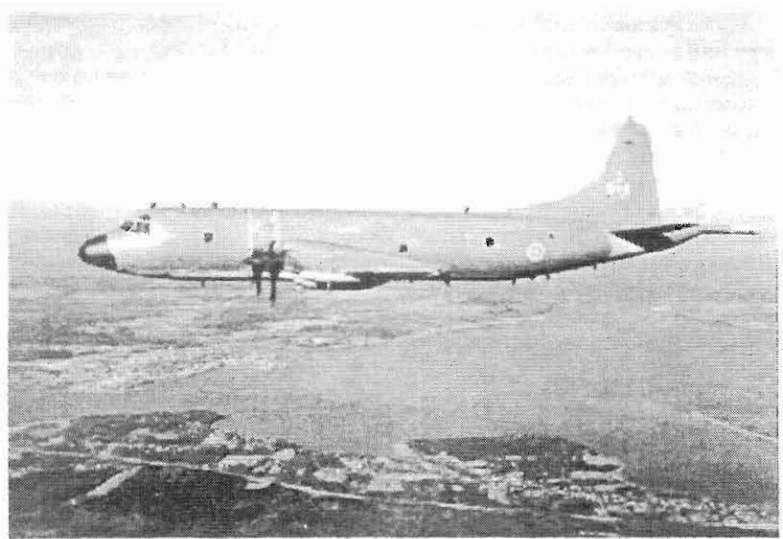
As mentioned earlier, the RNZAF acquired five P3-Bs in the mid-1960s, and a further ex-RAAF P3-B in the mid-1980s. Following an upgrade to some systems in the mid-1980s, these aircraft were rebadged P3-K. However, funding did not allow all the updates that were sought, and consequently the aircraft have suffered interoperability limitations. Two projects now underway will not only remedy this situation, but will extend the life of the 30-year old Orion fleet for a further 25 years.

One of these, Project Kestrel, is seeing the Orions fitted with new wings, tailplanes and refurbished engine nacelles. The work is being undertaken at RAAF

Richmond by Hawker-Pacific, under contract to Lockheed Martin, using wings made by Daewoo in South Korea, and tailplanes built in Scotland. A truly international effort. The payoff from this project, apart from extending the life of our aircraft, is the several hundred other ageing Orions around the world that should be able to leverage this engineering development. I am pleased to say the first Kestrel Orion to be completed, has returned to New Zealand, without mishap. And by all accounts the RNZAF is very pleased with the result.

The second project for the Orions is called Sirius. The scope of this project includes replacement of the data management, EW, acoustic processor, MAD, electro-optics, communications and navigation systems. It also includes the purchase of a new tactical data link (link 11), satellite communications, aircraft self-protection, (which I understand will be a first in the world for this type of aircraft) and a dedicated mission support system. Emphasis has been placed on to need to maintain a high level of interoperability with AUSCANNZUKUS and South East Asian nations. Following a project definition study completed earlier this year an invitation to register has been issued, with responses due next week. The current project schedule has the first aircraft commencing modernisation in 2000 and the final aircraft back in RNZAF hands by the end of 2003

So, as I said at the beginning, New Zealand's maritime aviation capability is determined for the foreseeable future. Determined by a policy of moderation in defence purchasing, and a culture that achieves the maximum return from equipment acquisitions. For the Navy—Super Seasprite for the next thirty years or perhaps even longer. For the Air Force—P3K, rewinged and modernised. You can expect them to remain in operation over the southern oceans for at least another twenty five years.



CP140 Aurora of the Canadian Armed Forces. (CAF)

7 Canadian Maritime Aviation Requirements

Director of Aerospace Requirements, the Air Staff, National Defence Headquarters, Ottawa

I have been asked to provide the Canadian perspective on Maritime Aviation as our forces enter the 21st Century. While many uncertainties lie ahead for all of us I will do my best to provide you with an overview of the current status of maritime aviation in Canada and give you a glimpse of the direction that we have taken to keep these forces relevant and effective for the foreseeable future.

Factors affecting requirements

Our most recent Defence White Paper published in December 1994 reaffirmed the commitment to conduct surveillance and control of Canadian areas of responsibility in the Atlantic, the Pacific and the Arctic. The White Paper also articulated the requirement to provide maritime air support to a naval Task Group in the Atlantic and the Pacific for defence of North America operations; and to a Canadian naval Task Group deployed on Multilateral operations anywhere in the world under UN auspices or in defence of a NATO member state.

During the 1990s, our participation in blue water ASW operations has diminished while our involvement in joint and combined operations with NATO and allied forces in littoral areas has significantly increased.

In addition to the Gulf War, our Sea King helicopters have participated in Maritime Interdiction Operations off Haiti, in the Adriatic and in the Arabian Gulf. They have also participated in efforts to deliver humanitarian assistance to Somalia. Closer to home, they continue to be used for fisheries patrols, counter drug operations, SAR and more recently in the provision of humanitarian assistance during the Winnipeg flood of 1997 (in the centre of our country) and are currently extensively employed in the recovery effort of Swissair Flight 111 which crashed off Halifax in September of 1998.

Our Aurora fleet has also experienced the same shift in emphasis away from blue water operations. They also took part in the Maritime Interdiction Operation in the Adriatic sea where they conducted armed ASW patrols and contributed to the establishment of the Task Force's Recognised Maritime Picture. In Canadian territory Auroras continue to conduct Arctic surveillance, fisheries patrols, counter drug operations, ice recce and SAR. They too were employed in flood relief efforts as well as recovery operations for Swissair Flight 111.

Just a decade ago, our military leadership would never have considered using these aircraft in these roles; however, today they are viewed as flexible and capable resources that are not just limited to the conduct of ASW. This change of perception has definitely served to shape future requirements. That is not to say that we can now ignore the requirement to conduct ASW. The proliferation of conventional submarines in the littoral environment continues to hold our attention. Dealing with that threat will pose even greater challenges than a nuclear boat in blue water.

Perhaps the most significant influence on requirements comes in the form of budgetary pressure. Like most nations, Canada's military has undergone significant downsizing since the end of the Cold War and has experienced a relentless series of defence budget cuts. These cuts are consistent with the public's perception that the end of the Cold War has reduced the need for the type of capability that we provide. Ironically, our ops tempo has never been higher in peacetime.

Our capital budget is determined by what is left after we pay our personnel and cover our operational and maintenance costs. Capital as a percentage of our total budget has also been steadily declining. What should be noted is that the percentage is getting smaller and so is the pie in absolute terms, our capital budget is under a lot of pressure. A relatively weak Canadian dollar has made this situation even more challenging as a lot of defence equipment must be bought offshore.

Canada's maritime aviation assets

Our fleet of 18 CP140 Aurora aircraft entered service in 1980. Three CP140-A Arcturus aircraft entered service in 1993. These aircraft are non-ASW capable and are used for Arctic and maritime surface surveillance, pilot training and deployment support.

Forty-one CH124 Sea King helicopters entered service with Canada between 1963 and 1967. They underwent an upgrade to the CH124-A configuration in the late 1970s which saw the installation of radar, a sonar upgrade and the addition of an internal stores dispensing system and a single channel sonobuoy relay capability. Today 30 are left in two distinct configurations: 24 CH124-As and six CH124-Bs.

In 1991, six Sea Kings were modified to the CH124-B configuration by removing the dipping sonar and adding a CDC UYS-503 sonobuoy processor and a CAE internally mounted (tail cone) Advanced Integrated MAD System (AIMS). These aircraft were intended as a bridge to the EH101 aircraft.

Aircraft basing

The main MPA operating base is located in Greenwood, Nova Scotia. It is home to two operational Aurora squadrons, a training squadron and a test and evaluation unit. Thirteen Auroras and all three Arcturus aircraft are based in Greenwood. West coast

MPA operations are based at Comox, British Columbia. Five Auroras operated by one operational squadron are based there.

The main operating base for Sea King helicopters is at Shearwater, Nova Scotia. It is home to an operational Sea King squadron, a training squadron and an operational test and evaluation unit. Eighteen CH124-A and five CH124-B aircraft are based here and provide seven air detachments for the Navy's Atlantic fleet. West Coast Sea King operations are based at Patricia Bay, British Columbia. Six CH124-As and one CH124-B operated by one operational squadron are based there and provide air detachments for the Navy's Pacific fleet.

Aircraft modernisation projects

Two major aircraft modification projects are currently being staffed to preserve the capability provided by our MPA and MH fleets. Because our Sea King fleet is currently in its 35th year of operational service, a number of initiatives have been undertaken to ensure that the fleet will remain airworthy until a replacement helicopter is introduced.

Aurora Incremental Modernisation Project (AIMP). The objectives of AIMP are to extend the life of Canada's eighteen CP140 Aurora MPA from 2001 to 2015 and potentially to 2025, provide a contemporary surveillance capability, assure aircraft self-protection, improve interoperability with the Canadian Navy and our Allies and improve mission system reliability. The project will address a number of avionics deficiencies, as well as costs associated with the supportability of existing avionics and support equipment (Estimated Life Expectancy, or ELE, items) to 2015. The project also aims to address capability and supportability issues associated with Canada's fleet of three CP140-A Arcturus aircraft.

Of primary interest within the project is supportability and an upgrade of several core capability components, including the Data Management System (DMS), Communication Management System (CMS), the navigation system and a Spotlight Synthetic Aperture Radar (SSAR) implementation. The project will also address additional operational requirements for an improved Electronic Support Measures (ESM) system for self protection, a 99 channel Sonobuoy Receiver/Reference System (SRX/SRS) for interoperability, and a modern acoustic system. Finally, the AIMP proposes to provide Canada's three Arcturus aircraft with a data management system and sensors required for them to conduct Arctic and maritime surface surveillance missions as well as extend their life to at least 2015. The current project strategy is to proceed under an omnibus approach comprising 22 increments.

A contract for the Advanced Development Model (ADM) of SSAR was awarded to Lockheed Martin Canada to demonstrate that the concepts proven with the Experimental Development Model can be translated into a compact and efficient system which meets AIMP operational and technical requirements for an imaging radar capability. Indications to date are that it will meet these expectations. Installation of the ADM on an Aurora aircraft is scheduled for fall 1999. Funding for

SSAR has not yet been identified and implementation is not currently scheduled within the next five years.

Maritime Helicopter Project (MHP). The Sea King helicopter entered service with the Canadian Forces in the early 1960s. Declining operational effectiveness, supportability issues and recognition that the Sea King would be incapable of providing effective support to the much anticipated Canadian Patrol Frigates, resulted in the initiation of a replacement project in 1979. By 1986, that initiative had evolved to the New Shipborne Aircraft (NSA) Project which was poised to deliver 35 maritime variants of the EH101 when the contracts were cancelled in November 1993.

The Estimated Life Expectancy (ELE) of Canada's Sea King fleet is 2005. The need to replace these aircraft with a fleet of robust and capable new maritime helicopters was recognised in the 1994 White Paper. Today, the MHP is the Chief of Air Staff's top priority in the plan to modernise Canada's Airforce. The Statement of Operational Requirement has been undergoing a period of intense review within the Department of National Defence (DND) prior to approval by government. The project staff are in the process of developing potential options and examining various acquisition and support strategies.

The MHP will be required to perform a broad spectrum of roles including: Defence of North America, NATO Collective Defence, UN Support and National Support Tasks. In this context it will be required to conduct Surface Surveillance and Control, Sub-Surface Surveillance and Control and Utility/Support missions. This last category will include SAR, Disaster Relief, Humanitarian Assistance, National Surveillance, Sovereignty, Evacuation of Nationals Overseas and Aid of the Civil Power.

The principal characteristics of the basic air vehicle that will be required are as follows:

- Three hours endurance plus 30 mins fuel reserve;
- Automatic Flight Control System (AFCS);
- NVG compatible;
- Rescue hoist; and
- Shipborne capability
 - Rapid Securing and Traverse System;
 - Power folding rotor head and tail.

A minimum of 32 airframes will be needed to meet the full requirement articulated in current policy guidance.

The principal mission systems that the aircraft will require are as follows: imaging radar, dipping sonar, sonobuoy processor, electro-optonics, ESM, self-protection, DMS, datalink, data recording, IFF/SIFF, VHF/UHF communications,

HF/SATCOM (voice/data), MAD, air-to-surface weapon. Note that MAD and an Air-to-Surface Weapon are considered desirable.

To ensure that the Sea King fleet can continue until a replacement enters service, the following major initiatives have been put in train:

- T58-100 engine upgrade;
- main gear box upgrade;
- centre section replacement;
- TRU/Inverters upgrades;
- ASN 123 digital TACNAV computer;
- floor boards (cargo secure)

The engines are being upgraded to a standard that gives them commonality with other users and thus improves supportability. The upgrade also provides a 150 SHP increase per engine; however, it will only be available in emergency situations. The Main Gearbox will be upgraded to provide better matching with the upgraded engines and to resolve a recurring overheat problem. Aircraft Centre Sections (entire fuselage from aft of cockpit to forward of cargo door) will be replaced to resolve problems with frame cracking in the fleet. (11 are complete and three currently in plant). Transformer Rectifier Units and Inverters will be replaced to address problems with power conditioning. These problems have become much more critical with the introduction of more sensitive digital equipment on the aircraft.

The 1950s vintage analogue Tactical Navigation Computer is being replaced with a 1970s digital system. This system was introduced on the CH124-B because it provided the accuracy necessary for deploying and processing the information from sonobuoy patterns. Moving to one computer will simplify and reduce the cost of training and maintenance as well as improve operational capability.

