

TURNING INTO WIND.. 'FLEET DEFENDER' F-35B

Cartoon by Steve George

F-35: The Smart Fighter for the Warfighter

<https://www.youtube.com/watch?v=Q7ufjQ6Eyj8>



F-35: page 9

"...internal bay Block 5 upgrade will be modified to accept up to 6xAMRAAMs AIM-120D..."

http://www.regjeringen.no/upload/FD/Temadokumenter/JSF_RBI-svar.pdf

Juan Carlos I L61 Aircraft Carrier

<https://www.youtube.com/watch?v=6ikZME8jHhE>

'I hate the word game changer, but it just is'

RAAF
News 19
May 2016

As part of a series on the F-35, Leigh Watson talks to the US officer paving the aircraft's way into service

<http://www.airforce.gov.au/News/Air-Force-Newspaper>

SHARING ideas to introduce the F-35 into service is not limited to the F-35A model or to activities at Arizona's Luke Air Force Base, where the Australian aircraft is hosted, the officer in charge of aviation programs for the US Marine Corps (USMC) says.

LTGEN Jon Davis, the USMC's Deputy Commandant for Aviation, believes the difference in size between his corps and the much smaller RAAF should not stop the two from learning from each other.

"Scale is relative. We're both learning the same things," he said during a recent visit to Australia.

"The brains – what makes the aeroplane special – are all the same ... Our test pilots can go from an F-35A to F-35B to F-35C. It takes off and lands differently but we're employing it the very same way.

"I've just signed the paperwork to transition that F/A-18 exchange billet to an F-35B billet in Beaufort starting in 2017. So we'll have

Australians flying F-35Bs with the USMC in the near term."

LTGEN Davis said he appreciated the invitation from the previous and current CAFs to share ideas, especially since the USMC was working on many of the same things as the RAAF.

"We have a very tight and growing relationship in terms of learning from each other," he said.

The USMC is leading the world in introducing the F-35 and LTGEN Davis said he was happy to pass on any lessons learnt.

"We achieved initial operating capability for the F-35 in July last year and that squadron, VMFA 121, will move to Iwakuni, Japan ... We will have 16 F-35s in Iwakuni by July of 2017 as a permanent basing," he said.

"Each time we deploy the aeroplane we learn, and we share those things with the larger community," LTGEN Davis said.

After a year of operations, he had seen the force grow through

"top-down design and bottom-up innovation", which aligns with RAAF's Plan Jericho.

"The young officers are doing incredible things – things I never thought possible, with techniques, tactics and procedures to leverage the capability, systems and sensors in the aeroplane and working as a team," LTGEN Davis said.

"The young captains and majors are doing things they couldn't do in other aeroplanes, and they are doing it very well. Now we have a capability we've never had before, so it opens up opportunities to do more."

In charge of aviation programs for the USMC, including procurement, policy, training, personnel and equipment for about 1300 aircraft and 54,000 marines, LTGEN Davis has a job ahead of him in transitioning to the F-35B and F-35C.

"It's a challenge, but it's a good challenge. I'm proud and excited to be a part of this capability that's coming in. I hate the word game changer, but it just is," he said.

'I hate the word game changer, but it just is'

19 May 2016 Leigh Watson RAAF News

"...So we'll have Australians flying F-35Bs with the USMC in the near term...."

LTGEN Jon Davis USMC

<http://www.airforce.gov.au/News/Air-Force-Newspaper>

'How Carrier operations Work' no date, **Steve George BSc MSc CEng FRAeS Cdr RN**

"...The Airfield and the Aircraft Carrier Compared..." <http://www.phoenixthinktank.org/2012/03/how-carrier-operations-work/>

...Aircraft carriers have to contain all these facilities onboard, and so it is often assumed that they are enormous objects. Indeed, the term 'floating airfield' is often used to describe them, and this is understandable. With their apparently huge flight decks, towering structures and complex fittings and equipment sprouting from their sides, they can resemble the vast 'starships' of science fiction. Most people, if asked to compare an aircraft carrier with an airfield, would say that they are about the same size. However, this is not the case....

...The airfield completely and massively dwarfs the ship. The aircraft carrier would fit comfortably on to one of the aircraft parking areas. And yet this ship is capable of taking and operating around 70 aircraft. Nearly twice as many aircraft are based in a fraction of the space along with fuel, weapons, people, hangars, workshops and communications systems and are still operated effectively and safely. Clearly, simply 'downsizing' or compressing land-based operations cannot do this. The solution is a totally different way of operating very different combat aircraft – and these differences, which lead to a totally different 'ethos', lie at the heart of naval aviation.

The key difference is the depth of integration between the aircraft and its base. An airfield is an essentially passive supporter of the aircraft – stores, fuel and weapons are delivered to various separated areas to support missions, and the very long runways offer no more than a hard smooth surface to run along on. **On board a carrier, the operation of aircraft has to be actively merged with the operation of the ship and its specialist systems, with the result that the aircraft completely depend on the ship to deliver combat capability. This is the central feature of naval aviation, and it leads to a different 'world', in which most of the basic tenets and assumptions of land based operation have to be discarded and replaced with different equipment and ways of operating.**

The most obvious element of this 'world' is the necessity to replace conventional take off and landing methods with completely different ways of launching and recovering aircraft using catapults and arresting gear – often described as 'cat and trap', or by the less elegant acronym CATOBAR (CATapult Operation Barrier Arrested Recovery). **As will become clear, these techniques are complemented by a less obvious, but no less vital, culture of 'naval aviation' that successfully delivers combat power effectively, reliably, sustainably and safely. This culture drives the organisation & processes of the Royal Navy's (RN's) Fleet Air Arm (FAA)...."**

OR <http://www.phoenixthinktank.org/wp-content/uploads/2012/03/mechanicsofcaropsPTT.pdf>

JOINT OPERATIONS

JOINT OPERATIONS ~
LIEUTENANT TOM LEWISWinter
2004AN ARGUMENT
FOR AUSTRALIAN
AIR POWER AT SEA

LIEUTENANT TOM LEWIS, RAN

http://www.google.com.au/url?sa=t&ct=rj&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCYQFJABahUKewj9p4P-s4THANUCsaYKHtgKChg&url=http%3A%2F%2Fwww.army.gov.au%2FOur-future%2FPublications%2FAustralian-Army-Journal%2FPast-editions%2F~%2Fmedia%2FFiles%2FOur%2520future%2520Publications%2FAA%2F2004Winter%2F12-AnArgumentForAustralian.pdf&ei=mu6VDSy4LKmwW4rqAAQ&usq=AFQjCNHYtmJm29VIXTycwEUNE-Xm_IA&bvm=mv.99261572.d.gDy

Australia's December 2000 Defence White Paper outlined a strategic posture dictated by two major imperatives. The first imperative was defence of the Australian continent and the second imperative was the need to participate in efforts to uphold global security. Since the al-Qa'ida terrorist attacks of 11 September 2001 on the United States and the Bali bombings of October 2002, the two imperatives have become intertwined. Participation in maintaining global security is now closely enmeshed with upholding the defence of the Australian continent.

In the current international security environment, the reality is that the Australian Defence Force (ADF) must go farther afield in order to safeguard the nation and its interests. As the Minister for Defence, Senator Robert Hill, put it in 2003, 'Australia's immediate region continues to face major challenges, making it more vulnerable to transnational security threats'.¹ The Minister went on to note that the changed global security environment meant that Australia's national interests could be directly

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Australian continent.

affected by events outside the immediate neighbourhood. Under these conditions, ADF involvement in coalition operations farther afield is more likely than at any time in the recent past. Involvement in coalition operations would probably entail the provision of important niche capabilities such as those deployed in the war against terror and those forward-deployed to the Middle East in 2002–03 for Operation *Bastille*. The Minister concluded by observing that, 'if adverse trends in our region continue, there may also be increased calls on the ADF for tasks in Australia's immediate neighbourhood'. He pointed to Operation *Bali Assist* as a recent example.²

The best way for the ADF to achieve force projection is for the Royal Australian Air Force (RAAF) to 'take to the sea' and for the Royal Australian Navy (RAN) to ensure that deployed forces possess effective organic air power. This article makes the case for the ADF to acquire two or more aircraft carriers that are equipped with F-35 Joint Strike Fighters flown by a mixture of RAAF and RAN pilots.

THE CASE FOR SEA-MOBILE AIR POWER: LESSONS FROM BRITAIN

Since the end of the Cold War, there has been a move towards expeditionary operations in Western armed forces. For example, the British have prepared for offshore operations in defence of their political interests. Elements of the Royal Air Force (RAF), equipped with the GR7 Harrier, are now configured as Joint Force Harrier—an element that 'remains ready to deploy anywhere in the world with the Royal Navy's (RN) Sea Harriers as part of a naval task force'.³ Recently the United Kingdom's Ministry of Defence announced the building of two 60 000-tonne carriers by BAE Systems—the biggest in the RN's history. Under the British plan, elements of the RAF, joined by the Fleet Air Arm equipped with the new Joint Strike Fighter, will have the capabilities of a carrier battle group, including land target attack, and will be deployable to wherever the British Government decides they are required.

Why is the capacity to deploy away from one's own country important in military strategy? First, such a capacity follows one of the key Principles of War, namely offensive action. Put simply, it is preferable to take war to the enemy rather than to wait until the enemy brings war to you. Passivity in military strategy gives an adversary the initiative to prepare and to choose the battlefield. The principles of good strategic planning dictate that one should choose the time and place of an engagement, preferably upsetting the enemy's preparations at the same time.

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Second, in contemporary security conditions, the asymmetric threat posed by global terrorism means that a country such as Australia might have to attack an enemy's centre of gravity at a distance, as did the United States by striking against al-Qa'ida in Afghanistan and Saddam Hussein in Iraq. In turbulent times, rogue nations and organisations of militant Islam espousing totalitarian political creeds may seek to attack those countries that embrace democratic political alternatives. Australian defence analyst, Professor Paul Dibb, summed up Australia's strategic situation shortly after the 11 September 2001 attacks by stating:

We face an arc of instability to our north, a weakened South-East Asia and an uncertain balance of power with the rise of China. Indonesia—the fourth largest country—has an unpredictable future. Prudent Australian defence planners must consider that Indonesia has the attributes of a friend and a potential adversary.⁴

Australia is part of a region that seems to be steadily becoming more politically unstable, thus jeopardising a national economic prosperity that is largely dependent on seaborne trade. As Lieutenant Commander Bob Moysé of the RAN has pointed out,

Some of Australia's most vital areas of interest lie... in the Sea–Air–Land gap of the Indonesian Archipelago. About 95% of Australia's trade is carried by sea and most of this goes far to the north before turning east and west onto the world's shipping lanes. Any significant interference with this trade would have a devastating effect on the Australian economy.⁵

How far can imagination take us in envisaging a possible crisis in the future? Several scenarios present themselves: a nuclear device exploding in a Western capital city; germ warfare sweeping through subways infecting thousands; a rogue state launching an attack with nuclear weapons on a neighbour; ongoing terrorist incidents; and problems emanating from failed states. Faced with such situations, the ADF may find itself increasingly deployed overseas in order to assist in ensuring global security.