Strengthened floor boards with no tie down points will be installed to enhance the Sea King's ability to conduct logistics missions and improve safety by enabling proper securing of cargo.

The operational requirements, in addition to our major aircraft modernisation efforts, that we will be focusing on in the near to mid term future are as follows:

- G size DIFAR;
- dual sonobuoy launch capability;
- alternative frequency response DIFAR;
- improved active sonobuoy;
- improved Arctic sonobuoy;
- advanced acoustic processor; and
- improved MAD.

G size DIFAR sonobuoys are considered essential for shipboard operations due to space and weight restrictions in our helicopters and storage limitations in our

ships. We will be taking delivery of our first lot of these buoys next Spring. G size sonobuoys are also one element in a strategy aimed at, carrying more sonobuoys on our Auroras to facilitate large field search tactics. We will not be able to take full advantage of smaller sonobuoys without the ability to carry more than one in each chute. To this end, we have entered discussions with industry (Hermes Canada and Sonocom Australia) to qualify a dual launch system that can be implemented with no modifications to the aircraft. A low-tech initiative to install additional storage racks in the Aurora will also complement our efforts to carry more sonobuoys.

We need optimum performance from our sonobuoys to successfully prosecute increasingly quieter targets in noisier waters. Therefore we have a requirement for an alternate frequency response DIFAR that will dynamically adjust its spectral sensitivity to match its ambient noise environment. We also need to improve our active acoustic capability in both deep water and littoral environments. Additionally, we require our Arctic Icepick sonobuoys to provide better RF range, increased acoustic frequency response, a directional capability and shorter initiation time following impact.

To prosecute the difficult current generation and even more challenging future generation submarines, we are drafting specifications for an advanced acoustic processor that would have the capability to:

- process 32 acoustic channels;
- provide growth to 64 channels;
- process narrowband, broadband, and transient data concurrently;
- process low frequency active and bistatic/multistatic data; and
- provide advanced windows-based, human-computer interface features.

Finally, to improve our capability to localise submarines in shallow water, littoral areas, we have a requirement for an improved MAD system.

In progressing these initiatives we must ensure that shrinking R&D dollars are used wisely, add value and contribute directly to enhancing operational capability. Wherever possible we are interested in making those dollars go further by collaborating with our allies in areas which have the potential to yield mutually beneficial results.

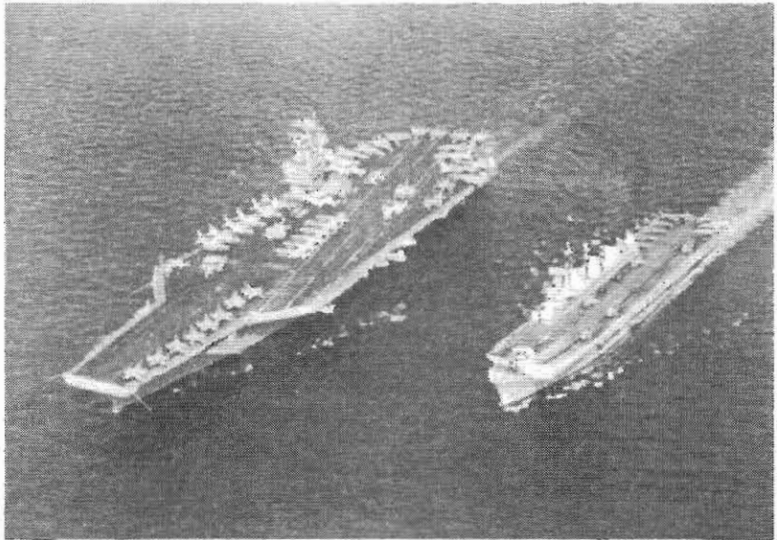
Conclusions

Today the Canadian Forces are continuing down a path marked by significant structural change, downsizing and budgetary reductions. Shrinking defence budgets and a public perception that with the end of the Cold War, we have little need for capabilities such as ASW, will significantly challenge our ability to implement any new operational requirements. We can expect to face increased scrutiny aimed at ensuring that requirements are absolutely essential and that proposed solutions represent the minimum capability necessary to satisfy them.

While ASW remains a critical role of the CF, our operations during the 1990s have clearly shifted from Cold War, blue water operations to peace support, domestic and non-combat operations. Consequently we are focusing more of our attention on littoral operations. R&D activities must add value and directly contribute to enhancing operational capability. Finally, since all of us are experiencing defence cut backs, Canada believes that we must continue to cooperate closely with our allies and explore opportunities for collaborative developments if we are to successfully meet the challenges of the future.



CH124 Sea King of the Canadian Armed Forces. (CAF)



USS John C. Stennis (CVN-74) steams alongside HMS Illustrious during Operation SOUTHERN WATCH in the Arabian Gulf. (USN)

9 Panel Discussion

CAPT C. George, COMAUSNAVAIR

You (CAPT Cleveland) have referred to coalition warfare, an earlier speaker referred to the technology gap, and CDR Edwards referred to the architecture and configuration of the Seasprite that New Zealand is getting as being different from our own. This is something that interests me greatly. The capacity for our aircraft to operate with others, and those of your respective navies to operate with those of other nations. Given the technology gap, could you comment on how the need or desirability to operate with other forces has driven the configuration of your vehicles and force structure? If at all? It's a very tactical question, but one that is very important to us.

CAPT Cleveland

Not being an engineer, or actually being in a position to make those decisions, this is solely my perspective on the integration of assets. And it's not just a problem with US and coalition partners. It's also a problem that we address and look very hard at within our own joint services, with the US Air Force, the US Army and the US Navy. The Gulf War was a graphic example. The Air Force could do all their transmissions of warplans (called the ATO), but there was also a Navy component, and that paper had to be flown out to the ship and delivered for execution within 48 hours. We have come a long way since then. We have SHF satellite broadcast, we use the same bandwidth. We have a common resource identification process that makes sure that my equipment can talk to the US Army and the US Air Force, and we are driven in that manner by the Joint Staff. In the same way we have typical problems as technology advances. Even with the CEC (Cooperative Engagement Capability), we're having integration problems that we need to recognise and fix with our own ships. So part of the process that we are looking at with coalition partners is to identify different levels of coalition. Dependent on who can bring what to the fight, so to speak. There is a technology gap, but it is important not only that we can talk equipment to equipment with equals, with Australians and the UK, but also our allies that are nearly as capable. There is also probably a third layer that you need to take a look at, where the coalition partners bring something to the partnership and you have to step down another level of capability. We're looking at the integration of that framework, and its part of our decision process. While it doesn't stop our progress or our development, it is a link that we address in the interactive role between our allied partners. We do pay attention to it, but its not going to slow down our development or our embracing of technology.

CMDR Edwards

I am too far removed from the project to actually know some of the reasons why we have adopted some of the configurations that we have. But from a personal,

professional point of view I do have some concerns that we appear to be re-learning the mistakes that the Air Force made when they didn't do the upgrades of the P3-Bs. I have a worry that our Seasprite is going to be interoperable with New Zealand *Anzacs*, and except at a very basic level, will not be interoperable with anything else. I suspect that the reasons are cost driven, and that that is really the baseline.

CDRE Lyall

In recent months the whole question of interoperability, and I certainly wouldn't deny its importance, seems to have taken on a very singular aspect. That is the technical aspect. And I would present to you that there are at least two facets to interoperability. One is quite clearly technical, and undoubtedly we share common problems there, particularly keeping up with the huge pace and rate of advance of the US, but there is also the procedural aspect. I would present that friendly navies do very much better than other services at cooperating, collaborating, co-exercising and so on. We do actually have a background in working together, which does mean that provided the technical aspects are covered, we can actually go pretty much straight in. I don't think you can say the same about the other services, be they yours or mine for that matter. They need a fairly considerable period of assimilation before they can then make this leap, so lets not forget that.

CMDR Paul Folkes, Commanding Officer 816 Squadron

There has been a fair bit mentioned about the cost of developing maritime aviation into the next century. More of an observation really, but both CAPT Cleveland and LTCOL LeBlanc pointed towards the rationalisation that maritime aviation forces in the United States are heading towards in the next century. Particularly with your Helicopter Master Plan and the rationalisation of your fixed wing forces to the JSF. I think its interesting to note at this stage that whereas you have got 44 odd squadrons and are going down that route, we have got three and seem to be diverging. I am just wondering whether you might like to comment on the degree that economic rationalism has driven you down this airframe route, or whether or not you see it as capability driven.

CAPT Cleveland

An interesting observation. My opinion is that we are driven in that direction by the capabilities you can buy with the economic resources saved. We retire type models that are series to save on infrastructure costs, to save for training, to save for logistics, spares, across the board, and put that savings into the improvement of the next airframe. Maintainability, reliability, economies of scale in buying parts, in buying training, all have recently come forward. We can do things with one airframe that we couldn't do with one airframe before, because people and machines are smarter. Therefore I don't think you can have one without the other. The capabilities certainly drive that neck down rationalisation, but if you had all the money in the world to spend on it, you wouldn't have to.

LTCOL LeBlanc

If I could just make a comment about the Osprey, the tiltrotor technology. The basic design can go back a couple of decades, as we all know, but it wasn't until these high strength light-weight composite materials, the fly-by-wire technology, the really great metals that we're using in our engines now, and the power we're getting out of them. All those things together have enabled this Osprey to present some opportunities for naval aviation to be able to go faster, get in and out of places that are smaller. What's a dilemma for the Marine Corps right now, is exactly how this new technology is going to effect how we do our jobs, the doctrine we use, the procedures we use. You are supposed to be out there looking for capabilities and then assigning or developing a machine for it. In this case we are going to get a machine that is actually going to drive new, probably unknown, capabilities for us as a Corps. We are not even sure how far it's going to go or where it's going to take us. I mean this aircraft can take off from the United States and self-deploy. Now we don't have any aircraft that have the ability to self-deploy across the Atlantic or the Pacific and then land in a small field.

LEUT Huw Paffard, 817 Squadron

Australia is trying to develop an amphibious capability. How do you, as a Marine, view Australia's current developments?

LTCOL LeBlanc

I am very impressed [laughter from audience]. I honestly believe that, given the kinds of threats that Australia faces, and the kinds of missions that you may have to carry out in your own region. The need to withdraw civilians and your own citizens from 'hot areas' is very likely. Those LST's that are being re-worked and that capability that you are coming on-line with in the next couple of years will be a very important tool for your government to use. But I also have to say that I don't see a lot of effort at this point in developing the doctrine that its going to take Army helicopters and put them on Navy ships and go do a job. There are a lot of command relationships that we have been doing for a couple of hundred years, and we still have tensions on how that works—when the phasing ashore occurs, and the command goes from the guy in the white suit to the guy that's wearing green. Those are really big issues that are really going to have to be worked through with this new capability.

LEUT Paffard

Do you feel that we should go down the RN line of using naval aircraft or maybe maintaining a joint helicopter force of movement helicopters like the Sea Kings and the Blackhawks?

LTCOL LeBlanc

It's an option, and I might add that the Army helicopters that they are thinking about using aren't marines. Its another area that has to be addressed. You need somebody

with some long vision to say 'This is where we want to be with this capability, and here's how we're going to get there'. But I'm both thumbs up for what you guys are doing.

LCDR Leon Voles, Lead Authority Aviation

My question is for CAPT Cleveland. In the arsenal ship concept that is starting to mature, it is obviously doing something to air power through the types of missile systems that it has. Do you see a reduction in the requirement for the number of aircraft carriers that you may need?

CAPT Cleveland

Let me qualify this by saying I don't know much about the arsenal ship. But the economic realities of what drives it, what the desired objective is, might lead you to assume that you won't need as many aircraft carriers. Nevertheless, presently the aircraft carrier is our capital ship and for the foreseeable future, for the next 75 years at least, that's what it will be.

CAPT Geoffrey Coles, Commanding Officer HMAS ALBATROSS

I'm a logistician not an aviator. On one hand as a logistician I can really understand the desire to shrink the number of different types. I can sympathise with that problem. On the other hand I'm rather surprised that that you wish to get rid of the AV8s. I would have thought that was a unique capability, particularly in view of the need to operate off LPHs, LPAs and LPDs; indeed, somewhat independent of the carrier battlegroups.

LTCOL LeBlanc

I should say that the Joint Strike Fighter that is being worked on right now, and that the Marine Corps is going to replace its Harriers and F-18s with, isn't just one aircraft. It's going to have several versions. The Marine Corps is requiring them to design a Joint Strike Fighter with a VSTOL option. So we are going to stay in the VSTOL arena.

CMDR Brett Dowsing, FAVO

In relation to the joint aspects of these aviation components that CDRE Lyall talked about in the Defence Review, does that also flow across into the supporting arrangements, logistics, training, etc? Are they streamlined down with the operational side of it, or do they remain separate?

CDRE Lyall

As far as the operational training is concerned I expect it to be, yes. Certainly in the Joint Helicopter Command, yes it will be. As far as the logistics are concerned we are actually, again it comes out of the Strategic Defence Report, going down a very

similar path to you. We have just created a Chief of Defence Logistics, whose job is to bring together a whole logistic train across the three services. Having said that, what I have quoted to you is what the Review itself has produced, and that only came out in mid-July. There is now the question of implementation, and so everyone is now sitting down chewing the ends of their pencils. A process that you have been going through too. So the actual final outcome, the details still await to be seen. But the philosophical thrust is very much down.