Fighting overseas is, of course, not a new task for the RAN. Indeed, the Australian Navy's fleet air arm, born after World War II, was designed to ensure that the country could defend its interests far from its shores. As the Chief of the Navy from 1962 to 1964, Admiral Burrell, stated: 'We will need a Navy as long as Australia remains an island—and the best place to fight, if unhappily that should be required, is as far

... the asymmetric threat posed by global terrorism may mean that a country such as Australia might have to attack an enemy's centre of gravity at a distance ...

from Australia as possible'.⁶ Admiral John Collins, a veteran of World War II, was a strong advocate of naval air power. He was of the opinion that 'a fleet that goes to sea without its aircraft today is just as obsolete as a fleet under sail ... Carriers give a fleet tremendously increased striking power and widely increased mobility'.⁷

The reason that air power is necessary in accompanying any army or joint maritime force deployed overseas is neatly summed up by the British carrier concept:

Aircraft have mobility, flexibility and versatility, which are the keywords of a modern defence strategy ... [A] Carrier Air Group (CAG) can move to almost anywhere in the world in international waters ... giving both politicians and military commanders options, including early reconnaissance, the landing of special forces and land attack from the air ... Events throughout the 1980s and 90s have demonstrated the high value of the CV [aircraft carrier].⁸

Of course, it might be argued that Australia's needs are not the same as those of Britain. Yet, a carrier-based force would give the ADF a flexibility that cannot be matched by any number of land-based aircraft operating from Australia. While it is true that in 2002 and 2003, on operations *Slipper* and *Bastille*, the RAAF deployed successfully to runways in the Middle East, it cannot always be assumed that friendly nations will provide basing and other necessary facilities to ensure the success of overseas military missions. Moreover, even if facilities are forthcoming, there is no guarantee that the bases themselves will enjoy the same level of protection and security as those used by the RAAF in the Second Gulf War. In contrast, aircraft carriers provide deployed forces with great flexibility as well as platforms that cannot be easily attacked by guerrillas or by enemy Special Forces.

In the past, Australia has always been able to rely on American air support. However, although the United States and Australia are close allies, it is prudent, in an era of multiple operations and military overstretch by US forces, to consider the possession of adequate national air cover in a crisis. Britain appears to understand this need. As the British historian and defence writer, John Keegan, has pointed out, 'Britain's forces cannot ... count on operating under the umbrella of American air cover in all future circumstances. A crisis may supervene when national air power is needed'.⁹

Like Australia, the United Kingdom plans to acquire the American F-35 Joint Strike Fighter in order to meet its future air-power requirements. All four arms of the American military—army, air force, navy and marines—are purchasing the Joint Strike Fighter. Lockheed Martin, which has designed the F-35 Fighter, will manufacture it in three variants. There will be Conventional Take-off and Landing (CTOL), Short Take-off Vertical Landing (STOVL) and Carrier Variant (CV) versions of the aircraft.¹⁰ The British F-35 project—the Future Joint Combat Aircraft (FJCA)—has been aiming to produce 'a joint RN–RAF offensive aircraft able to deploy from bases at sea and ashore'.¹¹ BAE Systems will take the leading position as preferred prime

contractor for the CV development, with Thales UK, a defence company, providing a design and performing a major role as key supplier.¹² In British defence planning, the aircraft carrier will become the principal platform for the RN–RAF FJCA, with the latter eventually replacing the RN's and RAF's Harrier jets.¹³

THE ADF, THE JOINT STRIKE FIGHTER AND THE CARRIER OPTION

Australia has also committed itself to the F-35 Joint Strike Fighter development project. On present trends, the RAAF should go ahead with the acquisition of the new aircraft, but it should ensure that it buys the carrier, or maritime, version of the plane. It is likely that the F-35 will be not only a highly capable fighter, but an excellent bomber since the aircraft possesses capable self-defence systems and a range of over 1300 km—more than double that of the present F/A-18 Hornet.¹⁴ In the future, the Joint Strike Fighter will be able to perform surface strike against maritime targets as well as attack land objectives.

On present and projected trends, therefore, it seems that the F-35 will be a comprehensive air-technology package. Nonetheless, advanced armaments, precision munitions and a range of 1300 km do not automatically translate into usable military power in a world of asymmetric terrorism and rogue states. If the Australian version of the F-35 is a land-based aircraft, it will only be capable of striking at targets within the Indonesian archipelago. Even with the added purchase of new refuelling tankers to replace the B-707, the RAAF's projected F-35s will still have limited range as land-based aircraft.¹⁵ The question that must be posed is this: how will land-based aircraft provide permanent air cover to Australian forces in a hostile situation in the Asia-Pacific? In any crisis situation that requires the projection of air power overseas, Australia is limited in its strategic options because it must rely on friendly or host-nation support to provide airfields from which the RAAF can operate.

By contrast, carrier-based aircraft can deploy anywhere in international waters and remain within range while needed, thus providing strategic 'presence'. Indeed, by merely being in an area, carrier-based aircraft can exert pressure. A good example was the military build-up outside Iraq in 2002 that resulted in the Hussein regime admitting UN weapons inspectors. Carriers and their aircraft present a unique force package that can be used in a variety of ways to project and maximise the effects of military power.

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In the past Australian forces have deployed to the Middle East, Africa (Rwanda and Somalia) or even Europe in order to support Australia's interest in preserving international peace and stability. Accordingly, the future F-35 should be sea-mobile and the RAAF should be equipped with the CV version of the aircraft. In addition, acquiring an Australian sea-mobile version of the F-35 would leave open the possibility for RAAF aircraft to operate not only from RAN vessels or from land bases, but also from British and American carriers.

There is, moreover, a case for the RAN to contemplate acquiring sufficient F-35s to protect its ships, both in an air-to-air role and for executing anti-shipping strikes against enemy warships. A submarine threat could be countered by the same methods that are used currently: a combination of anti-submarine warfare vessels and helicopters that have interoperability with assets such as the RAAF's AP-C3 Orions. The role of any future Navy F-35 fighters would essentially be one of force protection and anti-shipping strike, while the RAAF F-35s would be employed to attack land-based targets. The Navy's aircraft would be flown by personnel trained essentially in sea strategy and tactics, and would complement the RAN's array of surface-to-surface and anti-air missiles. Both RAAF and RAN aircraft could, of course, be used in air defence roles.

A FUTURE CARRIER FORCE: THE PROBLEM OF FINANCIAL COST

What would be the cost of the suggested strategic rearrangements? The carrier-based F-35 is more expensive than the land-based version, and acquiring two carriers would also be costly. Moreover, the RAN's projected Air Warfare destroyers would still be needed because defensive systems required against aircraft at a distance are not the same as those required to defend against missiles at closer range. The optimum defence capability for Australia at sea is the combination of the aircraft carrier and the F-35.

Britain's two new aircraft carriers will cost the taxpayer £2.9 billion or AU\$9.2 billion.¹⁶ In terms of current Australian defence spending, such a cost would be prohibitive. It should be noted that the United Kingdom's defence spending is 2.8 per cent of its GDP on defence compared with Australia's 1.9 per cent of GDP. In April 2003, the *Australian's* international and defence correspondent, Greg Sheridan, argued that '... we [Australia] have a defence force that is just too small. We have an expeditionary rhetoric, a defence of Australia force structure doctrine and a pacifist budget.'¹⁷ New carriers would also involve other costs,

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particular in staff, since the RAN would need to expand its current personnel in order to cope with two large vessels. A possible alternative to a CV force would be for Australia to seek to acquire the Tomahawk missile system, which is capable of being launched from submarines and/or surface vessels. The ADF could consider a cruise missile option for a future force, although such an option might not provide the same level of precision strike as modern carrier-based air power.

CONCLUSION

This article has tried to 'fly the kite' of carrier-based air power for the ADF. Although this solution has proven unpopular since the 1980s, and is both expensive and challenging in force structure terms, carrier-borne air power may, in the decades ahead, become a necessity for the ADF. Australia is an island-continent with a vital stake in helping to maintain a stable international environment, not least because the majority of its trade depends on secure sea-lines of communication. Additionally, in an era when threats to national security can develop at short notice and frequently require off-shore deployments in defence of the national interest, sea-based air power can provide the ADF with a potent method of force protection.

In contemporary security conditions, air power at sea is a matter for both the RAN and the RAAF to contemplate, if only because of the range of threats against which Australia must defend itself. The best way for Australia to cope with an uncertain security environment is to grasp the nettle and to spend a significant sum of money in order to equip the ADF with a flexible, offshore joint force with organic aviation. Such a force, based around two aircraft carriers equipped to deliver modern air power, wherever and whenever necessary, is the type of long-term insurance policy that the nation requires to protect its future in the first quarter of the 21st century.

ENDNOTES

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PM's floating fighter jet plan quietly sunk by Defence

by John Kerin 07 Jul 2015 <http://www.afr.com/news/politics/pms-floating-fighter-jet-plan-quietly-sunk-by-defence-20150707-gi6qxj>

Prime Minister Tony Abbott's proposal to put F-35 fighter jets on the Navy's two 27,000-tonne troop transport assault ships has been quietly dropped ahead of the government's defence white paper after it was found the ships would require extensive reworking and the project was too costly.

Mr Abbott asked defence planners in May last year to examine the possibility of putting up to 12 of the short-take-off and vertical-landing F-35 Bs on to the two ships – the largest in the Navy – which carry helicopters and are likely to be primarily used to transport troops and equipment to war or disaster zones.

The first of the assault ships was completed last year and commissioned into the Navy in November as HMAS Canberra.

But defence officials conceded to a Senate estimates committee late last year that the jump-jet proposal would involve extensive modifications to the ships, including new radar systems, instrument landing systems, heat-resistant decking, restructuring of fuel storage and fuel lines, and storage hangars.

Defence sources have told The Australian Financial Review that the proposal was "still in the white paper mix" up until some weeks ago.

But one source close to the white paper was emphatic on Tuesday that "it will now not make the cut".

"There were just too many technical difficulties involved in modifying a ship which takes helicopters to take fighter jets and it is also very expensive," the source said. "You can safely say it has been dropped."

'BETTER WAYS TO SPEND THE MONEY'

The white paper, which lays down the Abbott government's 20-year vision for defence – including a \$275 billion-plus weapons wishlist – is expected to be released next month.

The Prime Minister's proposal would have brought Australia into line with the United States, Britain and a number of other nations that plan to operate F-35s from their assault ships.

The F-35B version of the joint strike fighter is being built for the US Marines and British forces to replace their British-built Harrier jump jets.

The Spanish Navy's version of the troop transport assault ship, which utilises the same underlying design as the Royal Australian Navy's troop assault ship, is equipped to carry Harrier jump jets.

Mr Abbott announced in April last year that Australia would buy an additional 58 conventional take-off and landing versions for the Royal Australian Air Force at a cost of \$12.4 billion, bringing the number of orders to 72.

But the RAAF version was not suitable for the troop transport assault ships, which would have required the purchase of extra fighters to equip the ships. And the radar-evading stealth fighter program has been plagued by delays and cost overruns, as well as software issues with the F-35B – the worst-afflicted version of the aircraft.

In an independent report on the jump jet proposal, defence think tank the Australian Strategic Policy Institute warned that the purchase of aircraft and ship modifications would involve "multibillions of dollars".

Analysts Richard Brabin-Smith and Dr Benjamin Schreer also warned in the report that the cost was unjustified and could also "raise unrealistic expectations" that Australia was adopting a "much more muscular strategic posture" in the region.

"The cost-benefit analysis is not in favour of developing [the assault ship-jump jet proposal]," the paper said.

"The scenarios in which the capability would be realistically required and make an important impact are operationally vague at best.

"The 2015 defence white paper should not announce a decision or intention to acquire jump jets for the ADF... there are likely better ways to spend the money."

Australia Abandons Proposal to Order F-35B

08 Jul 2015 Bradley Perrett <http://aviationweek.com/defense/australia-abandons-proposal-order-f-35b>

“Australia has dropped consideration of buying the short takeoff and vertical landing (stovl) version of the Lockheed Martin F-35B Lightning for its two largest assault ships, a defense source says. The decision was made during preparation of a defense white paper that may be published next month. Deploying STOVl fighters, proposed last year by Prime Minister Tony Abbott, would have required costly modifications to the two ships, says the Australian Financial Review newspaper, which first reported that the idea had been abandoned.

There was widespread opposition across the armed services to buying the F-35B, the variant capable of short takeoffs and vertical landings, the defense source tells Aviation Week. Likely operational scenarios would not greatly demand Australian shipborne air-combat capability, analyst Ben Schreer of the Australian Strategic Policy Institute wrote last year in an assessment of the proposal. To the extent that the aircraft could be useful, the country had more important things to spend its defense budget on, Schreer wrote.

For the Royal Australian Air Force, an F-35B order could have diminished the government’s commitment to buy a total of about 100 units of the F-35A, the version designed for long concrete runways. So far Canberra is committed to only 72 F-35As.

The two ships are HMAS Canberra and its sister, Adelaide, which is still running trials. They are LHDs—assault ships with docks and extensive facilities for helicopters, including almost full-length flight decks. Australia plans to fly mostly army helicopters from them.”

No F-35Bs for RAN LHDs – report 08 July 2015 by australianaviation.com.au

<http://australianaviation.com.au/2015/07/no-f-35bs-for-ran-lhds-report/>

COMMENT: <http://australianaviation.com.au/2015/07/no-f-35bs-for-ran-lhds-report/comment-page-1/#comment-34278>

“Chris G says : 10 July 2015 at 3:20 pm

BH the best document in the public domain re Spanish Navy ships is http://infodefensa.com/wp-content/uploads/JCI_en_v2.pdf (13.8Mb). The only changes to ours were in the starboard island structure particularly the ops rooms. I have confirmed that storage quantities are at least equal to those stated above without identifying by whom. People stating they are less are either misinformed or confusing long UK, metric and short USA quantities and specific gravity volume to weight conversions.

Spain designed Juan Carlos 1 for the F35B before the exhaust heat issue was fully known. The unique fueldraulic activation and focus of the exhaust on deck was lessened plus coatings found by the USN via trials on Wasp. The aircraft elevators dimensions are F35B compliant and weight limit MTOW. The hangar width is 2 x F35B wingspan plus. JC1 has a Precision Approach RADAR at the aft end of the island structure ours would need. Our RADARs are also different. After the Sea Giraffe is replaced by CEAFAR on the ANZACs post 2017 the same will become operationally unusable on our LHDs because opposing ESM will identify the high value LHDs immediately it is fired up. CEAFAR was still undergoing trials at the time the LHD tender went out. LHD sensors are going to have to be replaced in the near term anyway.

The main reason we need F35Bs at sea is because the RAAF cannot secure our ALOCs or SLOCs in the Indian, Pacific and Southern Oceans AOs from fixed bases from reasonable threats with their current equipment, acquisition plans and structure as nations like China and India develop their sea based fixed wing assets in that region. Never mind the aspiration of Japan and South Korea who have both built flat tops over the last decade or so. Italy, Spain, Turkey and other Europeans have acquired/are considering fixed wing aircraft at sea because they know the power projection advantages France, Russia, UK and USA have had securing ALOCs and SLOCs and intervening in conflicts when nearby air and sea ports were either denied politically, damaged by conflict or natural disaster or non existent.”

Royal Australian Navy's NUSHIP Adelaide LHD embarks for sea trials

24 June 2015 NAVYrecognition <http://www.navyrecognition.com/index.php/news/defence-news/year-2015-news/june-2015-navy-naval-forces-defense-industry-technology-maritime-security-global-news/2837-royal-australian-navys-nuship-adelaide-lhd-embarks-for-sea-trials.html>

“NUSHIP Adelaide, one of two Landing Helicopter Dock (LHD) ships being built for the Royal Australian Navy (RAN), left BAE Systems Williamstown on 17 June to begin sea trials, the company announced yesterday, June 23, 2015. After some initial trials in Port Phillip Bay, NUSHIP Adelaide will spend ten days on the water travelling to Sydney.

The current testing precedes a second period of sea trials in August, ahead of delivery to the Royal Australian Navy (RAN) later this year. The sea trials are conducted under a number of scenarios; some require the ship in certain conditions and/or water depths while others require the ship’s systems in specific configurations.

In Sydney, NUSHIP Adelaide will be dry docked so her hull and flight deck can be cleaned and painted. She will then set sail and undertake more sea trials on the return voyage to Williamstown, arriving in mid-July. The August sea trials will focus on communication and combat systems.

BAE Systems Director of Maritime, Bill Saltzer said: “We will undertake approximately 240 hours of testing over 20 days to ensure all systems perform to their capability. Some of the trials will run concurrently and cover everything from basic systems operations such as alarms, to the ship’s manoeuvrability while at sea. We are on track to deliver NUSHIP Adelaide at the end of September this year. The ship is even more ready than HMAS Canberra was for her first sea trials, reinforcing that we have implemented lessons learned from the first of class and we have continued to improve our productivity.”



Sydney, Friday 26 June 2015 NuShip Adelaide proceeds into the dry dock

Navy keeps very quiet while it waits for the last laugh

04 Aug 2007 Sydney Morning Herald

WHEN Brendan Nelson announced last month a \$3 billion order for two giant amphibious landing ships, it was widely seen as a victory for the "expeditionary force" school of strategy, emphasising overseas punch for the Australian Army.

The Defence Minister himself went on to proclaim the "final nail in the coffin" for the "Defence of Australia" strategy adopted under Bob Hawke's Labor government in the 1980s, which stressed navy and air capability to fight off threats in the country's approaches and resulted in the army contracting to a niche force.

Now the army would be able to dispatch 1000 troops plus Abrams tanks and helicopters on each of the 27,000-tonne ships for fighting operations anywhere in the world. The navy was being reduced to the escort service, its \$7 billion fleet of three new destroyers providing air cover.

But a close reading of the latest Defence Update shows the pillars of the Defence of Australia doctrine remain.

The navy might also have the last laugh. The new ships are actually its path back to acquiring the capability it lost with the retirement of the carrier HMAS Melbourne in 1982: its own fixed-wing strike aircraft operating off its own carriers.

The two ships, of the Juan Carlos I design for the Spanish Navy, will have a "ski-jump" ramp for vertical and short take-off and landing jets, and be able to carry at least six such aircraft.

The aircraft could be the Harrier jump-jet strike fighter long in service with the British Navy, the US Marine Corps and the Spanish Navy, or the projected V/STOL variant of the F-35 Joint Strike Fighter in which Australia has invested as the next generation supersonic, stealth mainstay of the air force.

The Spanish shipyard Navantia, which will build the two navy ships with the Melbourne-based group Tenix, has made much of this capability, and Canberra defence insiders say the navy was well aware of this when the Government was persuaded to opt for the ships over the smaller French rival.

"There's a lot of chuckling behind the sleeves," said Derek Woolner, an expert on defence technology at the Australian National University's Strategic and Defence Studies Centre. **"The joke around is Navy's being very, very careful.**

They've got almost total discipline: no one in Navy is saying anything about Harriers."

Woolner expects the subject to come up once the air force starts getting its new F-35 aircraft.

"They'll say how about buying some V/STOL versions, they'll be really cheap

because we can get the maintenance and support done out of the RAAF fleet, they wouldn't be like a little orphan fleet, we'd only need a few, and gee, it would add so much to our power projection.

"People are fully aware of it, it's just that the politics of the thing are such that Navy is shutting up," Woolner said.

"At the moment the whole defence equipment thing is oversubscribed and people feel the navy has already got more than their fair share, so the other services are going to get fairly growly if the navy starts mentioning fixed-wing aircraft off aircraft carriers."

The argument will build once it is realised the two ships are unlikely to be used to their full capacity, Woolner added.

"These ships give us no more capability to do what we want to do, than having the right to tie up at a dock in-country with the navy ships we've got now or even commercial freighters," he said.

"While we've got the capacity to land troops over the beach we don't have enough force to make an opposed landing."

A combination of more, smaller, ships would give more flexibility for operations in the south-west Pacific in which the ships are likely to be required: political stabilisation, disaster relief, or shuttling illegal immigrants to Nauru.