CMDR Dowsing

We didn't mention terribly much in the way of looking at the commercial options, and where they might come into the equation in terms of maritime aviation. I know that Kamax is one component, but are there other areas that any of your services are looking at in respect to commercialisation?

CAPT Cleveland

Kamax, Kaman's proposal to provide logistics, is the extent, that I am aware of, to which we are looking at commercialisation of aviation at sea. We will hire out to contract to replace the logistics aboard the AOs and AOE's and fast supply ships. I am not aware of anything else. The problem you have is that it gets into the liability issue. You go to war, where does the commercial vendor go? He goes home. You have got to provide those uniformed service capabilities.

CDRE Lyall

Particularly with respect to the logistic train arena there is an awful lot we can learn from industry. About how to improve it, how to streamline it, to produce the goods on time. There is nothing like the dollar, or lack thereof, when it comes to concentrating your focus in getting things in the right place at the right time. I would certainly agree with CAPT Cleveland, that at the end of the day, at the front end, you will always want to keep it military. That doesn't mean to say that pretty close up behind the front line it might not at least be part commercial.

CDRE McCaffrie

For CDRE Lyall. Where does the push come from for a joint aviation organisation, and how is it being accepted by the aviation elements in the separate services?

CDRE Lyall

Well the push for JF2000, the combined fixed-wing group, I think it started almost by accident. In as much as we had a carrier in the Gulf, and as well as the organic capability from the RN Sea Harriers, it was quite plain that in addition to that we needed the capability that could be provided by the GR7s. So an experiment was tried about a year and a half ago. I think as a result of that and the opportunities offered by the occurrence of the SDR itself—you can be as cynical and as sceptical as you like—but actually the First Sea Lord and the Chief of the Air Staff did literally get together

and say 'This makes sense'. And having come to that conclusion, they then looked about taking it forward, and came up with what to me is a fairly historic agreement. For once we are not trying to gouge each others eyes out, we are actually cooperating, and producing something that is truly maritime. As far as the Joint Helicopter Command is concerned, I suspect that in some ways it was perhaps a follow-through in broader, conceptual terms from that, and of course there was a requirement to try and make the most logical result of the current logistic tail etc., that we have got. Noting that the ASW helicopters are still kept separate, for instance because they are a unique requirement.

As regards acceptance. I have been over here for the past six months, but all the reports I have had back from the UK, and everyone I have spoken to, and I think this is particularly important for the younger people, are behind it. For the younger people, they believe that this opportunity now presents them with a good, worthwhile career into the future. But that's me speaking.

LEUT D. Goldsmith, RN, 816 Squadron

I hope to go back to the Merlin in the UK. But I did a tour in Bosnia, and GR7s, RAF Chinooks and Army Lynx were a regular part of the carrier air group. It worked really well, and I would expect that to continue. As I am going to ASW I obviously won't be able to see how it is now. Helicopter Training has already gone to a central school in the UK. It is a bright future.

WO Bruce Tunnah, Directorate of Engineering Policy-Navy

CDRE Lyall, along the same lines, one of the challenges that we are faced with is coming up with a common maintenance regulatory program. Navy has traditionally had its own way of managing our engineering requirements, a specific set of regulations, Air Force/Army have had theirs. We now have to work out how to put them together. Are you faced with the same problem, or is it largely one system in the UK?

CDRE Lyall

No, we are facing exactly the same thing, and that is obviously one of the things that the implementation team will have to sort out. While quite clearly there must be areas which are common, equally there will be aspects which are unique. The important thing will be to recognise which fall into which category, and make sure none of them go by the board while we go through the process. Not forgetting of course, that we both need to go through a similar process to make absolutely certain that we establish, both in terms of principle and in legal terms, where the liabilities lie.

10 Maritime Aviation in the 21st Century

Commander Tim Barrett

So far we have looked at issues in maritime aviation from an historical perspective and from the view of allied foreign services. Let us now turn specifically to ADF force development—that is, the process that will determine the maritime aviation force structure in the 21st century.

It is not necessary to recite an endless list of approved and unapproved major and minor projects, although information on a number of them will arise during the presentation. This presentation will, principally, describe the current process of force development. Why is this necessary in the context of the seminar? Well, firstly, it may explain why certain maritime aviation development has occurred to date, and secondly it will inform you of the proposed direction of maritime aviation into the 21st century.

To explain this broad theme we must first look at how we have progressed to the current development process. This is important because there are a number of significant issues that have influenced our force development in the past, and they continue to do so *despite* the considerable reforms of the last 25 years. Some of these appear obvious, if only for the misplaced perceptions they might cause—such as service parochialism or the domination of defence civilians within the force development arena. Others include the fluctuating influence of other government departments. These are all factors that can affect the outcome of the development process either at the top level of strategic guidance, or at the lower levels of committee work. And whilst objective analysis is always the preferred tool, perceptions still play their part. This examination will necessarily lead to a review of current strategic guidance and a look at the committee process.

Once this background is complete, we can focus in on the business of today; that is, where maritime aviation fits into strategic guidance and its prospects for the future. At this point we can discuss specific naval aviation and maritime patrol issues.

A word of caution is needed here. The results of some contemporary force development have, in the past, led to robust debate both within and outside the official arena. Thus, whilst the facts in this presentation will be obvious, much of the analysis belongs to the author and does not necessarily reflect departmental policy.

Evolution of the force development process

A contemporary definition says force development is about justifying long term force structures with well-reasoned analysis for our political authorities. In Australia's case it refers to the methodologies used in the absence of a defined threat. In turn this

implies a formal process by which analysis of strategic guidance is tied, through progressive steps, to equipment in the field—a sort of: ‘strategy to task’ philosophy if you like (in US parlance). But this has not always been the case.

Australia’s current force development process has evolved from a prolonged, and tortuous, route and its current strengths and weaknesses have been scoped by this path. Thus, a brief review of this evolution is warranted. The review will be restricted to the last 25 years for reasons that will become apparent.

Prior to 1973 the Defence organisational scenario was characterised by the following points:

- Single service departments each had their own minister. Service chiefs were responsible for all aspects of their services, including the development of force structures.
- The Defence budget was largely dictated by the treasury, which also monitored expenditure.
- The Department of External Affairs had a virtual monopoly on the provision of intelligence information to Government. Likewise, it was pre-eminent in the provision of advice to Government on defence commitments overseas. Foreign policy was defence policy.

In this scenario the basis for strategic advice to Government, broadly dictated by the Department of External Affairs (later DFA then DFAT), reflected perceived contemporary threats and focused on single service commitments in pursuit of foreign policy. Thus, it involved the short-term imperatives of a forward defence strategy. As a result Australian forces were developed more for their cooperation with the *similar services of allied nations* rather than as a joint Australian force. One could easily suggest that such a scenario would promote service parochialism in the extreme. Similarly, with the lack of future guidance it suggested a short-term focus on contingency operations resulting in a philosophy of simple platform replacement rather than a coordinated framework.

However, in 1973 the Tange reforms produced some fundamental changes. It occurred at a time when Australia’s strategic outlook was shifting from one of forward defence to the defence of Australia as a consequence of Nixon’s Guam doctrine and Australian withdrawal from Vietnam. The reorganisation saw, among other things:

- The three service departments combined into the Department of Defence, which also included the defence responsibilities from other departments.
- The creation of a Strategic and International Policy Division within the Department of Defence, which allowed strategic assessment and advice to Government from within Defence.
- It provided the Department with its own budget, under financial guidance directly from Government not Treasury. A Defence organisational structure was also created to manage expenditure. This *remains* a unique feature within government departments.

The reorganisation saw the progressive lessening of influence by other departments on the Defence Department. Ironically, it also reduced the influence of the individual Service chiefs. However, the Department of Defence became largely autonomous in policy, resource management, and implementation, thus allowing a direct link to be established between strategic guidance, defence policy, and force structure. However, such a connection was not fully articulated until the mid-1980s when the Dobb Report on Australia's defence needs was taken onboard by the influential Defence Minister, Kim Beazley. Now, a sustained long-term plan for force structure was developed by qualitative analysis from definitive strategic guidance endorsed by Government. The methodology for analysis was based on an assessment of regional *capabilities* rather than on a perceived threat. In some ways this methodology allowed Australia to maintain a robust plan after the end of the Cold War at a time when NATO planners were seeking justification for their level of defence spending.

However, this period may have represented the peak of Defence's autonomy. Some commentators now highlight the renewed influence of the Department of Foreign Affairs and Trade since the late-1980's, manifested in the coincidental release of complementary Defence and DFAT White Papers, most recently in 1997 with *In The National Interest*. Is it too much to suggest a return to the short-term imperatives for force development?

Now what does this historical view do for us? To start with, it indicates that the current force planning method does have a sustained basis. Indeed, similar arrangements exist in the United Kingdom and Canada. It shows that the process can allow long-term planning based on qualitative analysis. However, it also highlights some of the current pitfalls and explains the constraints within which we have to work.

- Firstly, Dobb's review and subsequent ten year plan required sustained defence spending—thus, a commitment by the Government to the endorsed plan. However, this has not occurred. Eg. Dobb's original 2.5 per cent of GDP allocation had dropped to 1.9 per cent by 1997–98. Indeed, are these the practical realities, given changing economic and strategic circumstances and the fact that government may change every three years?
- Secondly, commitment to the development process is also required within Defence. What does this mean? Well, limited resources mean compromises over some capability. Here the joint focus is paramount; yet service parochialism still prevails in some areas.
- Thirdly, the immediacy of day to day operations in Defence Headquarters often overrides the long-term plans for force development. Peacekeeping, regional engagement and good international citizen tasks are not force determinants, but are often the dominant focus of staff activity. One might suggest the early introduction into service of the Seahawk for use in the Gulf War—well before it was ready to be stood up in all respects—as an example.
- Fourthly, it demonstrates that a dependency on long-term strategic guidance, derived from sound analysis, is necessary. Why? Because the force structure

planning and major capital equipment procurement phases are prolonged. For example, we started the ANZAC ship helicopter paperwork in 1993. Government approved the project in 1996. The first Seasprite will be in operational service in 2002. The *Collins* class submarine and ANZAC ship projects have taken even longer. Moreover, despite anticipated changes to the process as a result of the Defence Reform Program (DRP), public accountability of billion dollar projects will invariably require a lengthy process.

The bottom line is that the ADF force development process is probably as robust as could be found in any other democratic society. The 15 years since Tange have given constituency with the top structure of defence for a high level of planning and strategic analysis. However, these principles may not be firmly embedded as the pitfalls have alluded too. The urgent tasks still hold sway over the important ones.

The current force development process

But now let us move from the conceptual to reality and describe how the current system actually operates. There is currently yet another review of the process underway. Whilst not predicting its outcome, we should not expect it to deviate markedly from the generic process described here:

- It starts with strategic guidance, derived from both Defence and increasingly now, from DFAT input, as discussed earlier.
- This devolves down into what used to be called the strategic concepts. Most recently we have deconstructed these to be replaced with national military strategies and military response options (MRO). These are the tasks that the ADF is likely to be required to perform, but they do not specify *how* missions are to be accomplished. The strategies are developed by the Strategic Policy and Plans Division and are as follows:
 - Defeating attacks on Australia (DAA);
 - Defence of regional interests (DRJ);
 - Defence of global interests (DGI); and
 - Protection of national interests (PNI)
- At the next level, capability options (or Operational Capability Limitation Statements) are prepared in Capability Development Division (formerly Force Development). These options papers look at whether the ADF currently has the capability to carry out the MROs. Where deficiencies are identified, broad options to rectify them are presented. These options are reviewed by the Defence Capability Committee (DCC). This key committee will be described in more detail shortly.
- Once the preferred option is endorsed by the DCC, a more specific 'Capability Proposal' is submitted by Capability Development Division detailing operational requirements such as numbers required, date of introduction etc. Again the DCC reviews this documentation and once endorsed it is presented

to Government for approval. This is the thrust of the work done in the Maritime Aviation Section of Aerospace Development Branch.

- It is important to note here that in preparing the Capability Proposal, individual Service endorsement is sought prior to being presented to Committee, because once the capability is procured it is the service that picks up the tab for running costs. Thus, in Navy's case, the Proposal goes through Navy Headquarters (Naval Staff Requirements Committee) and the materiel areas (Naval Materiel Requirements Committee) to ensure the capability can be supported. Note that these names have changed post-DRP, but the process is still required. We must stress this point, because it reflects one of the pitfalls of the current system. Whilst the process is robust, it requires commitment. If proposals are not given the full rigour of analysis at this level, then the full cost of a capability may not be discovered and its upkeep may be threatened in later years.
- Once all this has been done, the acquisition process can begin.

One should notice that this analytic approach is top-down, aimed at deriving sound justification of long-term planning needs. It does not exclude a bottom-up approach, particularly from operational areas that identify an existing deficiency in what they are required to do. However, the bottom-up approach is usually equated with urgency consistent with short-term contingency planning. Therefore, it is important that a balance is kept to meet both the immediate needs of the operational commander and the longer term planning requirements.

Now we consider the committees. First, the Defence Capability Committee. It consists of three people. Two Defence civilians, the Deputy Secretary of Strategy and International Policy (DEPSEC S&I—Mr Hugh White) as Chairman and DEPSEC Acquisitions (Gary Jones), together with VCDF as the third member. There are a number of invited participants, including the Service chiefs, but this troika runs the committee. This membership arrangement had its origins in the Tange reforms, and though it is sometimes questioned by serving personnel, it reflects the arrangements in most western democracies where the Defence dichotomy between military and civilian management exists.

The DCC is responsible for establishing the priorities for long term investment in capital equipment against the endorsed strategic guidance and subsequent analysis. Their recommendations for capital equipment investment are sent to Cabinet for approval through the Minister, although Ministers have been known to implement a fast-track solution.

In general terms, the Portfolio spends about 23 per cent of the annual Defence budget on capital equipment investment. This equates to about \$2.3 billion in the 1998–99 financial year. A majority of this is already committed to projects under the acquisition phase. The remainder is managed through 'the Pink Book' which is simply a programming tool for future expenditure. All unapproved projects bid for capital equipment funds in the Pink Book. As you would expect, more projects are bid for than money exists to implement. Thus, the DCC must prioritise cognisant with strategic guidance.

There is a second important forum for discussion of capability issues, known surprisingly as 'the Capability Forum'. This 2 Star group mirrors the DCC in membership, (basically one level down) and acts as a filter for capability issues that should allow the DCC to concentrate on the broader issues.

The implications for maritime aviation

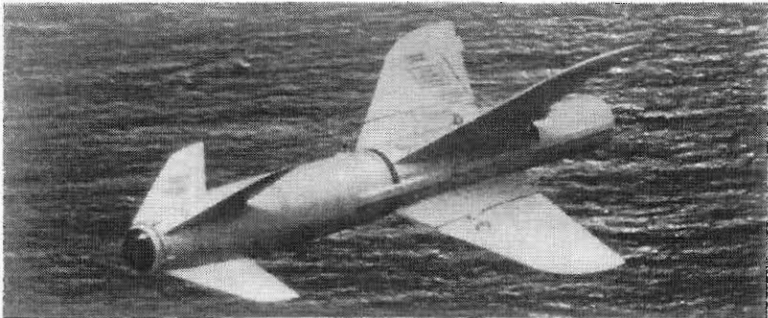
Having described the process now let us look at the direct implications for maritime aviation. Current strategic guidance is laid down in *Australia's Strategic Policy*, published in 1997, and we have already seen the strategies involved. Fundamentally, it supports a maritime concept: that is, we plan our operations to defeat aggressors in our maritime approaches before they reach our territory. The following Defence priorities for force structure development flow from this concept:

- **Gaining the Knowledge Edge:** that is, the collection and collation of real-time intelligence; exploiting superior command and control measures and importantly, the high quality surveillance of our maritime approaches.
 - Clearly, the surveillance capabilities of our maritime aviation assets can contribute to these elements along with other capabilities such as JORN, AEW&C, UAVs and space-based assets.
- **Defeating Threats in our Maritime Approaches:** this includes the two key features of gaining air superiority and defeating ships.
 - Maritime aviation assets contribute to the later, with anti-surface warfare (ASuW) capabilities through Harpoon fitted AP-3Cs and Penguin fitted Seasprites, or sub-surface warfare (ASW) through torpedo fitted AP-3Cs and Seahawks.
- **Strike:** the third priority is strike, where the contributions of maritime aviation are limited.
 - although maritime strike with either Harpoon or Penguin may be appropriate.
- **Land forces:** lastly, development of land forces to defeat hostile land forces on Australian territory. The priority here affords some effort towards establishing a limited amphibious capability.
 - The major contribution of maritime aviation assets in this area is clearly in the conduct of amphibious operations. From surveillance by AP-3Cs and embarked helicopters during transit to the amphibious landing itself, where, as CDRE Clapp observed during the Falklands, you can never have enough helicopters. Here the Sea King plays its role.

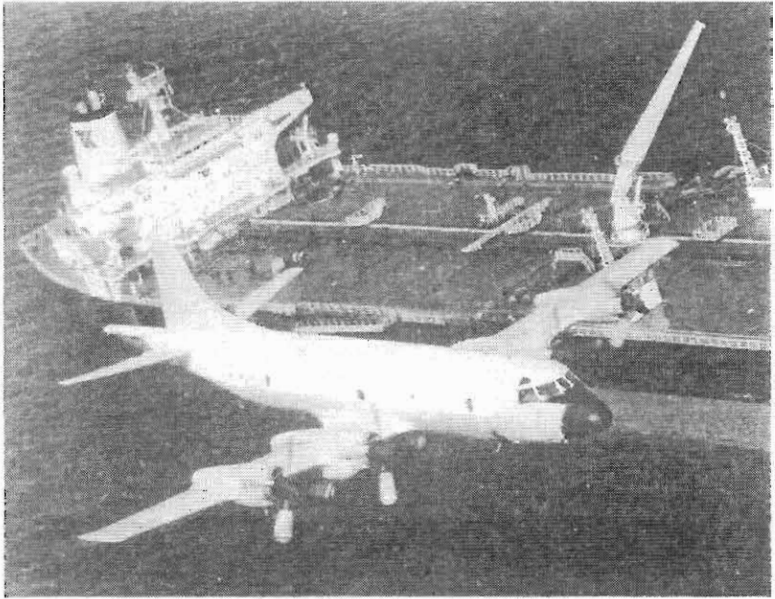
One should note, however, that it is a relatively simple exercise to justify the existence of our current maritime aviation assets against each of these priorities; but it is a false exercise as clearly they were procured under a different set of arguments. It is more important to note that any *future* maritime aviation capability must be justified

against these priorities. Therefore, any upgrade to our helicopters or new capability, such as a mobile floating airfield... must meet the rigour of analysis against each priority. This is stressed because it leads to the understanding that capabilities are argued, not simply as platform replacements, as may have been the case prior to the Tange reforms, but as a solution to a shortfall in meeting the military strategy in the longer term. Thus, the future of maritime aviation might well be shared with space-based surveillance, or UAVs with a limited strike capability.

At this point it is appropriate to consider the specific development issues associated with maritime patrol and naval aviation elements. We shall start with maritime patrol.



Penguin missile. (RAN)



P-3C Orion maritime patrol aircraft. (RAAF)

11 Maritime Patrol Development

Squadron Leader David Flood

To view where Maritime Patrol Aviation is going in the 21st century we will take a walk through time starting in 1939 and going out to possibly 2050. The aim in taking this walk is:

- to provide the background on where the maritime patrol force has come from;
- provide details of the update program that is being conducted on the P-3 Orions today;
- examine the plans or wish list that are in train following the current program; and
- determine where we will go in around 2015 when the current aircraft reach their planned withdrawal date.

History

The Air Force received its first long range maritime patrol aircraft in 1939 when Number 10 Squadron was formed and moved to England to convert to and pick up its Sunderland aircraft. Before they finished conversion war erupted in Europe and at the request of the British Government, 10 Squadron remained in the United Kingdom. Subsequently becoming the first Commonwealth squadron to fly combat operations against Germany. Number 11 Squadron was formed shortly afterwards and was equipped predominantly with Catalinas. Before the Pacific War started another Catalina squadron, Number 20, was raised. The Catalina squadrons were flying surveillance patrols out of Port Moresby when the Japanese made their surprise attacks in December 1941 and continued operations until the war's end and beyond repatriating former prisoners of war. These early MPA were equipped with a credible defensive armament suite and performed a variety of missions that included: anti-submarine warfare, anti-surface warfare, bombing and strafing, mining, air-sea rescue, reconnaissance, insertion, supply and supporting coastwatchers, and pathfinder duties. They were tough, multi-role aircraft, they proved to be flexible and long enduring and often operated beyond their design limits.

Post-war, Number 10 Squadron was equipped with the 'long-nose' Lincoln for the maritime reconnaissance role as was 11 Squadron for three years until 1951 when re-equipped with Neptunes. In 1963 10 Squadron received a later variant of the Neptune. 1968 saw the P-3 Orion introduced into RAAF service when 11 Squadron received their P-3Bs.

In 1978 Maritime Patrol entered the digital age as the Neptunes of Number 10 Squadron were replaced by P-3C Update 2.0 Orions under Project AIR 9. These aircraft joined the P-3B Orions already based at RAAF Edinburgh and formed the frontline assets of the newly formed Number 92 Wing. Between 1984 and 1986 the P-3Bs were replaced by a second batch of P-3C Update 2.5 aircraft. To the aircrew the differences between the P-3C variants were insignificant, unless the crew had change types in pre-flight. The Update 2.0s had a reel-to-reel tape system for the central computer while the Update 2.5s used cassettes. By about 1988 the cassette system was retrofitted to the earlier Update 2.0s making the aircraft almost identical. The introduction of the all P-3C fleet saw the aircraft being pooled by the Wing, which allowed the aircrew to fly any of the Orions on the flight line. The tail flashes were no indication as to which squadron the crew operating an aircraft came from.

Current projects

The P-3 ESM system was considered deficient and under Project AIR 5140 the ALR-2001 system was introduced. The last aircraft was modified in early 1998 and the project is now being wrapped up. The modified aircraft are best identified by the new wing tips. The ALR-2001 is proving to be a very capable system.

Maritime Patrol Group is now in the middle of a major systems update to the aircraft and they will be designated the AP-3C—the 'A' for Australian. Additionally, there are life extension measures being implemented to take the aircraft through to a planned withdrawal date of 2015. The systems being updated include the avionics, radar, acoustics, data management system, MAD, and the communications systems. The new and retained systems are interconnected via two dual redundant 1553 data buses, known as the mission and avionics data buses.

The navigation system has two inertials with embedded GPS. These feed both buses to provide the navigation solution. There are 8 navigation solutions available. The flight deck is a glass cockpit with Control and Display Navigation Units used to select the flight instrument set up, radios and navigation aids selection and operation of the flight station tactical display.

The radar system is multi-mode imaging radar with auto tracking capabilities. Imaging modes include ISAR, spot SAR, CSAR and range profiling. During recent flight trials on B737 test bed aircraft in the Mediterranean, merchant contacts were being detected out to the maximum range of 200 nm.

The acoustics system is a later variant of the Seahawk 503 system with colour displays. The similarity ends with the name, CDC just call all their acoustic systems a 503 because it is an established name. The processing limit is currently 16 sonobuoys with growth that can double the number, although recent advice is that with receiver modules now available the system could potentially monitor 64 sonobuoys.

The data management system is a later variant of the USN P-3 system. This allows modules of USN developed software to be adopted by the AP-3C, which has

already been done in this project. The provision of an on-line Harpoon capability was originally rejected when the project was considered due to cost. However, the USN developed a module to provide an on-line Harpoon capability that has been imported into the program baseline. There is significant growth available within the data management system for the future.

The MAD system is the 504, similar to the Seahawk but the P-3 fit reputedly performs better.

The radios have been changed. There will be two VHF, including marine band capability, three UHF, two HF capable of simultaneous operation with minor limitations, and a UHF/MIL SATCOM capability has been included. The Integrated Communications System (ICS) is software programmable, and in the AP-3C crewmembers will no longer be isolated from all other communications when using covered circuits.

In addition to the modified aircraft, the project is providing a Software Engineering Laboratory, a Mission Replay and Analysis Module, and two simulators: a tactical mission simulator, and a Flight Simulator.

Life extension measures included reducing aircraft weight by approximately 2900 pounds, moving the centre of gravity from the aft caution zone forward to the normal zone, more accurate fatigue monitoring systems and the acquisition of three austere training aircraft. The training aircraft are used for pilot conversion and continuation training to relieve the mission aircraft of that high fatigue accrual activity.

Future potential projects

There are a number of systems that will not be upgraded under AIR 5276 which are 20 years old or more and leave us with potential follow-on projects. These include:

- **EW Self Protection (EWSP).** The major threat to the AP-3C is considered to be man-portable air defence systems in the vicinity of a home base used by insurgents or carried by vessels. Particularly in times of tension when an AP-3C may be conducting a close investigation of a contact. When conducting a normal photograph run today the aircraft is flown 500 yards abeam of a contact to obtain the imagery. The aircraft is expected to side step or avoid other threats such as fighters or radar-guided surface to air missiles from own sensor data, or by utilising external support such as JORN.
- **Enhanced electro-optical system.** The current Infra Red Detection System (IRDS) is 20 years old, but when scoping AIR 5276, technology had not advanced to a point where it was cost effective to replace the current system. The situation changed in about 1995. The USN has selected a very capable multi-spectral system built by Wescam that has three sensors: infra red, colour, and black and white/near infra red. The

system also has the capability to take a laser designator/range finder. The new equipment fits where the current IRDS hardware is installed. The field of view on the colour sensor is a variable zoom from 51 degrees to 1.7 degrees. The black and white sensor's largest field of view is 0.61 degrees and steps down to 0.11 degrees. A tanker imaged from 20 000 feet at 34 nm with field of view of 0.19 degrees fills the operator's screen. A combatant is likely to be visually identified by class by at least 70 nm with this system. This capability would round out the sensor fit of the AP-3C, complementing the radar and ESM.