Aircraft carrier on navy's secret \$4bn wish list

25 MAR 2008 Ian McPhedran

THE Royal Australian Navy has produced a secret \$4 billion "wish list" that includes an aircraft carrier, an extra air warfare destroyer and long-range Tomahawk cruise missiles for its submarine fleet.

The RAN wants a third 26,000 tonne amphibious ship equipped with vertical take-off jet fighters, a fourth \$2 billion air warfare destroyer and cruise missiles that could strike targets thousands of kilometres away.

The list comes at a time when the RAN can barely find enough sailors to crew its existing fleet.

It also coincides with a Federal Government push to save \$1 billion a year in defence costs as well as a government-ordered White Paper which will set the spending priorities for the next two decades.

According to insiders, the Government was unimpressed by the RAN's push for more firepower at a time when the Government is aiming to slash spending.

"The navy is out of control," one defence source said.

It is understood that the wish list was the final straw in the tense relationship between the Government and Chief of Navy Vice-Admiral Russ Shalders - who will be replaced in July by Rear Admiral Russell Crane.

Admiral Shalders last year also pushed hard for an expensive US-designed destroyer, but lost out to the cheaper, Spanish option.

Taxpayers will spend more than \$11 billion to provide the RAN with the two 26,000-tonne amphibious ships and three air-warfare destroyers equipped with 48 vertical launch missiles.

<http://www.news.com.au/national/aircraft-carrier-on-navys-secret-4bn-wish-list/story-e6frfkw9-1111115876869>

The two big ships, known as Landing Helicopter Docks, are designed for amphibious assaults and will be fitted with helicopters and be capable of carrying more than 1000 troops and heavy vehicles such as tanks and trucks.

The RAN wants a third ship to carry vertical take-off fighter jets.

Its last aircraft carrier, HMAS Melbourne, was decommissioned in 1982 before being sold for scrap.

The latest ships are 10m longer and 8m wider than the Melbourne and will be built in Spain and fitted out at the Tenix shipyard in Melbourne.

The Spanish navy will carry 30 Harrier jump jets aboard its similar ships.

They will each cost more than \$1.7 billion. The fighters would cost about \$100 million each. The destroyers will cost about \$2 billion each, taking the total cost to more than \$4 billion.

Tomahawk cruise missiles cost about \$1 million each and can carry a 450kg conventional or 200 kiloton nuclear warhead more than 2500km.

In the past Australia has stayed away from long-range strike missiles for fear of triggering a regional arms race.

The wish list is what the RAN would like to see make up part of the White Paper process which will later this year provide a strategic blueprint for the defence of the nation for the next 20 years.

That process will direct new spending worth more than \$50 billion over the next 10 years.



TED HOOTON LONDON

Historic boost in capability for the ADF

AMPHIBIOUS ASSAULT SHIPS

The Re Juan Carlos Primero on trials
Credit: Navantia

On September 12 2009 the Royal Australian Navy took its first step to a radical improvement in its strategic projection capability when the keel was laid of the amphibious assault ship HMAS Canberra.

When she and her sister ship HMAS Adelaide enter service in 2013 they will provide a quantum leap in capability over the existing Kanimbla class and the heavy lift ship HMAS Tobruk. In terms of amphibious warfare they represent a totally different change in philosophy marking a break with Australian experience during the Second World War.

The traditional philosophy was aimed at landing troops on the beach and the Kanimbla's represent this because they are heavily modified US Newport tank landing ships designed to beach and then lower a ramp along which heavy armour and troops would pour to storm enemy fortifications. But even as the Newport were built in the 1960s a new philosophy was emerging aimed at landing troops beyond the beaches which was one reason these ships have a limited helicopter capability with up to four medium (10-tonne) aircraft. The new philosophy saw the development of amphibious assault ships that were essentially helicopter carriers but increasingly were given the ability to discharge large numbers of troops and equipment rapidly at docksides to meet international crises which required the rapid deployment of troops.

Spain - which also operates two Newport - addressed its requirement with the Buque de Proyección Estratégica (BPE) or strategic projection

vessel laid down by Navantia's El Ferrol yard in May 2005 and launched in March 2008 as SPS Re Juan Carlos I. She has recently completed her trials off Cadiz and will shortly join the Spanish Fleet but the design was already being considered by Canberra to meet a similar requirement.

Australia's position was understandable, as this decade has seen an explosion of interest in this kind of ship among many Asian navies - and not only Asian because the Russian Navy has expressed keen interest in France's Mistral class. One reason for Asian interest was highlighted in the aftermath of the Tsunami Disaster of 2004 when a major source of humanitarian aid in Sumatra proved to be a USN Wasp class amphibious assault ship whose helicopters could reach isolated areas and which had the medical facilities to treat large numbers of sick and injured.

Although not a formal feature of Joint Project 2048 Phase 4A/4B it does appear to have been a 'selling point' for Defence which placed the BPE and the Mistral on the short list for the \$3 billion project in August 2005. The requirement was for a ship to carry 1,000 troops and 150 vehicles including the M1A1 Abrams main battle tank. It would have a full-length flight deck with at least six helicopter spots for medium- and light (4 tonne)-weight helicopters while a fully-equipped hospital was also a feature of the requirement.

Australia faced a dilemma in making its choice - for while the Mistral was in service at the time of the contest, the BPE was still under construction but at 27,000 tonnes it was 3,000 tonnes larger than its competitor. This



Artist's impression of the Re Juan Carlos Primero and the Principe de Asturias sailing together.
Credit: Navantia

appears to have been a major reason for the decision to award Navantia's sponsor Tenix Defence (BAE Systems Australia from January 2008) the contract but it was obvious that no single Australian yard could build these ships. It was decided that the hulls should be built at El Ferrol and the ships would then be transported to the Williamstown yard in Victoria where their superstructures would be built and installed. The ships - now known as the Canberra class - would also be fitted out in Williamstown.

While the two Canberras will have much in common with the BPE they will also be distinctly different designs. Both classes are designed to carry more than 900 troops and will have hanger/ light cargo deck. The latter is 1,800 square metres and in the BPE can accommodate 31 6 x 6 trucks and 18 4 x 4 vehicles and as in the Canberras is linked to the 200-metre flight deck by two 27-tonne elevators, one forward and one aft. Below the hanger heavy cargo deck which is 1,400 square metres and can accommodate up to 46 main battle tanks. Direct access to this deck is from the flooded landing dock area which is 69.3 x 16 metres and is designed for a single Landing Craft, Air Cushion (LCAC) or four medium landing craft.

Both will be powered by a LM 2500 19.75 MW gas turbine turbo generator and two MAN 16V 32/40 7.7 MW diesel generators linked two a pair of Siemens-Schottel 1MW podded propulsors and two 1.5 MW bow thrusters. The Spanish ship is designed to sail 9,000 nautical miles (16,700 kilometres) at 15 knots and to have a maximum speed of 21 knots and the Canberras will have a similar performance but with the maximum speed reduced to 19 knots. Survivability is aided by inclined sides on the hull and superstructure to reduce the radar signature, rafting to reduce the acoustic signature, a magnetic mine degaussing system and, if damaged, five damage control stations, six vertical fire zones with main and secondary damage control rooms.

But the ships will vary slightly and this is one reason why the Australian ship will have a slightly smaller displacement of 25,790 tonnes (full load) compared with 27,079 tonnes in the Spanish ship. Nevertheless the new vessels will have a greater displacement than the Royal Australian Navy's previous largest ship, the 19,966-tonne carrier HMAS Melbourne. The Spanish ship is designed to meet four roles; amphibious assault by the marine corps, strategic projection in which army units will be rushed to a crisis spot, a secondary carrier carrying up to 19 fixed-wing Short Take-Off and Vertical Landing (STOVL) aircraft and a humanitarian relief vessel.

The Australian vessels, although retaining the BPE's 'ski jump' which the Spanish ship has to fly off STOVL aircraft, are expected to operate only rotary wing aircraft and while the SPS Re Juan Carlos I will be able to fly off six simultaneously - but twice that number can be kept on the flight deck. It is reported the Royal

ON F-35BS on ON LHDS

Australian Navy would like to have some STOVL F-35 Lightning II Joint Strike Aircraft embarked in the Canberras, as with the BPE, but the government has not approved this and given the rising cost of the F-35 this capability does seem even more unlikely in Australian ships. While amphibious assault role may nominally be included in the Canberras' roles in practical terms they are more likely to be used for strategic protection and humanitarian relief. Interestingly, they are expected to have a slightly larger military presence of 978 troops compared with 902 Spanish.

The ships will include an air search and three surface-search/navigation radars, a combat command system, communications suite, self-protection gun, torpedo-protection and decoy systems. The BPE uses domestically produced electronics but the Canberras will feature a Saab Systems Australia combat system based on the 9LV Mk 3 or Mk 4 used in the Anzacs while communications will be provided by L-3 Communications. No choice has been announced on the radars but a Raytheon SPS-49 might be selected for the air search radar to bring the new ships into line with the Anzacs. Like the Spanish ship the Canberras is likely to feature the SRBOC Mk 36 decoy launcher (although with Nulka active counter-measures system as well as passive munitions) and the AN/SLO-25A Nixie torpedo decoy but the gun system is likely to be the 25mm Rafael Typhoon. The ships will receive an EADS MSSR 2000 Identification Friend or Foe (IFF) system under a contract announced in December.

The ships will be built to a slightly different standard based upon Lloyds' Register Naval Rules and Royal Australian Navy standards rather than upon LRS commercial and US Navy standards. There will be environmental, habitability, damage control and safety standards and the 440 Volt 60 Hz voltage cycle electrical system will be replaced by the Australian standard 240V and 50 Hz. There will be new armories and changes in the magazines (reflecting the Australian operational requirement) and with virtually all operations in the tropics a 30 per cent increase in chilled water plants. Up to a quarter of the equipment by value in the Australian ships will come from domestic sources.

HMAS Canberra is expected to be launched in March 2011, and is scheduled to arrive in Williamstown in 2012 and to be commissioned in 2013. Her sister ship is to be launched in 2012, to arrive in Australia two years later and be commissioned by the end of the year. APDR

http://www.asiapacificdefencereporter.com/backissues/download/25&ei=9YSDVb_-GZTFAXd8oG4Aw



Re Juan Carlos Primero BPE under construction.
Credit: Navantia

LHD and STOVL — An engineer's view

20 Jun 2014 Steve George

As a military aircraft engineer, I've been associated with STOVL aircraft operations for around 30 years, and have worked on the F-35 program. So I've followed the current discussions around potential use of F-35B from the Canberra-class LHDs with interest.