- **Data links.** The new data links sought fall in three categories: tactical, strategic and intelligence. The potential interactions are as follows:
 - The tactical system sought is Link 16 to ensure the AP-3C is interoperable with the other tactical units that will be out in the battlespace.
 - The strategic system sought is the Officer in Tactical Command Information Exchange System (OTCIXS). This enables an AP-3C to receive and contribute to the battlespace picture produced by the ASJIC and to receive JORN in close to real time.
 - There are a number of US stovepiped intelligence broadcasts that would be useful to enhance a crew's situational awareness. These stovepipe systems will be migrated to the emerging Integrated Broadcast System (IBS). Raytheon are developing a product line called Joint Tactical Terminal (JTT) which will be capable of receiving any of these broadcasts using the one box. This appears to be the way ahead.
 - Link 11 will be retained for interoperability with ADF units not migrating to Link 16 and with regional nations such as Singapore and Thailand. The company producing the software for the Seasprite Link 11 have already made an unsolicited offer to produce combined Link 11 and 16 software such that both Links can be operated simultaneously without over burdening the crew of the AP-3C.
- **Weapons projects.** There are three weapons projects in various stages of approval today seeking to modernise weapon that have also been around for over 20 years. They are:
 - a new maritime mine is being acquired under JOINT 2045;
 - a new Light Weight Torpedo is being acquired under JOINT 2070; and,
 - an anti-radar, anti-radiation and littoral weapon is sought under AIR 5398. The type of weapon sought here is in the SLAM ER class, although how the anti-radiation requirement will be achieved is going to be interesting.

- **Crash data recorders.** The aircraft will be fitted with a crash data recorder system under the Air Force minors program.
- **Warning systems.** An Airborne Collision Avoidance System and Ground Proximity Warning System are two systems the Directorate of Flight Safety is seeking to install in all aircraft and these are likely to be considered in any further update of the AP-3C.
- **HF modernisation program.** Under JOINT 2043 the AP-3C will receive a Higher Order Controller that will hang off the avionics data bus. *Amongst the capabilities this will provide is web browsing on HF, if anybody has the time. Not during ASW I would suggest! A significant capability will be imagery transfer from and to the aircraft. Recorded audio, such as acoustics or ESM, will also be able to be transferred. This is an approved modification that is under contract.*
- **ASW sensors.** An important development that is expected to revolutionise ASW is multi-statics. The pendulum has swung at times in favour of the submarine then back to the ASW forces. Bi-static technology shows promise, which may yet take the initiative off the submarine again. Bi-static ASW is a later generation of JULIE that is possible because of the processing power now available with computers.

This is fairly large wish list in times of financial constraint, so it will be interesting to see what eventuates. Of note, these updates are doing nothing for the aircraft's hotel services such as propulsion, hydraulics, electrics etc. Yet these are starting to show their age and impacting on availability. There may be a need to update these systems to keep the aircraft operational out to 2015.

The fatigue life of the airframe has not been neglected, and in addition to the life extension measures being completed as part of this project, Support Command Air Force is funding participation in the USN P-3 Service Life Assessment Program (SLAP) to better define the fatigue life of the aircraft.

Beyond the AP-3C

Work has also begun on examining the retention of the maritime patrol capability post 2015. The ADF is participating as full members with the USN in their Multi-mission Maritime Aircraft (MMA) study. The study is possibly blinkered, in that it assumes a manned aircraft similar to a P-3 will be required. The study team have been requested to examine this position within the study, and the issue will also be examined outside the MMA study.

The study will seek to identify future technologies that may be incorporated in the future aircraft. These include:

- A Cooperative Engagement Capability is being developed for anti-air warfare and is expected to migrate to anti-surface and ASW.
- Advanced periscope detection and discrimination has an expected IOC of 2004 for both aircraft and ships.

- Autonomous Underwater Vehicles may be deployable from aircraft to conduct a variety of missions including ASW, mine warfare, intelligence collection and submarine SAR.
- Data fusion and multi-source image fusion will utilise data gathered from own sensors and other sources such as satellites, JORN and seabed arrays.
- Automatic target recognition will be applicable to electro-optical systems, imaging radar, millimetre wave, multi-spectral/hyper-spectral and other imaging sensors, and will be applicable to surveillance and targeting systems that may be carried by this aircraft.
- Airborne mine hunting technology is likely to mature and includes LIDAR line scanners, sub-surface synthetic aperture radar and nuclear quadrature resonance. Please do not ask about these, as the names are the extent of my knowledge and the notes are still a bit scant.
- Integrated avionics, improved navigation systems and digital mapping will enhance the situational awareness of the crew, while systems going into the F-22 and B-2 are expected to be adopted widely in future combat aircraft.
- Autonomous reconfiguration control technology allows aircraft with battle damage to redistribute control capability between the remaining actuators, rather than having duplication or triplication.
- Sensor technology will advance with the fielding of wide-band multi-spectral systems in conjunction with the narrow-band sensors of today.
- Growths in computer hardware mean that data storage and processing power is doubling about every 18 months. This trend is expected to continue until the 2010–20 timeframe when the atom to bit of memory ratio reaches one-to-one and the finest machining technologies are expected to reach the resolution of about an atom. While this sounds very positive, in terms of software the expected trend is that software will expand to fill the available hardware to meet human expectation. The conclusion is that the software environment will always be pushing the limits and not be any less difficult to work within than it is today, there will just be more of it.
- UAVs are expected to be major players on the future battlefield. They will in some instances replace today's aircraft, while in other cases the MPA will control the UAV.
- The future MPA will be a strong candidate to participate in Network Centric Warfare as espoused by the USN to enhance a Commander's command, control, communications and intelligence (C3I) capabilities.

The later phase of the MMA Study will examine options for their technical and economical feasibility. This will be done in conjunction with industry. Identified options are:

- perform the identified missions with UAVs;
- start from a blank sheet of paper;
- adapt a current aircraft design to the MPA roles;
- refurbish the current aircraft; or

- postpone the requirement to replace the current aircraft by extending their service life

The data from the MMA study will not be in for another 12 months. What is its likely outcome? While UAVs could perform some of the current MPA missions, they are unlikely to offer an equivalent multi-role capability, and therefore a manned aircraft is likely to be retained. Specialist UAVs will probably be utilised for the more hazardous missions. The new development option and the adaptation of an existing platform are unlikely on cost grounds. As the MMA product will not fly off a carrier these options are unlikely to attract the USN funding support required.

That leaves the two refurbishment options, one a short term solution that will delay the requirement to replace the current aircraft, and the other that will see the current aircraft rebuilt to operate until 2050. This is a similar solution to that selected by the United Kingdom for their Nimrods. Both approaches could be adopted, the first to shift the planned withdrawal date from 2015 when we are also intending to replace the fighter force, and the second to rebuild and zeroise the fatigue life of the aircraft. The hotel services discussed earlier, if not updated previously will need to be updated during one of these programs. Even though it is called refurbishment you might have difficulty pointing to an original component.

Performance wise we could look at what putting C-130J propulsion units on a P-3 would do. While maintaining four hours on task an aircraft could operate a further 400 nm from base. Furthermore, the dash speed at maximum all up weight would be V_{NE} limited, which is 405 kts at sea level. The 18 weapon stations would be retained, but at some point the armament system will need to be updated to accommodate the new weapon capabilities

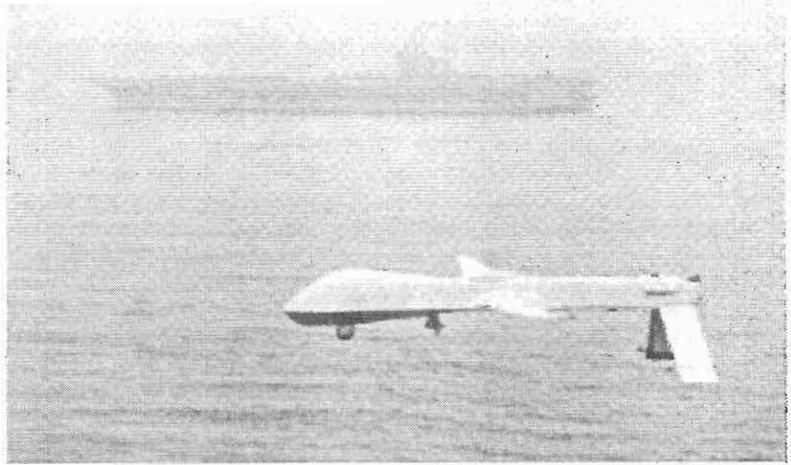
Summary

Where has the Maritime Patrol force come from and where is it going? Maritime Patrol Aviation started with large multi-engined, multi-crewed aircraft with long range and endurance relying on visual sensors conducting a wide variety of missions. Slowly stand-alone sensor systems to search above and below the oceans have filled out the inside of the aircraft. The analogue systems were provided with rudimentary connections to transfer data between crewmembers. The digital age saw an increase in the amount of data being passed around the aircraft, but on the whole the sensors were still analogue and utilised interface units to pass data to the central computer for display. The central computer is able to share the information with other platforms using data links. Digital sensors are now being used that share information via a data bus, with other systems picking the data they require as the information flows through the buses. The potential to share information will increase. The next step will be to an open architecture system that will enable the aircraft to be part of the network centric environment of the 21st century.

Over time there has been an increase in the number of on board systems, yet with technology, the size, power and environmental requirements are reducing. An

example of this is the radar system changes between the aircraft—the Neptune's radar had a peak power of two gigawatts, the P-3C is 143 kilowatts, while the AP-3C will be 200 watts.

One of the results of miniaturising the systems fielded by MPA is that they become a viable option for then fielding in maritime helicopters.



Outrider UAV.

12 Naval Aviation Development

Commander Tim Barrett

We have just had a sample of the past, present and possible future development of our maritime patrol force. Much of what has been said, such as surveillance issues, or multi-static ASW, is equally applicable to naval aviation. Therefore we do not need to dwell on it.

What must be said, however, is that in the past a lot of parallel development has occurred in isolation within the MPA and naval aviation communities. The new task in Aerospace Development Branch, given the paucity of funds for any new development, is to maximise common approaches to things like ASW and ASuW. Things have already started with the implementation of common tasks to DSTO.

But now lets turn to the specifics of Naval Aviation. Given the recent 50th year celebrations, it is most appropriate that we now reflect on the Fleet Air Arm's developmental timeline. Let's have a look at the capability scorecard thus far.

The past

The genesis of the RAN Fleet Air Arm (FAA) was in the immediate post-war years with development by a small team that included the then LCDR V.A.T. Smith. His modest Capability Proposal (or whatever the staff paper was then called) was for the purchase of two light fleet carriers, complemented by three carrier air groups (CAG) based out of two naval air stations. The current Defence Committees would choke on the magnitude of such a proposal. But like the majority of contemporary proposals, his was cut back in size due to cost capping. He only got two carriers, two CAGs and one naval air station!

Throughout the years of operating these ships and aircraft, the FAA can rightly say that it sought to maintain a technological capability commensurate with the relatively small size of the organisation. We stayed abreast of aircraft and sensor changes. Indeed, HMAS *Melbourne's* delivery was delayed so that she could be improved—she was to be the first operational aircraft carrier to be equipped with steam catapults, angled deck and mirror landing system—still standard fit on carriers to this day. We then saw the advancement of piston to jet, and Sycamore to Sea King, in pursuit of maintaining a capability suitable to our forward defence strategy.

The early 1980s saw a fundamental shift in the way we did business. The decision was made not to replace the carrier, yet the requirement for organic air support for the fleet remained. The solution lay in helicopters operating from aviation capable major fleet units, but the wide range of traditional roles remained. As a result

the requirement dictated the pursuit of multi-role helicopters and the exploitation of emerging technology.

So, in October 1984 the FAA went digital with the approval of Project SEA 1308 the Seahawk Role Adaptable Weapon System. This project was a significant step. To some critics it was a bold and challenging move to create an orphan type that exploited emerging technologies not fully integrated in other medium size helicopters overseas. To those with a contemporary knowledge of aircraft systems, it was both achievable and well within current technology. My view then, as it is now, is that it was necessary to take the risk with Seahawk when we did. This was largely forced upon us because of our strategic circumstances, the size of our operating fleet and just how much we have to spend on realising the capability. We mitigated the risk through a good development program. However, the successful introduction of any type needs commitment beyond the project phase—commitment to operational testing, resources for training and ongoing through life support. Few would disagree that this aspect was not afforded the same rigour as the initial project development. There is an obvious lesson here for future development.

The Seahawk was a quantum leap forward. In 1989 it delivered a helicopter with dual redundant 1553 databus, semi-glass cockpit, the 503 acoustic processor, and the 504 integrated MAD—all the things that the AP-3C is getting now (albeit the latest versions)! And we procured a mission simulator to go with it. Notably, the sixteen aircraft were acquired for a project cost of around \$610 million (1985/86). The proposed Seahawk mid-life upgrade under Project SEA 1405 Phases 3 & 4 may cost up to \$600 million. These figures expose the cost of technology (and demonstrate the sheer financial difficulty in trying to replicate Admiral Sir Victor Smith's original Capability Proposal. Noting the cost of technology for a small number of aircraft, the development process is obviously complicated. It means our justification against the Defence priorities, discussed earlier, must be more robust. Fortunately, we continue to be supported by some authoritative studies by DSTO and the Capability Analysis Branch that surface combatants achieve an order of magnitude improvement in capability when equipped with a suitably fitted helicopter.

The present

This leads us to the present, and the justification for the ANZAC ship helicopter. This helicopter, like the Seahawk in the FFG, is not an unnecessary appendage, but a significant part of the ship's weapon system. The selection has been contentious, at least in the minds of many current aviators, however, I ask you to recall the force development process, discussed earlier. Decisions were made in mid-1995, subject to financial constraints *and the capability requirements at the time*.

The acquisition of the Super Seasprite with its FLIR, ESM, EW Self Protection, counter measures, Penguin missile, datalink, SATCOM, dual INS with embedded GPS, and an integrated tactical avionics suite, requires the support of a two man crew. We have returned to the scenario posed by the introduction of the Seahawk in the last decade. Have we asked too much of technology? What risk

mitigation plans are in place? Well, the human factors issues are acknowledged as a critical issue by the prime contractor. Georgia Tech, an authority on aviation human factors engineering in the United States is providing independent advice, and dedicated human factors engineering working groups meet monthly to consider progress in cockpit display and management. The design is another bold move, but we should be concentrating on our commitment to introduce this capability.

A further area of development often forgotten is infrastructure. Yet *Albatross* is about to commence a significant infrastructure upgrade to accommodate increased aircraft numbers due to Seasprite, and simply just to replace those buildings that were in V.A.T. Smith's original capability proposal. Another development issue of concern at the moment is Kalkara. Kalkara is replacing the Jindavik as the ADF's aerial target system. Yes, it is providing some problems with introduction into service at the moment. It would seem that Kalkara is becoming a target in more ways than one!

So looking back on our recent achievements, we can suggest that naval aviation, as part of the broader maritime aviation capability, has been successfully argued as a significant contributor to the force structure derived from strategic guidance. Despite the current financial constraints, the series of projects just mentioned (but not including V.A.T. Smith's original Capability Proposal!) have consumed over \$2 billion of the capital equipment budget in the last 14 years.

The future

But what of the future capability development for the Fleet Air Arm?

We need to address the question of helicopter support for the LPAs—this will largely determine the future of the Sea Kings beyond the current planned withdrawal date of 2008. Will the Sea King be extended with another, more comprehensive LOTE? Will more airframes be purchased? Will the Black Hawk survive the rigours of embarked life? Perceptions abound, but as alluded to earlier, the development process requires sound analysis before any amount of money is spent. Constructive and empirical analysis can often override the myths espoused from parochialism. Thus, the First of Class Flight Trials in 1999 should validate our assumptions one way or the other.

As discussed earlier we are now formally defining what needs to be done to address the capability shortfalls and supportability of the Seahawk to keep the aircraft in service until 2025. If the aircraft are to be upgraded it may cost up to \$600 million dollars depending on which option is selected. Replacing the capability with another aircraft would probably cost twice this amount. The aims of any upgrade are simple really, and are similar to those that confront any other in-service capability across the ADF—we need to increase capability and supportability, whilst reducing operating costs.

How do we increase the aircraft's capability. Firstly, we provide increased surveillance capability with the fitment of FLIR and ESM under the current Project SEA 1405 phases 1 & 2. However, the Seahawk *remains* the primary ASW asset in

the fleet. If it is to be effective into the future we need to match our acoustic systems to the threat. For us, this could mean fitting dipping sonar and the exploitation of advances in multi-statics. Similarly, a new radar, a new tactical data system (which may be the Seasprite ITAS?)—or any or all of the above, and more, could be selected. Integrating the Penguin missile will finally provide us with the full Role Adaptable Weapon System that we sought in 1984. Secondly, we must increase the supportability and the life of the aircraft. This *must* involve tackling the corrosion problems, perhaps by replacing the aircraft's entire cabin structure, and replacing or upgrading obsolete or inefficient aircraft systems (just as the USN are doing with the 'R' project for their Seahawks). Finally, we must reduce the life cycle costs of the aircraft. Reducing the maintenance burden is a good start. Systems commonality is another factor. FLIR and ESM already fit the bill to some degree. ITAS, radar and Penguin, as fitted to the Seasprite could be next.

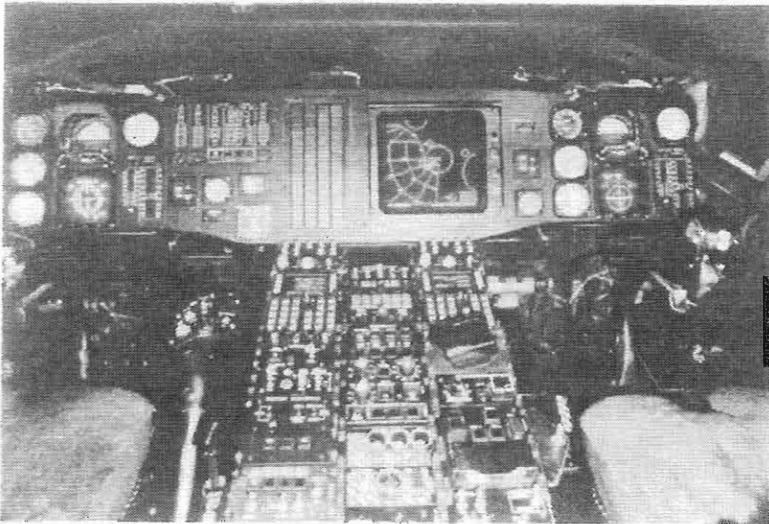
Now, these may sound like motherhood statements but they do represent the philosophies by which future development will take place. It leads neatly to the discussion of the number of aircraft types operated by the FAA. Our current practice is not sustainable in terms of operating costs, training, and personnel issues. Indeed, the last recommendation in the Naval Aviation Force Management Review report places an action of the Director General Aerospace Development to reduce the number of types. We are currently investigating the options to implement this. The management of this reduction will probably commence around a decision point for the Seahawk Midlife Upgrade, but may still be based on the planned withdrawal dates (PWD) for existing types. Certainly, we envisage a plan to have no more than two types by 2025. Some of the options could be to:

- Combine a Black Hawk/Seahawk upgrade around 2005. Produce a common cockpit and some major maintenance items.
- Turn some of each variant into CH-60Hs to conduct maritime utility and LPA operations with a joint Army/Navy squadron. This would allow us to retire the Sea Kings at their PWD. (This option, however, would probably require augmentation of a further number of CH-60H airframes)
- Retire the Seasprites early and revert to a fleet of Super Seahawks. (this has obvious capital investment and political implications given the current progress of the Seasprite project)
- Retire the lot in 2013 and buy a limited number of single multi-mission helicopters to support the new surface combatant, ANZACs and the afloat support vessels.
- Alternatively, we could concentrate on a common systems approach as proposed earlier: that is, Seahawk, Black Hawk and Seasprite commonality through engines, avionics, mission equipment and the like.
- Finally, we could replace some or all types with UAVs and save on retention and completion bonuses.

Conclusions

The force development process that we now have has evolved over a considerable period, and is similar in some degree to the methods employed by our allies. It is based on the analysis of long-term strategic guidance, but can be affected over the shorter term by contingencies imposed by both our own department and outside influences. Secondly, in the current financial circumstances selection of approved capabilities is rigorously tested against endorsed military strategies and priorities.

Lastly, maritime aviation has featured well in recent force development despite the paucity of funding, and is in a strong position to contribute to these military strategies in the future. However, we should not fool ourselves that in the immediate future, strategic guidance and funding would allow the Maritime Aviation developers to draft a Capability Proposal similar to that which Sir Victor Smith contributed in 1948.



Seahawk cockpit. (RAN)



Kaman SH-2G(A) Super Seasprite. (RAN)

13 Panel Discussion

CMDR Neil McQueen, Maritime Warfare Advisor, IAP Branch, CPRP Division

One question that leads on from earlier discussions is the importance of communications between a variety of joint/combined ops scenarios. Noting CAPT Cleveland's comments on the progression to Link 16 in around 2002, the New Zealand P3 upgrade to Link 11, and indeed our unassisted bid for a Link 16/Link 11 combination software for the Seasprite, what importance do you place on interaction and standardisation?

CMDR Barrett

The short answer is: 'considerable', and we refer to the ADF Data Link Authority for reference to the ADF future standard. For example, a lot of work has been done recently on the future of the P3 tactical data link, (and indeed the operational and strategic datalink) and the Authority has been used to provide the guidance. The difficulty we face at the moment is a lack of firm direction on the transition plan from Link 11 to Link 16. Each have been used in different ways; for example Link 16 for air defence, whilst Link 11 has been used basically in the maritime scenario. Each is in a different stage of development—Link 11 is mature, whilst Link 16 is still under development. It has presented a dilemma as to which system the Seasprite should be fitted with given the timing of its introduction into service; that is, Link 11 (as contracted), Link 16, or a combination of both?

So, a lot of thought has been put towards standardisation, but I can't offer a definitive solution on the long term future Seasprite datalink as yet. Similarly, this is being considered in the Seahawk mid-life upgrade.

SQNLDR Flood

Clearly with data link, you've got to be where everyone else is, otherwise you're not going to be interoperable. I mean Link 22 is out there as well, no one is going Link 22 today, so there is no point in my mind, us even going to look at it. Which is why I am saying Link 16, because further down the track with Link 16 there is also an over-the-horizon capability they are proposing with satellites, which gives you that over-the-horizon capability of Link 22. We do have to be where the people are today, or where they are going to go. When I said OTCIXS or its successor, the Americans have already identified an operation path from OTCIXS. I have asked people in Australia, particularly in MHQ, CSOC3I, if he even knows about it, and he didn't. So there is no point in us looking at what the Americans are doing until Australia comes up with a consolidated approach. And it's really got to be an ADF move, and giving the TADIL authority some authority to do things is actually a step in the right direction.

LEUT Huw Paffard, 817 Squadron

This is a question on the capability for ASuW. Recent publications say that a lot of our maritime operations, especially with helicopters, are going to be in littoral areas. A missile the size of the Penguin is maybe too large and too far ranged. Is anything being looked at to fill in that gap, so that we are not using a very high value missile to take out a very low value target, or indeed take out the wrong target because it was fully autonomous?

CMDR Barrett

The Penguin missile was bought specifically to operate in the littoral regions because of its imaging capabilities. It was acquired to supplement the ANZAC ship harpoon capability which is known to have deficiencies in the littoral. Other weapons were considered during evaluation by DSTO, but we are not currently looking at anything between Harpoon and Penguin capability.

LEUT Paffard

Even less than a Penguin?

CMDR Barrett

Well, during evaluation we looked hard at what the New Zealanders were doing with Maverick. But they had issues of in-service commonality with their own Air Force weapons that may have prompted their decision. The answer is no, we aren't looking at another weapon.

CMDR Tony Dalton

The capability process you have described to us seems to be a very *matériel* orientated process. Do you look at the personnel side of it? And with that—there is a capability involved in our personnel—there are gaps appearing in our system between what you are introducing as a fundamentally new piece of kit, say Seasprite, and what you want the crew in Seasprite to do, and what the established system is capable of providing. Moving the people along with the technology, seems to me to be fundamental part of the capability development process.

CMDR Barrett

It's a very good point, and in my presentation I stressed that there is a point within the development of the capability proposal where all quarters must state their commitment. I see that particular point (it used to be the Staff Requirements Committee endorsement) as a major pitfall in how we do things at the moment. It may well be that there are not enough people with sufficient time to put sufficient rigour into the proposal before it goes up to committee. Thus, in the utopian force development process system, when the Committee sees the proposal it assumes that it has the full support, *and can be fully supported by*, the individual service. Indeed,

each Capability Proposal includes a specific section on net personnel and operating costs, so all those things should have been documented.

Noting all this then, and speaking with a Capability Development hat on, the individual headquarters are given a good chance to make comment prior to major capability proposals going through. Whether the headquarters put sufficient rigour into this process is the issue. If not, we put ourselves in the situation you described.

CDRE McCaffrie

Can I just add something to that. Very recently there was a proposal to buy some additional Seasprite attrition aircraft. I gather that the decision in the end was hinging not so much on the actual cost of the aircraft, but on the ongoing personnel and operational costs associated with them. So it certainly is a major issue.

CMDR Barrett

Again, as I tried to stress in the presentation, we in the Navy traditionally look at challenging new projects. We are always looking at introducing something that is just beyond our current capability. The fact that we don't take full cognisance of some of the personnel issues right at the start is a valid observation. It behoves us to ensure that when the proposal is considered at headquarters level, we are adding that rigour to the analysis. Otherwise we end up with a situation where people aren't trained to a sufficient level for the capability that is being introduced.

GPCAPT David Pietsch, Director of Aerospace Combat Development

My observation over the last few years of watching this process taking place, is certainly a few years ago when a new capability was being proposed, everybody wanted it, but they didn't want to hear too much about the costs associated with it. The Chiefs of the Services said 'Yeah we'll sort that problem out when the problem comes'. And what's happened is that finally the ship has come home, and all three services are discovering that the things that they wanted they can't really afford to operate. Now what's happening is we are put through the wringer every time on the through-life support costs, the operating costs—there is no such thing as personnel costs by the way, or personnel issues, because we are limited to 50,000 people in the services, which means there are no offsets, you can't get more people. So the services now, individually have much greater responsibility to themselves to ensure that when they do sign up for a capability that they can actually meet it. In the past they hoped. I think now the services have started to realise that, for example, the Air Force is going to have to handle AEW&C, and when we agreed to it at the time there was a certain amount of faith and hope that it would all work out. We haven't yet manned all those elements.



Seahawk operations. (RAN)

14 The Future of Naval and Maritime Aviation

Commander Vince Di Pietro

As a junior officer I used to refer to 'they' or 'those blokes at the top' a lot. Now that I am actually one of 'they' it is often very frustrating to realise 'we' don't actually have as much control or influence as you would think! Even more surprising when you get to this part of the atmosphere, is that the big circuit breaker on the bulkhead that fixes everything like the magic football sponge, does not actually exist.