In my view, it's remarkable how much the debate focuses on the problems that the aircraft would face in operating from those ships rather than the potential benefits to be gained. Assertions abound about the 'limited' nature of F-35B operations from an LHD, and the 'severe challenges' involved in generating a militarily 'decisive impact' from 'small' platforms. And yet for 30 years or more the UK and US (using AV-8Bs and Sea Harriers) have delivered significant operational effect from

similar platforms. Clearly, STOVL at sea can work. So I'd like to offer a few observations that might assist and inform the debate.

For STOVL aircraft, the Canberra class isn't a 'small' ship. They're actually much larger than the RAN's last carrier, HMAS *Melbourne*, and significantly bigger than the UK's highly effective Invincible class. Their flight decks are nearly as big as Wasp class LHDs decks, for which the F-35B was designed. Indeed, the Canberra class actually have more suitable decks for F-35B operations; their ski jumps would deliver significantly improved launch payloads and safer launches. The point here is that STOVL is a truly disruptive technology. It allows LHD-sized vessels to deliver a level of maritime aviation capability previously limited to large conventional carriers.

There are understandable concerns about the F-35B's jet blast. STOVL operations require nothing

like the complex blast deflectors fitted to CVNs, but jet-blast issues have been considered, researched and tested throughout the F-35 programme. In my view, the F-35B's impact on flight decks is understood and manageable. New and highly effective flight-deck coatings have been tested and trialled. It's possible that minor ship modifications may be required, including protection for deck equipment, or possibly even deck reinforcement, but measures like those are normal for STOVL operations on ships.

Staying with the engineering aspects, there have been statements about the 'inability' to maintain the F-35 on board the LHDs. In fact, the aircraft has been specifically designed to be maintained at sea, and to have a small logistics footprint. It's true that embarking F-35s would require some changes to existing spaces and facilities—but the RN put Sea Harriers (an aircraft not remotely

optimised for maritime operations) on board with minimal ship changes. Lack of space doesn't mean lack of engineering expertise, nor does it inhibit ingenuity.

Turning to flight-deck operations, it's been argued that F-35Bs would 'displace' other aircraft on the flight deck leading to a 'loss of capability'. True, some specific capabilities would be constrained. But a different set of capabilities would be gained. We shouldn't ignore the significant capability the F-35B would bring to the fight, nor overlook the value of being able to tailor the LHD's 'air wing' to meet the (often unexpected) task. Concerns have also been expressed over safely operating both fixed and rotary wing aircraft on a single deck. So let me reassure readers that operating different types of aircraft simultaneously from small spaces is, like handling jet blast, a routine and well-understood aspect of naval aviation.

Any integration of the F-35B

with the Canberra LHDs would have to deliver operational impact in an efficient manner. There's a key point here, not well understood by those unfamiliar with naval aviation, and it's this: putting aircraft, stores, fuel, weapons, support facilities and personnel into close proximity on a ship allows for high operational tempos. That has been demonstrated for many years, from the South Atlantic to the Bay of Sirte, and from Korea to Suez. The amount of air capability an LHD deck could generate from five to 10 F-35Bs, and the length of time that could be sustained, would startle anyone who hasn't done 'STOVL at sea'. Coupling high-sortie rates with the ship's ability to minimise distance to the target is the essence of naval aviation: proximity equals capability.

In my experience, the key challenge in delivering a viable maritime aviation capability wouldn't be the equipment, but

in re-generating the required naval-aviation expertise. Fortunately, Australia has a strong naval-aviation heritage, and a number of ex-RAN aviators who were (not that long ago) involved in the UK's Sea Harrier operations. In my view, the Australian Government should assemble some of that priceless experience and put it to work assessing the F-35B/LHD option. Regenerating a fixed-wing naval-aviation capability would be the key to exploiting the F-35B at sea—and I have no doubt the RAN would be equal to the challenge.

Steve George was an air engineer officer in the Royal Navy for 28 years, and served in HMS Invincible during the 1982 Falklands operation. During his career, he was closely involved with the Sea Harrier, and also with joint RN/RAF Harrier operations. Retiring from the RN as a Commander, he joined the JSF programme to work on F-35B ship suitability. He is now an engineering consultant.

<http://www.aspistrategist.org.au/lhd-and-stovl-an-engineers-view/>

Jump jets on Defence radar 17 May 2014 Nick Butterly, Canberra, The West Australian

<https://au.news.yahoo.com/thewest/national/a/23583014/jump-jets-on-defence-radar/>

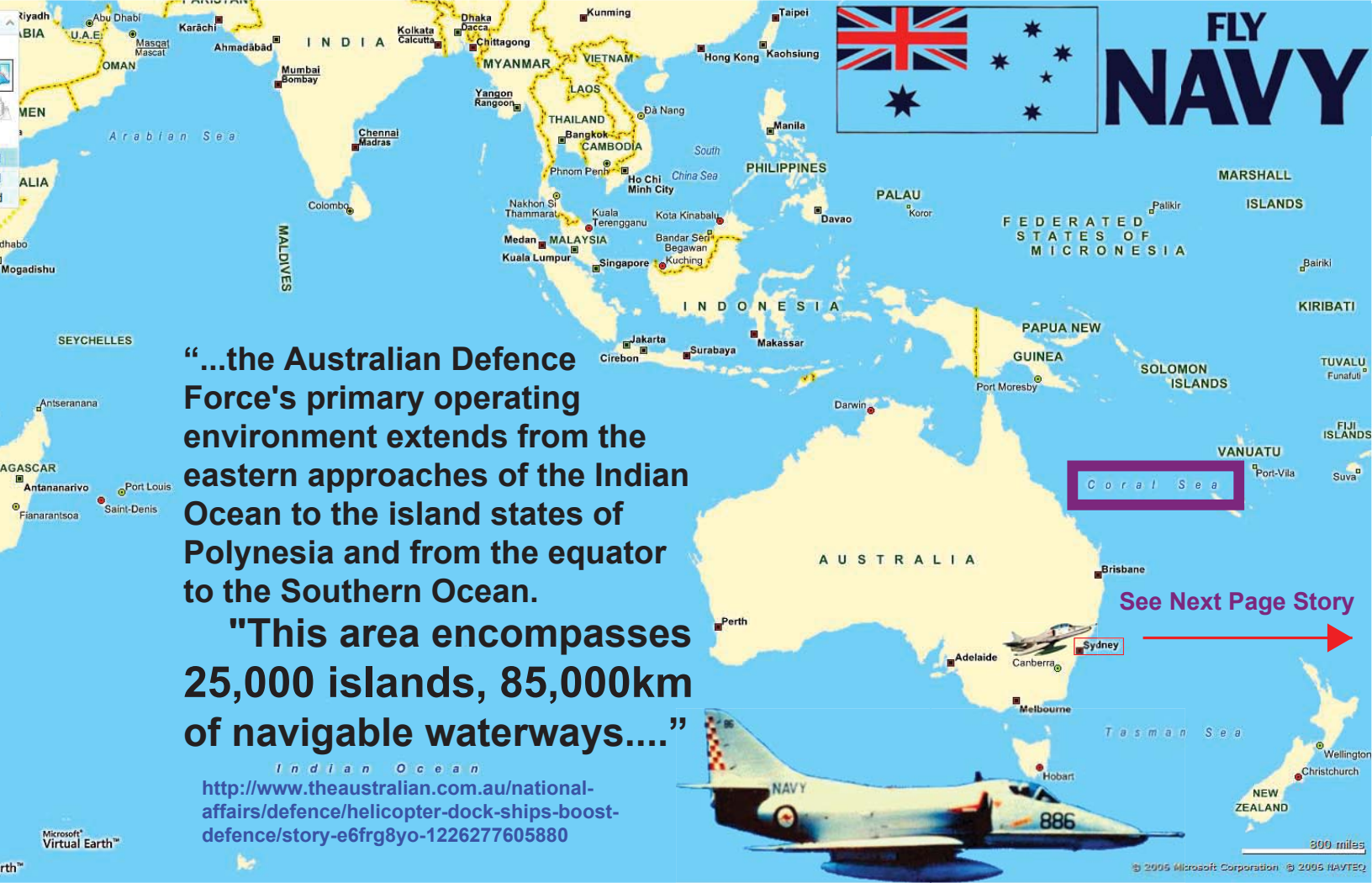
“Australia could buy "jump-jet" Joint Strike Fighters to base aboard new landing ships, giving the nation its first aircraft carrier since the early 1980s. Defence Minister David Johnston told The Weekend West the Government was considering buying the "B" model of the F-35 – a specialised variant of the stealth jet being built to operate from aircraft carriers.

Last month, Australia committed to buying 72 of the conventional model F-35s from US aircraft manufacturer Lockheed Martin at a cost of almost \$20 billion. But the Government has left the door open to buying more F-35s and the minister says the F-35B will be considered. "Now that aircraft is more expensive, does not have the range but it's an option that has been considered from day one," Senator Johnston said....

...Australia is soon to bring into service two large ships called landing helicopter docks. Though they resemble small aircraft carriers, the Government has maintained until now they would be used only to deploy helicopters & troops. Senator Johnston said stationing the F-35 aboard an LHD would be costly and technically challenging, but it could be done. "The deck strength is there for such an aircraft," he said.

The Hawke government mothballed Australia's last aircraft carrier, HMAS Melbourne, in 1982. Commissioning an aircraft carrier is considered a significant strategic statement of military might by a country....

...The F-35 will replace Australia's fleet of F/A-18A/B Classic Hornet aircraft, due to be withdrawn in 2022.”



“...the Australian Defence Force's primary operating environment extends from the eastern approaches of the Indian Ocean to the island states of Polynesia and from the equator to the Southern Ocean.

“This area encompasses 25,000 islands, 85,000km of navigable waterways...”

<http://www.theaustralian.com.au/national-affairs/defence/helicopter-dock-ships-boost-defence/story-e6frg8yo-1226277605880>

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NAVY

See Next Page Story



Helicopter dock ships boost defence

by MARK DODD Feb 22, 2012

<http://www.theaustralian.com.au/national-affairs/defence/helicopter-dock-ships-boost-defence/story-e6frg8yo-1226277605880>

“THE arrival in 2014 of the first of two 27,000-tonne Landing Helicopter Dock warships represents **the biggest change to Australia's "force projection capability" since the navy's first aircraft carrier was acquired more than 60 years ago**, Defence Force chief General David Hurley said yesterday. Speaking at a key defence conference in Canberra, General Hurley said restructuring of the army's three combat brigades into an amphibious assault force - the most ambitious revamp of Australian Defence Force doctrine in decades - was on track to enable company-size ship-to-shore landings by 2018....