This is not a party political broadcast. What I present today are my views and opinions, and not Navy or Government policy. They are in fact, little more than the ravings of a Latin lunatic. I would prefer Chatham House rules, but as my career is already (or shortly about to be further) in tatters should any opinion reach the 9 o'clock News, so be it. We live in controversial times.

I ask you to shed the shackles of this place. Consider now that I am not Vince Di Pietro. To effect my crystal ball vision I will need you to imagine that I am CDR Benzino Gasolini, grandson of Vince Di Pietro, a third generation naval aviator of no particular renown...

Good afternoon gentlemen, welcome to this seminar. I have been asked to report the current state of naval aviation in the year 2048. As you are aware from my telepathic fingerprint, I am the visiting air fellow at the faculty of Maritime Academia at the Australian Commonwealth Navy's University of Booderee at Jervis Bay. I felt I would vary my approach to the steady deck of our current status by giving an insight to the pitching deck of the past 50 years, from which a successful laser recovery has been effected, and from which our current well being has evolved.

One day not so long ago my dear old grandad, Vince Di Pietro, passed away. As his favourite grandchild he didn't leave me his 250GT Lusso Ferrari or his money. Just this bag. In it are some of his writings, a diary, some old books, a rubber nose, a fake moustache and an old flying helmet. My disappointment at missing out on the red Italian chick magnet was soon eclipsed by the amazing and interesting contents of the bag. They give an insight into the ways of the 20th century, and while focussing on the present I feel it my responsibility to enlighten with a view to the past, so that all may appreciate from where we've come, and hopefully how we got here... and believe me we've come a long way. So let's energise...

We currently enjoy :

- task stability;
- operative activity objectivisation (jobs for life);

- a functioning and efficient component replacement system second to none;
- a smooth training continuum which is completely transparent to the operational tasking agencies who receive a complete, value added product ready for use; and
- equipment ready to maintain our national and global objectives.

But it seems it wasn't always that way. Grandad's books talk about the James Tiberius Kirk effect. Apparently Jim was a starship captain in a form of entertainment called television serials. His effect or theory was that you could go everywhere in multiples of the speed of light, using no fuel to get there and taking no time at all to arrive. Apparently, in 1998 a manifestation of this effect was the direction and environment within which the defence force and the airspace in which it operated was expected to function.

The state of our manpower in 2048 has come from a long way back. Apparently the training of people to perform their function hasn't always been as we have it today. As you all know, we who are proud to serve in today's Navy enjoy a through life leadership which energises the second a young person shows interest in aviation at sea through his/her ocular hologram.

At that time our objectivisation facilitators (recruiters) will expend their resources to nurture that interest, encourage the prospective aspirant to acquire the necessary pre-function skills sets, and help them to arrive at the training gate ready to receive the necessary adaptation and talents to operate in naval aviation. As those of us approaching retirement know, we also enjoy the privilege of assisting the objectivisation facilitators attract more young people by spreading the word and retaining contact with the service, and returning to it corporate experience and knowledge as we are invited to do from time to time. In a nutshell the service is finally able to enjoy a person for the whole of life, from spark of interest to retirement and beyond. We have been able to achieve this through sensible terms of release and return of skilled people to and from our workplace, making the employment more attractive than the trappings of office and promotion, and being sensible about giving people room to manoeuvre, broaden their personal horizons and exploiting that depth for the good of the force. We are indeed lucky. We have the right number of people to perform the functions, give them the responsibility to do so and the flexibility to retain their interest.

My grandfather writes that James T. Kirk was well and truly at work in 1998. At that time the size of the force was dictated by increasingly constrictive economic rationalisation and operating budgets, with no realistic regard for the number of functional operatives required to gain the full capability from the equipment of the era. We fortunately have learnt that at the turn of the 20th century warfare was a crude and dastardly thing. Armies would meet on battlefields and proceed to obliterate each other—last man standing and biggest club won. The size of the army was dictated by the available intelligence of the size of the opposing army. At the close of the 20th century the Navy acquired a most complex and technologically advanced anti-surface helicopter with only two warriors taking it into battle from their mother ship.

Apparently the defence force was believed to consist of two parts called the sharp end and the support tail. It was thought that by reducing the support tail, with what was perceived to be cheaper options to arrive at the same outcome, the funds saved could be injected into the sharp end. Thereby facilitating the pursuit of technological excellence.

It was also thought that extending the line even further, the function of warfare could be conducted by a curiosity called unmanned air vehicles, with absolutely no people in the sharp end supported by a much diminished support tail. There's Jimmy Kirk again!

It seems that in 2048 we have managed to survive the purge of people and understand that waging war now is not significantly different to how it was done by the Vikings, the Greeks the Romans the British—you still need a lot of people. The fewer you put at the front merely increases the number you need supporting, to keep them out there with components, support, training, and welfare services. The tail, and those in it, need to have experienced the thrill, the pressure, the frustration, and the exhilaration of being a warrior. This awareness is necessary to ensure that operational urgency is fully appreciated: it is something we have gripped and encapsulated in stone.

We have also learnt that there isn't a piece of technology available which has been cheaper to introduce than that which it replaced. It is clear from his diaries that Grandad, as a policy implementer, had to answer his phone, do his own filing, type his own papers and answer many tens of e-mails. He was paid four times the salary of an assistant operative once known as secretaries. But he was only able to type at one fifteenth of the pace of a secretary, and was forced to use a machine 24 times more expensive than the secretary's primary workplace tool, the typewriter, to produce the files. I think that's why he became a politician. The networked computer was not networked as ours are today to everybody and anybody. They were restricted in the production of material permitted to be produced, were of a different standard across the force, and loaded with many applications for which training was not provided. Hard to imagine I know, but imagine the confusion at midnight on December 31st 1999.

While on the subject of the technology of the day, it is also amazing to think that the lesson we have learnt about 'toys for the boys' weren't immediately obvious in Grandad's time. We now know that economics and *not* technology is the key as well as the enemy. As surely as the biggest bank roll won the Cold War, the pursuit of technological excellence nearly bankrupted our force forty years ago.

We understand that the most technologically perfect equipment is not a sensible or realistic target. Off-the-shelf has come to mean just that, and we no longer purchase off-the-shelf shells and fill them with technology which is unproven or not fully developed. We now appreciate the technology spiral of the early 21st century for what it was, and enjoy realistic levels of supportable and affordable technology in appropriate numbers and capabilities, and in much fewer types of machines.

While speaking economics, it is difficult to imagine that a strategy could be anything shorter than twenty years as we have come to accept it today. In fact a curiosity in Grandad's bag is that there were four Defence White Papers written in ten years, and a myriad of reviews on a plethora of subjects. The strategic reviews seemed to do little beyond explain existing equipment and acquisition processes already underway. The equipment purchased seemed to be very conventional in configuration and more pertinent to European defence with little lateral thought for the demands of our island continent. In fact, Grandad had an uphill battle as Prime Minister convincing people that if a nation addresses its *vulnerabilities*, then its *threats* look after themselves. Australia needed strategic redirection and we are now living off the fruits of many hard fought battles.

In the last forty years acceptance of the naval presence mission to secure and encourage peace has really borne fruit. We have shaken the intellectual irons of the late 20th century. Our nation once believed that we should spend many billions of dollars on assets which either had severe limitations, were useable for only a small percentage of the year, provided a false impression of control well beyond our shores or, and most definitely most undesirably, could *only* be used in the ultimate level of response. At the same time, our defence was unable to accept the validity of presence at sea or the essential nature of being able to:

- exert influence in our region and when honouring our global peacekeeping responsibilities;
- of being a worthy friend or a willing foe; and
- of having assets which, like a gas cook-top, could either be full on or full off, thereby allowing us to cover the middle ground and the greyness between the first hint of international tension and punching stations.

When encouraged to think beyond the economic induced battle for survival and the Jimmy Kirk effect, we were able to see that a nation of our size and geography and international status needed assets which could fully satisfy its strategic vision, but possess tactical peacetime application. We realised these assets didn't have to be of biblical proportions or have two MacDonald's franchises onboard to be effective and viable. We also realised that every defence asset is vulnerable. Each has an achilles heel, and that none should be purchased if we as a nation are not prepared to use, and if necessary lose, that asset if the stakes are sufficiently high. The dividend of all those thoughts and awakenings was ironically a naval aviation configuration not unlike that of 100 years ago, in the late forties and fifties of the twentieth century. Which is why we now successfully operate three stealthy, non-fossil fuelled, platforms of 18,000 tonnes which are heavily defended by onboard weapon systems, and aerial projection platforms for defence, probe, and attack. The crew of the naval aviation assets are embarked because they have the necessary skills, not a particular uniform. Their qualifications have been gained from standardised objective training transferable to any part of the defence force dependent upon the operation to be effected.

It is similarly inconceivable now, but in the late twentieth century there were no fewer than eight government departments with coastal surveillance assets with specific regions of responsibility. The lessons of World War II were not well

translated into useable capability in other forms. During World War II the United States Navy had 186 airship squadrons which flew 2.3 million flying hours in support of Atlantic convoys. Not one airship was lost in anger, nor was one ship lost when under their protection. In the late twentieth century technologies existed to produce airships similar to those we operate today. Our airships have:

- very long endurance, sophisticated detection, and self protection systems;
- The ability to conduct round-the-coast, round-the-clock surveillance: and
- 24 airships are operated by 48 crews.

Australia nonetheless, didn't grasp the nettle and rationalise all of the individual activities of the separate departments to adopt the single coordinated defence of our coastline. However, the realisations of affordable and realistic technology eventually eclipsed thinking in a box—not to mention a reluctance for clever and well educated defence academics, officers and planners to 'fight the white'. In a way the airship exemplifies our national will to keep ourselves safe and economically immune from attack by illegal coastal activity of any description. The same presence enacts a lasting impression of our desire to be a willing friend or, if need be, a worthy foe.

But all in 2048 has not been smooth sailing. We have had to rationalise the many, many numbers of discs which legislate naval aviation. Our blue print to simplify legislative requirements and offer realistic process direction for our operations is curiously offered by a book in use 100 years ago. Here it is [BR 67 *Manual of Naval Airmanship*, 1948]! It fitted into a flying suit pocket, could be read at leisure, and offered readable and concise instructions on everything from pressure instrument theory and meteorology, through to how to land on a carrier, or set up an air station. The more time we can spend learning to operate, rather than checking legality or regulation, the better it will be for our operations. Lateral tactical thought ought to be a daily function, rather than a lost grail.

Furthermore, training in our era is being achieved as a whole function before presenting the graduating trainee to the end user unit. An important step forward in recent years has been to identify, accept and endorse training as an essential and distinct force role, demanding discretion from operational activity, and conducted with appropriate levels of support, equipment and personnel. We understand that believing training can be performed without detriment in an operational environment is insidiously corrosive, and introduces dysfunction to both training and operations.

In a nutshell, I suppose it's back to the future for us in 2048. The face of naval aviation changes only as does a Hollywood set, but the fundamental reason for being remains.

To sum up, in 2048:

- we have reliable, predictable, discrete training:

- affordable and realistic levels of off-the-shelf technology in few types, but large numbers;
- a cohesive coastal surveillance, identification and interception force made up of 24 airships and 48 crews, in support of Australian continental interests;
- three fast, well armed and defended, stealthy, non fossil-fuelled, 18,000 tonne aviation capable platforms manned by the defence force;
- adopt a through-life approach to personnel as we do with equipment. Showing due care and interest in the youngest spark of interest and maintaining that through to retirement and beyond. Thereby capitalising on much corporate talent and experience; and
- offer a work environment and activity level which motivates our people to put the company first, and makes promotion a bonus not a driver.

Finally, I have kept the discussion intentionally away from describing types of toys. We all know what's in the inventory and what we do with it. A more important issue is that we remain focussed on the principals that dictate the types of toys we acquire: not feeling threatened by any continuation of a unified approach to defence problems, while fully aware that nothing comes free or cheap, and that the thrill of cheap price will soon be eclipsed by a reduction in standards.

May the force be with you ...

All I can say is I've only been married once, my oldest is 12, and fortunately keeping good company and maintaining sensibility, so Benny Gasolini hasn't been born yet. He was indeed a figment of all our imaginations, and whether you agree or disagree with the future he brought us today, I hope it stimulates thought and encourages discussion.

15 Prospects for Maritime Aviation in the 21st Century

Captain Cris George

As I said in my introduction to CMDR Di Pietrio, in this section of the seminar we have aimed to switch from the academic/strategic/historic/procurement based treatment of the prospects for maritime aviation to the local level. Taking a quick and hopefully light look at our own naval aviation.

It is late, and I don't have very long to get my message across. So to underline what I see to be the main challenges before naval aviation, as distinct from maritime aviation, I will use this horseshoe and horseshoe nail together with a nursery tale—'For the want of a nail etc. a Kingdom was lost'—to point to the importance of adequate integrated logistic management. And in particular effective integrated planning during the next phase of project implementation.

Last year I had the good fortune to attend the Australian College of Defence and Strategic Studies. During the year I was lent an essay by my fellow participant Air Commodore Norm Gray, who is here today, and who is now responsible for the development of the capability we have had outlined this afternoon. Norm had written the essay while attending the College of Air Warfare in the United States, and one of its themes dealt with how in late 1914-early 1915, how close the Royal Navy had come to forcing the Dardanelles by neutralising the Turkish forts guarding the entrance to the straits. There is apparently solid evidence that suggests that Turkish ammunition, food and morale were almost at the point of defeat, when the failing health of the local RN commander and minefields militated against the Allied cause. Army power was consequently applied just short of a breakthrough, which would have been achieved predominantly by the Navy.