...The challenges in creating an Amphibious Task Force (ATF) should not be underestimated, he warned. **Much would be learnt from the shared experiences of the US Marine Corps, units of which will soon to be based in Darwin, and its British counter-part, the Royal Marines, General Hurley said.**

As reported in The Australian in December, the testbed for the new capability will be the Townsville-based 2nd Battalion Royal Australian Regiment, just returned from Afghanistan. However, outside Afghanistan, the Australian Defence Force's primary operating environment extends from the eastern approaches of the Indian Ocean to the island states of Polynesia and from the equator to the Southern Ocean.

"This area encompasses 25,000 islands, 85,000km of navigable waterways.

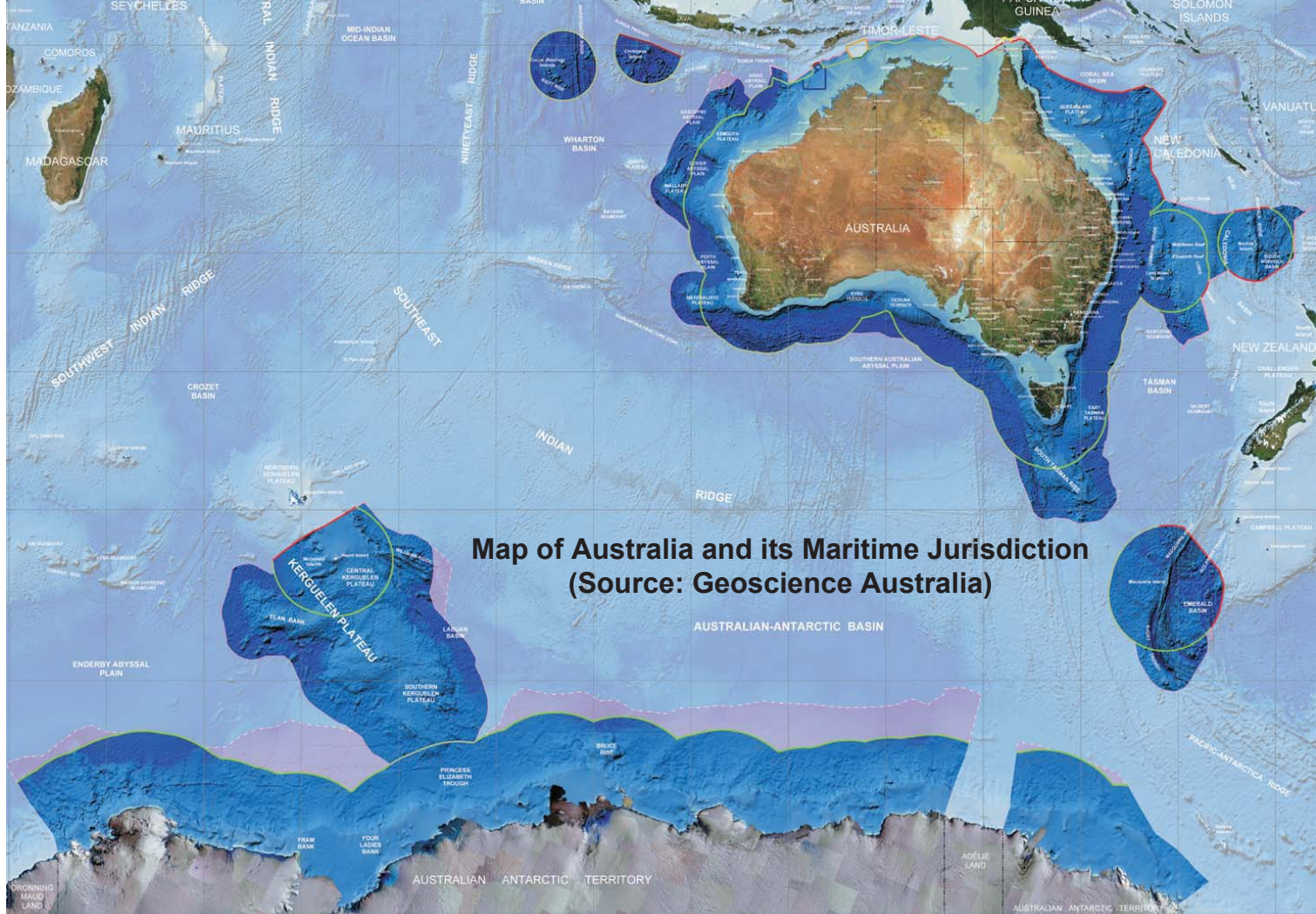
"The ADF must be able to maintain situational awareness across this vast area and must be capable of responding swiftly and decisively to a range of scenarios," General Hurley said....”





Indonesia's archipelagic sea lanes - by the Australian Hydrographic Office

<http://air.power.gov.au/APDC/media/Files/CAF%20Occasional%20Papers/CAF04-Australian-Air-Power-in-a-Maritime-Strategy.pdf>



Map of Australia and its Maritime Jurisdiction
(Source: Geoscience Australia)

Australia commits to Triton in \$5 billion deal

Nigel Pittaway 27 Jun 2018



<https://www.defensenews.com/global/asia-pacific/2018/06/27/australia-commits-to-triton-in-5-billion-deal/>

MELBOURNE, Australia — Prime Minister Malcolm Turnbull announced on June 26 that the Australian government will purchase six Northrop Grumman MQ-4C Triton unmanned surveillance aircraft.

The initial investment in the Triton capability is AU\$1.4 billion (U.S. \$1.03 billion), which includes AU\$200 million to enter into a cooperative development program with the U.S. Navy; and AU\$364 million for major infrastructure works at two Royal Australian Air Force bases.

The total cost of the deal, including whole of life sustainment costs, is estimated to be AU\$6.9 billion Australian dollars (U.S. \$5.1 billion).

The first aircraft will be delivered in 2023 and the last in 2025. They will be based at RAAF Base Edinburgh in South Australia and at Tindal in the Northern Territory, but are also likely to be forward-deployed to other airfields around the continent, including a string of bare bases to the north and north-west.

The announcement marks the Gate 2 milestone in the Australian Defence's Force's Air 7000 Phase 1B program, which seeks to acquire a high altitude, long endurance maritime surveillance platform to complement its eventual fleet of 12 Boeing P-8A Poseidon manned maritime patrol aircraft.

Australia's Triton program earlier achieved Gate 1 approval in 2014, and the 2016 Defence White Paper affirmed the government's commitment to the acquisition of the capability, subject to the successful completion of the U.S. Navy's Triton development program. At that time the requirement was for seven Tritons, one less than the six announced yesterday, and was initially capped at AU\$4 billion, although this did not include through-life sustainment costs.

"The Triton will complement the surveillance role of the P-8A Poseidon aircraft through sustained operations at long ranges as well as being able to undertake a range of intelligence, surveillance and reconnaissance (ISR) tasks," according to a joint statement by Prime Minister Turnbull, Minister for Defence Marise Payne and Minister for Defence Industry Christopher Pyne. "Together these aircraft will significantly enhance our anti-submarine warfare and maritime strike capability, as well as our search and rescue capability."

Minister Pyne said that the Triton will be responsible for surveillance of Australia's areas of maritime responsibility, which represents over 10 percent of the world's surface.

"They will provide surveillance and reconnaissance across the Indian Ocean, the Pacific Ocean and the Southern Ocean as far as Antarctica," he said.

"Triton provides unprecedented endurance and 360-degree coverage through its unique sensor suite," commented Doug Shaffer, Northrop Grumman's vice president of Triton programs. "Australia has one of the largest sea zones in the world over which it has rights to use marine resources, also known as an Economic Exclusion Zone. As a flexible platform, Triton can serve in missions as varied as maritime domain awareness, target acquisition, fisheries protection, oil field monitoring and humanitarian relief."

The Australian Defence Force estimates Triton is capable of establishing a ten-hour orbit in the Southern Ocean, south of Heard Island, or similar efforts to the north of Guam and to the East of Fiji in the Pacific Ocean, from bases around the country.

Australia is interested in the multi-intelligence (MULTI-INT), also known as integration functional capability 4 version of the Triton. This features several enhancements over the baseline aircraft and includes a signals intelligence payload which, in U.S. Navy service, is intended to replace the Lockheed EP-3E Aries surveillance platform.

The cooperative development program Australia has signed with the U.S. Navy is similar to the agreement it has with the Navy regarding P-8A spiral development and will seek to influence the further development of the MULTI-INT Triton to meet Australia's specific needs. Items of interest are understood to include the integration of a weather radar system, for prolonged operations in tropical conditions where daily thunderstorms are a fact of life, and a ground moving target indicator to facilitate overland ISR missions in addition to the blue water maritime surveillance role.

"This cooperative program will strengthen our ability to develop advanced capability and conduct joint military operations," Prime Minister Turnbull said.