It remains an attractive 'what if' for me in light of the subsequent defeat of the Allied aim and the national significance of Gallipoli. But more recently I read a book written by R.D. Layman titled *Naval Aviation in the First World War*. Mr Layman in a chapter on Gallipoli claims that Mr Churchill had confidence in the ability of the naval aircraft of the day to effectively spot the RN's big guns, but that in application his confidence was greatly misplaced. In theory it was a good concept. The guns of the time were very powerful weapons, particularly if their plunging fire from a distance in excess of 30,000 yards could be accurately spotted. Anyone here who has corrected the fire of big guns will know how effective in the appropriate tactical circumstances they can be. Fifteen-inch battleships like HMS *Queen Elizabeth* were, if you like, the arsenal ships of the day. In the event the naval aircraft were too few and unsupported, they reportedly couldn't perform adequately in the sea and density altitudes encountered. Only two wireless sets were available, these were unreliable and couldn't be accommodated in some of the available aircraft. Most importantly

perhaps, a standard procedure for spotting had not been worked out and practiced. So the result of all of this was that that the British guns did not achieve their best effect.

As a naval aviator I can't help toying with the notion that naval aviation missed a tremendous opportunity to have been instrumental in achieving victory in not just a battle and campaign strategy, but also in grand strategy. Alas it was not to be. The record has relevance for me because naval aviation failed to reach its practicable potential due to what appears from the distance of time to have been a failure of ILS (integrated logistic support). The issues resonate for me, not because naval aviation is going to contribute to grand strategy in any foreseeable way, but because right now our naval aviation force is at a comparable point of great promise in the implementation of a number of crucial projects. If they are executed with effective ILS (or whatever you might prefer to call that discipline i.e. system engineering etc.) the Fleet Air Arm will be able to contribute to the effectiveness of the fleet with a capability never before achieved. However, if we get the inter-related activities substantially wrong the compounding effects could dog us for years (while consuming the resources outlaid) by not achieving the operational capability intended.

As ably outlined earlier by CMDR Tim Barrett we have to be in a position to prove our Sea Kings on the LPA (landing platform, amphibious). I have no doubt that they present least risk in performing the embarked utility role (but importantly they are less capable than the Blackhawk over the battlefield). You might recall that most of the regional contingencies the NAF (Naval Air Force) has been called upon to assist with, have involved the assistance of and/or possible movement of civilian personnel. This is an example of the so-called non-military roles mentioned earlier by Dr Alan Stephens. And seen, I suggest, as likely to increase in frequency during the short to mid-term future. Our Seahawks are commencing modification of their software, fitment of ESM and FLIR and the attrition aircraft are being prepared for service on the *Anzacs*. The Seasprites are coming! But the Project Sea 1411 timeline carries what might be considered to be the most significant risk factors likely to cause reduced performance, increased cost and/or delayed introduction. These include simultaneous development testing and production of new or previously not integrated systems, and operational testing and evaluation (OT&E) as the training of operational flight personnel is being conducted. The Seasprite timeline is very compressed for what is an extremely small project team, developing a new system that is challenging in a number of areas, including the workload to be sustained by the (usually) two person crew. With the Penguin missile will come a requirement for armament proficiency to be redeveloped. Also remember that our cab is, in its system, completely different to the Kiwi's SH2G, so the originally conceived logistic commonality will not be achieved to the planned extent.

The AS350 BA Squirrel which has served very well indeed for about 14 years on the FFGs is required to have its hydraulic controls modified to provide the required amount of redundancy during embarked operation. This modification will take about a year to implement. In the interim the full capacity of the aircraft is required to perform naval lead in helicopter training or 'NLIHT'. But the little aircraft retains a place in our order of battle and performed useful work during the Gulf War. (How might the 'Battle Budgie's' utility be increased if we fitted some of the micro systems becoming

available for use in UAVs? Just a thought which has long been attractive for me, but perhaps not for those fully wedded to the 'Big Metal' approach to naval aviation.)

Our HS748 Electronic Warfare Training System or EWTS, is shortly to be contracted over the next year to achieve a more appropriate training capability. It is CN's intent that the contracted system will continue to be operated by Navy EW operators. Our aircrew training continuums have both been under severe scrutiny Recently to ensure that the pipelines provide the product that is required by an embarked flight in the fleet. CN has decided that our pilots will continue with PC9 training at RAAF Base Pearce and that Navy will pay for a third King Air at the School of Air Navigation to provide for the development and application of more appropriate (and available) training for our observers. Following on from a rigorous review of the naval aviation force, CN directed that the Fleet Air Arm was to be reinvigorated. Amongst the many recommendations of the review was the identification of the critical need to improve the support and therefore the operational availability of our aircraft (our Sea Kings and Seahawks currently provide less than 50 per cent availability). Additional investment made to achieve that end and the new ADF arrangements for the regulation of airworthiness and supply support pose new challenges of change, but already promise to achieve considerable improvements.

So summarising my comment on naval aviation, our potential has never in my view been greater. We are truly at a new dawn of capability and contribution to the fleet. But we had better get our horseshoes and horseshoe nails in the right place at the right time!

I will deal very briefly with maritime aviation by recalling Dr Stephens' reference to the increasing importance of non-military roles such as resource protection, surveillance, illegal immigration, smuggling, political unrest etc., in addition to the more traditional military roles—including a credible individual national capability and an evident readiness to contribute when appropriate to coalition and allied security. Much of the potential for maritime aviation is and will increasingly be driven, albeit indirectly, by the press of increasing population and a competition for resources and living space. As a member of a relatively very small population on a very large island what helps me establish our situation is to recall that a little less than half the world's population lies within a circle centred on Cocos (Keeling Island) and transcribed with a radius of the distance between Cocos and Hobart (what I take to be our rough geographic 'scope'). This little exercise may or may not be valid for all, but it amplifies for me that a great many of the world's people live within a relatively short distance of us, and amongst the richest EEZ's and the most important focal points on the planet. To look at the title of this seminar for a moment. For me the question is not so much about the prospect for maritime aviation by itself. That future has never been brighter or the need greater. You can rest assured that 'someone's' naval aviation increasingly will need to be 'out there'—because they have to be. The question before us is whether that maritime aviation capability will be Australian. I think that is the really important national question before us. It is our choice. Thank you.



AS350B Squirrels. (RAN)

16 Panel Discussion

Air Commodore Norm Grey, Director Aerospace Development

If I could make a comment first. I have been involved in Force Development for about eleven years now and I have watched a lot of this stuff go through. The biggest problem with addressing the sort of things you are talking about, personnel, operating costs in force development, has been that the committees that actually do equipment approvals and budget approvals have no power to influence personnel or operating costs. The two things have been totally separate. The system is trying to pull those together now. However, part of pulling that together is of course to work out how you are actually going to use these things. How they are going to be operated. Where, for naval aviation, is the doctrine development done? Where is the forward thinking done, the publication of papers on new ways of doing business in naval aviation? How is naval aviation selling that? Because I must admit I don't see much of it.

Captain George

It is the fundamental position or baseline underpinning our problem. We don't have a document which is what we might call the 'Sheet of Music', which ties together from cradle to grave the evolution of our capability and all its implications. We just do not have such a publication. We have various aspects of it, that devolve from manpower areas, Tim Barrett's area, your area. CN is putting a great deal of emphasis, both into the Fleet Air Arm this year, and toward developing capability desks to manage those questions that you were just talking about. The simple answer is that we don't have it, we are working very hard to develop it right now. That's part of what we are doing here. That is a coherent definition of capabilities, the statement of operating intent, what we are going to do with the aeroplane in terms of its development, its trials, its fielding, its modification, its upgrade, its cost. We have been very much admiring of some of the Air Force's Weapons Systems Master Plans, which we have an ambition to replicate.

SQDLDR Bill Crompton, Air Force Headquarters

In a previous life I had the privilege of being tasked to organise a brief of resource planning people to go around all the bases. Their remit was to go and check what had been some of the unintended consequences of projects. We went around some of the Force Element Groups, through Nowra and through other places, and one enduring aspect came up. It was a bit like your nail over there—it's only a small thing. Where we were having cost overruns, or where we were having additional costs in maintaining equipment in service, and those sorts of things—and they seemed to be endemic wherever we went. What had happened was we had saved money in the manning of project offices. It was enduring, that was the theme we heard everywhere.

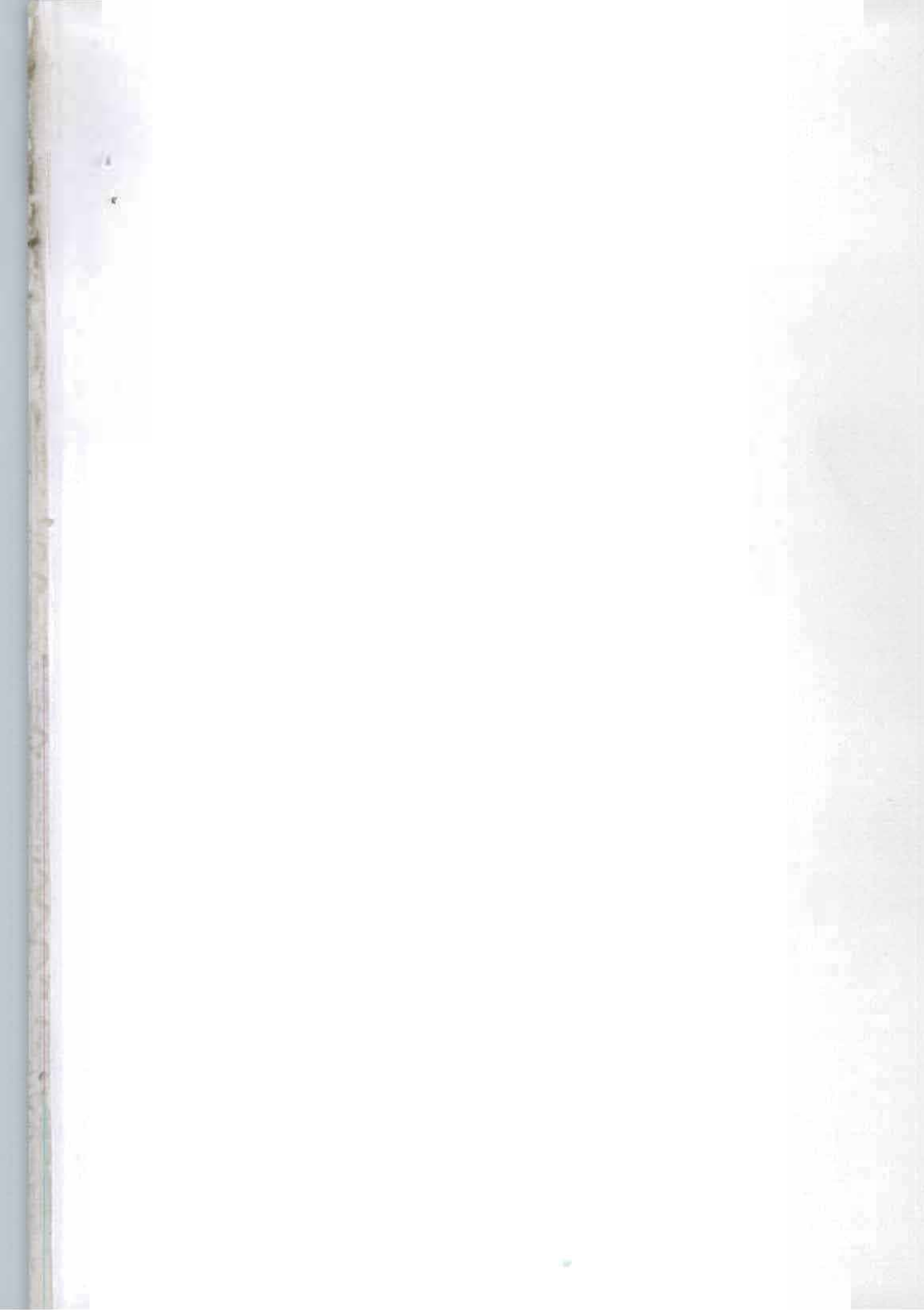
And so we might have saved \$10M, but arguably it will cost us \$600M over the next ten years. The legacy of projects that were not properly understood, because there weren't enough people, and they didn't have the right skills sets. I think if there is a nail that we can look at hitting on the head very quickly, it is not to be scared of sending a few more people overseas. Let's get away from the idea that it's a 'jolly'. They seem to be working pretty damn hard.

Captain George

I take that as a statement, and I don't think that you will find anyone that would disagree with you. Take for example the Seasprite, which is the current issue. I think most of us are living and breathing the management of developing that very demanding system, which has new, never fielded or integrated, sub-systems. It would be great to have more than the approximately seven people, at last count, that are involved with that particular development. But we don't have the people available. In fact we've provided a test Taco and a test pilot out of this organisation here to assist the Seasprite project. This will have a flow-on effect on our first-of-class flight trials program with ongoing cascading effects. I agree with you, all I can say is that it does teach innovation, and it does give us the skills sets. But the consequences are quite significant and are uncoded. My suspicion is that at the end of the day the lack of sufficient people probably adds costs, decreases initial performance, and delays the system's introduction. I'll get back to you in four years and let you know what happened.



S-70-B2 Seahawk. (RAN)



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