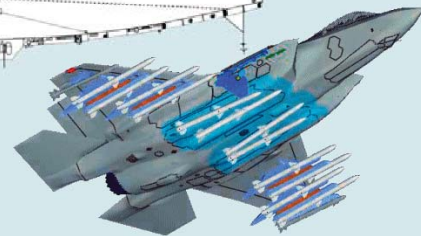
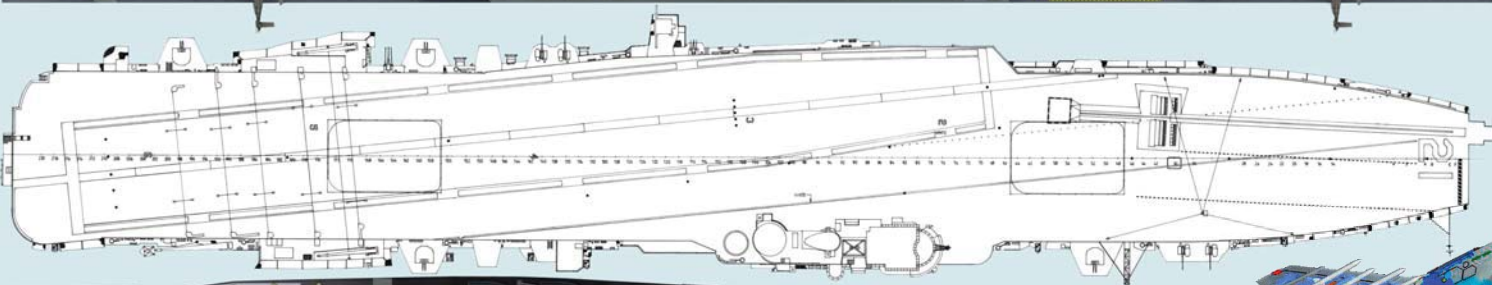
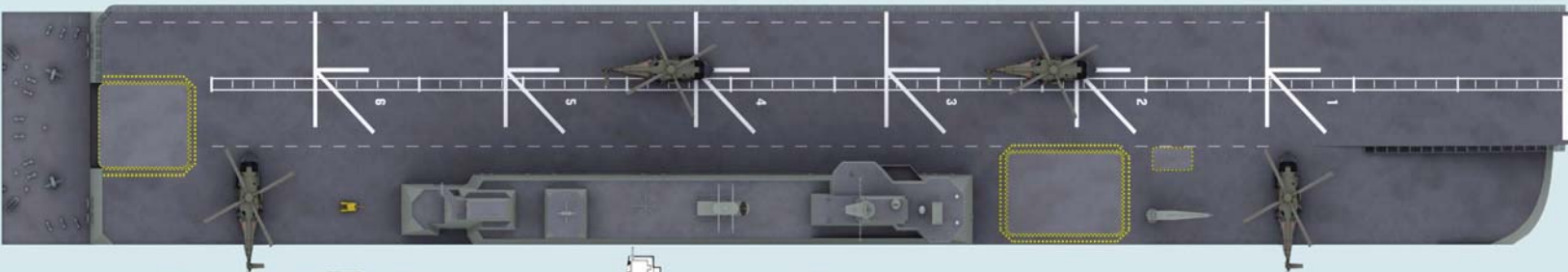
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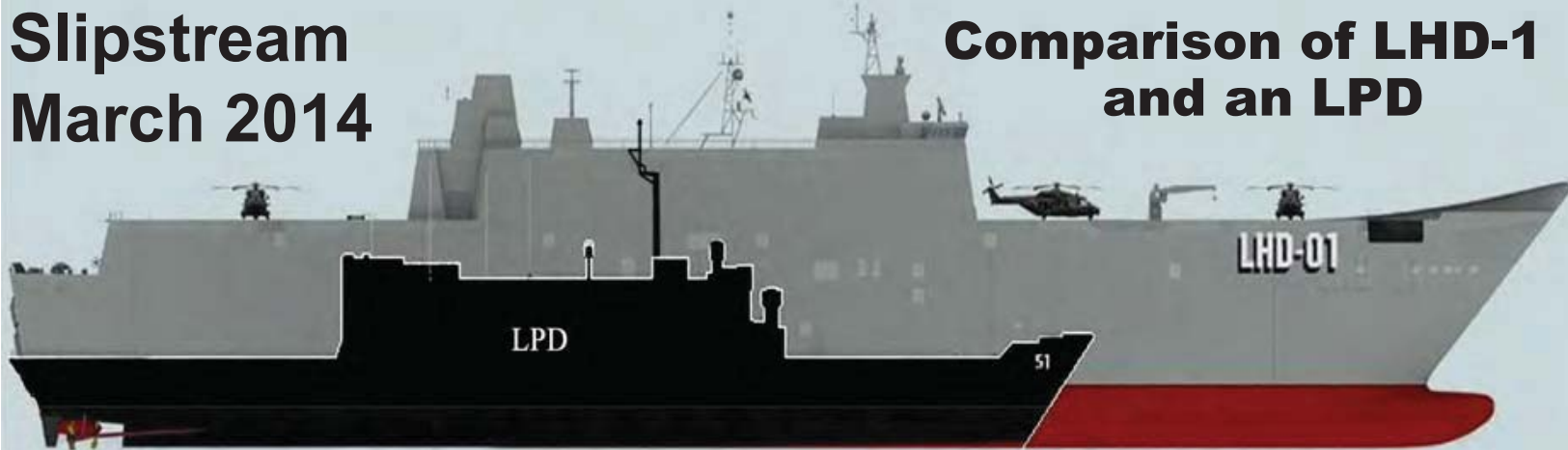
LHD 230m = 755ft | CV 213m = 700ft

To Scale



Slipstream
March 2014

Comparison of LHD-1
and an LPD



[https://www.faaaa.
asn.au/wp-content/
uploads/2016/08/
Slipstream-
Vol-25-1-Mar14.pdf](https://www.faaaa.asn.au/wp-content/uploads/2016/08/Slipstream-Vol-25-1-Mar14.pdf)



CARRIER-BORNE CLOSE AIR SUPPORT Historical and Contemporary perspectives **CMDR David Hobbs MBE, RN (Rtd) The NAVY Vol 72 No 4 Special Oct-Dec 2010** http://navyleague.org.au/wp-content/uploads/2012/06/The-Navy-Vol_72_No_4-Oct-2010.pdf

“...Historically, air forces have shown themselves to be the least joint of armed forces, the least adaptive to other people’s ideas and formed on the unsubstantiated political assumption that all future wars would be fought by them, making navies and armies obsolete. Experience shows the need for successful integration of ‘air’ into naval and military operations and questions the need for a third service to support the other two without fully comprehending their needs. The transfer of battlefield support helicopters from the RAAF to the Army Air Corps was a wise move that supports this view. **The choice of future aircraft put forward by the RAAF is questionable and demonstrably follows an independent line. The LHDs are being built to a Spanish design with a ski-jump and their Spanish sister-ships are intended to operate the F-35B, STOVL, version of the Joint Strike Fighter (JSF), itself designed to meet a US Marine Corps requirement to operate as CAS aircraft from US Navy LHDs. The RAAF wants ‘up to’ 100 JSF; to an outsider this offers a straightforward solution since the Australian Defence Force is buying the big deck ships and the CAS aircraft to operate from them. This is not the case since the RAAF insists on procuring the F-35A version of the JSF, designed for the US Air Force and incapable of operation from a carrier or providing support for a distant expeditionary operation.** It is not clear why the Australian Government is considering buying an aircraft with such limited potential when it could get so much more for its money by taking a wider view. Air Force politicians will point out that airborne tankers and transport aircraft could relocate maintenance personnel, spare parts and ammunition to a ‘friendly’ air base near the scene of the action. As with the Hunters in Kuwait, however, this would buy up much of the tanker/transport force and prevent it from carrying out other tasks which would no doubt be given lower priority; **an inward-looking RAAF view rather than working with others to achieve the best result in the national interest.**

There are major issues with the cost of the JSF programme and the high cost of individual aircraft and the unknown cost of their support may deter many nations, including Australia, from buying it in the numbers they originally intended or at all. This is another area that has not yet been debated and deserves to be. The phenomenon of expensive front line aircraft is not new....”



SEMAPHORE

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AMPHIBIOUS SHIPS

Of course, the introduction of the LHDs will bring significant challenges to the ADF. Without a dedicated marine force, such as the UK Royal Marines or US Marine Corps, the Australian Army will provide the landing force transported by the LHDs. The Army has a core of amphibious experience; however, the LHDs represent a quantum leap in capability, and one that the ADF must understand fully to maximise their potential. To that end, an RAN-Army 'Joint Amphibious Capability Implementation Team' (JACIT) was established in September 2006 to identify and resolve issues associated with introducing this capability into the ADF. The Chief of Navy is the capability manager for the LHD, but the JACIT is responsive to a wide range of stakeholders involved in delivering ADF amphibious capability.



HMAS Melbourne (CV)



LHD 230m = 755ft
 CV 213m = 700ft

To Scale

THE CHALLENGES OF AN ORGANIC FIXED WING CAPABILITY FOR AUSTRALIA'S LHDs

Oct 2010 By Mark Boast in THE NAVY VOL. 72 NO. 4 http://navyleague.org.au/wp-content/uploads/2012/06/The-Navy-Vol_72_No_4-Oct-2010.pdf

"The best way to overcome a challenge is to understand it. With this in mind former Sea Harrier squadron commanding officer Mark Boast takes a look at the challenges that could confront the ADF adopting organic CAS for the new Canberra class LHDs."

"The acquisition of two LHD ships within an expanded amphibious capability has naturally stimulated thinking within the Defence community about the best force mix to support the capability. There has even been guarded speculation about the potential of operating fixed wing aircraft to provide enhanced offensive capabilities in air and surface environments; a natural path given that the basic ship configuration so clearly reflects its evolution as a STOVL jet platform.

The Australian operational concept for both LHD ships is focussed on amphibious operations but does not include an organic fixed wing aircraft capability that operates from the LHD or within the deployed amphibious force. This has left open the traditional questions about the need for organic offensive fixed wing aircraft capabilities where land based air assets may be limited due to range or response times, and other organic assets such as Tiger are relatively limited in their offensive roles, range and firepower.

In order to simplify the approach and get straight to the organic fixed wing aircraft discussion, I am going to assume that the Minister has requested the ADF to provide some initial key discussion points on the development of a fixed wing offensive air support capability to operate from the LHD ships. I leave it to others to ponder on the Minister's request and reasons for it!

The purpose of this article, therefore, is to explore some of the fundamental operational and support implications of an organic fixed wing aircraft capability. There is no intent here to question a similar land based air capability or the role and contribution of an embarked ARH Tiger. If it eases the reader's concern, consider the Minister's request as being one based on risk reduction for the more demanding offensive land and maritime scenarios, or as a "peace of mind" force protection requirement for the future....

...CONCLUSION

Complete Article Next Pages

So given the consideration of only three assessment criteria; aircraft, weapons and organisation and culture, what does a potential response by the CDF to the Minister's question look like?

"Well Minister, to start with we need to purchase at least one squadron of approximately 12 STOVL aircraft and training systems; train the pilots on a different variant of an existing aircraft but one that flies differently; develop our engineers and flying operations people overseas with one of our major allies, which we've done before, and integrate the new squadron onto the ship overseas using our allies support for up to a year. Needless to say this will have an impact on our existing plans within the RAAF fast jet force and those for the LHD, but we have excellent people and with careful management it is certainly achievable. When would you like to see 1st Pass?"

"Mark Boast is a former naval aviator of 23 years experience in both the **RAN [A4G Skyhawk]** and **RN [SHAR]**. The majority of his flying was on the Sea Harrier where he was CO of the training squadron and operational evaluation unit. He was also an **MOD** staff officer for the Sea Harrier replacement and was involved in the concept development for **JSF** and **CVF**. Opinions expressed in this article are entirely his own and developed without reference to any ADF project including the LHD and JSF projects."

REMOVE SKI JUMP from LHDs by MarkLBailey (19-Oct-2012)

<http://warships1discussionboards.yuku.com/sreply/309398/LHD-01-Departs-Spain-Australia-Bound-22-August-2012>

“Without revealing anything I should not, I was present in 2002 at Puckapunyal when the modelling was done to recommend either the Spanish or the French design.

During the process, the question was asked if Treasury & Finance would provide additional funds to remove the fixed-wing capable light carrier elements of the Navantia design (ski jump, certain magazines and elevators, certain other systems, some weight and space).

The answer was an emphatic no.

All the systems were dual use. To my knowledge, none were removed or not installed. Therefore she is perfectly capable of operating something like SHAR or STOVL F-35, although undoubtedly additional kit would be needed (hence the weight and space mentioned above).

The Navy guys were so delighted with the Treasury response they were too terrified even to move a muscle. It was as funny as hell to watch.

Cheers: mark”

THE CHALLENGES OF AN ORGANIC FIXED WING CAPABILITY FOR AUSTRALIA'S LHDs

By Mark Boast

The best way to overcome a challenge is to understand it. With this in mind former Sea Harrier squadron commanding officer Mark Boast takes a look at the challenges that could confront the ADF adopting organic CAS for the new Canberra class LHDs.

The acquisition of two LHD ships within an expanded amphibious capability has naturally stimulated thinking within the Defence community about the best force mix to support the capability. There has even been guarded speculation about the potential of operating fixed wing aircraft to provide enhanced offensive capabilities in air and surface environments; a natural path given that the basic ship configuration so clearly reflects its evolution as a STOVL jet platform.

The Australian operational concept for both LHD ships is focussed on amphibious operations but does not include an organic fixed wing aircraft capability that operates from the LHD or within the deployed amphibious force. This has left open the traditional questions about the need for organic offensive fixed wing aircraft capabilities where land based air assets may be limited due to range or response times, and other organic assets such as Tiger are relatively limited in their offensive roles, range and firepower.

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An F-35 STOVL JSF, to be used by the RN, USMC and a number of other nations. The Australian operational concept the LHDs is focussed on amphibious operations but does not include an organic fixed wing aircraft, like the STOVL JSF, for CAS missions. (Lockheed Martin)



http://navyleague.org.au/wp-content/uploads/2012/06/The-Navy-Vol_72_No_4-Oct-2010.pdf

An Australian Army Tiger reconnaissance helicopter. The Tiger's limited range and weapon plus, its un-manned nature, means it cannot provide the necessary CAS required by Australian troops during an amphibious operation. (Defence)



THE ORGANIC FIXED WING AIRCRAFT CAPABILITY

The organic capability is defined as one that is able to operate and support fixed wing aircraft from either or both LHDs in support of warfighting operations. The conventional model of embarked Squadrons or flights involves a sufficient number of aircraft that can be operated sustainably to be ready for warfighting when required, armed with appropriate weapons, operated by suitably trained personnel and able to be reliably planned in support of operations. Twenty four hour operations and poor weather/night time flying must be considered as fundamental requirements to complement the existing ADF land and maritime forces capabilities and doctrinal warfighting.

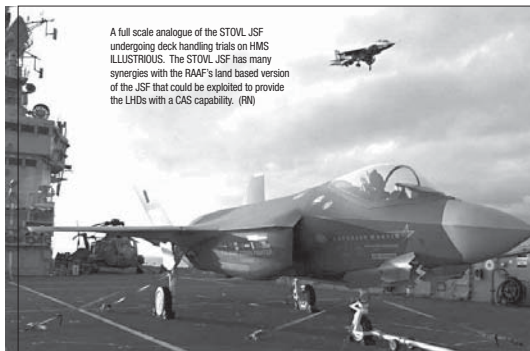
OPERATIONAL ROLES

Potential roles for organic fixed wing aircraft in support of an amphibious force are as broad as those of land based aircraft in support of a conventional land force. But in practice the roles will be restricted to the capabilities of smaller aircraft types able to be operated from the restricted space and characteristics of the flight deck. Long range and high endurance air and surface surveillance and high mass air logistics will remain in the domain of land based aircraft such as Wedgetail AEW&C and C-17 Globemaster III respectively. These capabilities are mentioned here because they will continue to be required even if the LHD develops its organic fixed wing capability.

Similarly, Air Refuelling and the additional land based offensive aircraft that it enables will always play a vital role in providing the numbers and breadth of battlefield coverage that a small number of embarked aircraft will never be able to meet. Beyond the scope of this discussion but not far from the back of the

mind is the apparent irony of our current fleet of naval F-18 Hornet aircraft. But again the size and characteristics of the flight deck dictates feasibility.

For ease of discussion, and to remain true to the Minister's request, I will assume that the required primary role is for a fixed wing land attack air capability in close support of amphibious and associated deployed forces. Given today's mobile forces and the inherently remote nature of amphibious operations, this support extends to a strike capability against influential targets that are not in the immediate battle areas. In making this assumption I am keenly aware of the many solutions that exist and are under development to support this role besides the well known aircraft currently employed. Long range naval gunfire and missile systems, long range land based air systems including UCAs (Uninhabited Combat Aerial Vehicles), and the increasingly lethal weapons within the amphibious force itself will eventually



A full scale analogue of the STOVL JSF undergoing deck handling trials on HMS ILLUSTRIOUS. The STOVL JSF has many synergies with the RAAF's land based version of the JSF that could be exploited to provide the LHDs with a CAS capability. (RN)

need to be taken into account to determine the force mix options.

A secondary role is the provision of a supplementary maritime offensive capability against air and surface threats. Whilst a secondary role, this consideration falls into the requirement of most deployed assets to provide as much value to the force as possible. This role is more about complementing and supplementing capabilities such as AWD and long range land based systems rather than replacing them. At sea there is rarely too much force protection available and the RN's lessons in the Falklands Conflict provide ample proof should there be any doubt.

Roles that I will not investigate are those that would not normally be solved by a STOVL jet. Nevertheless they are worth mentioning. Air and battlefield surveillance is an essential capability and one that our own Wedgetail and allied assets can support. In order to meet persistent coverage and support surge or unpredictable demands however, an organic capability may need to be considered. Its value will not be measured by its limitations when compared to that provided by a large fixed wing aircraft, but by its rapid availability to fill gaps and cope with unexpected availability of the larger assets. Again, the lessons of the Falklands Conflict are applicable and especially the challenge of conducting amphibious operations at extreme ranges of land based aircraft.

The question of an organic fixed wing capability is a complex one. In the spirit of simplicity and in keeping with the intent of the Minister's question, I will approach this discussion using only three criteria: the aircraft, the weapons, the organisation and culture.

THE AIRCRAFT

The provision of land attack by an organic STOVL jet requires some fundamental enablers. Deck and hangar space that support flying and support operations, weapons stowage and assembly areas, accommodation for associated personnel, ship technical and operations systems to support flying, and a training system to provide an effective, deployable and safe capability. The majority of these enablers come at the cost of space, utility and cost within the strict boundaries of the ship environment. Whether above or below deck, the aircraft will displace other aircraft, amphibious force elements or stores. The weapons will require appropriate storage, handling and assembly areas. The personnel will need a certain amount of appropriate accommodation that will probably displace others who may have been assumed in the full warfighting configuration. The aircraft will require appropriately equipped workshops while in the hangar and finally, flying operations will need the communications and instrument approach aids whilst flying.

These requirements are unsurprising and distil into being competition for space with the confines of the ships design. What may not be apparent is that the nature of fixed wing flying that includes rolling take offs, high thrust vertical landings and the presence of weapons will dominate the ships flying operations. Nor will this domination diminish during amphibious operations when the natural tendency will be to support intensive helicopter operations. Even ships position, heading and speed will default to the fixed wing flying operation, albeit within the generous flexibility that STOVL capabilities provide and far less extreme than that which would be required for a conventional (non STOVL) naval fixed wing aircraft.

But back to the space competition. In the first instance it is worthwhile considering the number of aircraft that may be required and their "residential" requirements; the amount of time the aircraft are embarked and when they may not be present.

Let me immediately constrain the discussion to two STOVL jet aircraft types based on feasibility and the ADF's acquisition plans respectively. The first is the Harrier AV-8B family and secondly the STOVL F-35 JSF. Both these single seat multi role aircraft have been taken into account in the development Australia's LHD design, given their Spanish

predecessor, and therefore are valid for this discussion. But it is important to remember that neither aircraft has been or is planned to be in the Australian inventory. Whilst still under development, the STOVL JSF has perhaps the greater application in the longer term as it is a more specialised (and expensive) version of the land based JSF already being planned for the RAAF. Before going further I have already assumed that the reader is aware of the tremendous impact that catapults and arresting gear would have on the LHD design and that such an option is well outside the spirit of the Minister's question, and probably that of engineering feasibility as well.

Aircraft of this type are operated in pairs. This doctrine has been developed from experience in the conduct of operational tactics, self protection and mission assurance. Individual mission planning will therefore always include two aircraft plus a further one at least as a "spare" in the event one of the planned aircraft suffers an unavailability prior to launch. Depending on the criticality of the planned mission, the "spare" may be manned or they may be a further "spare", manned or unmanned. Assuming that there will be critical missions in a land battle associated with amphibious operations, then we can assume that four aircraft equipped with weapons will be the minimum number required "on deck".

From this fundamental assumption, the increase in STOVL jet numbers is driven by issues such as aircraft maintenance cycles, the battlefield coverage required (numbers and time), and secondary role requirements. A simplistic answer to the question of how many aircraft on the ship required to provide a reliable capability is four ready to fly, one in the hangar in maintenance, and if required a further pair to provide additional land attack or maritime force protection. Depending on aircraft reliability and maintainability, it would not be unrealistic to expect that between six and eight aircraft would be required on board to provide a sound capability base. These numbers would not be unfamiliar to current AV-8B operators, most of whom are operating these squadron sizes from ships in the twenty thousand tonne category i.e. smaller than the Canberra class LHDs.

STOVL jet aircraft are deliberately designed to be able to be operated from a range of airfields and landing pads. Therefore it is feasible to consider that the aircraft may disembark to shore operating locations.



Six USMC AV-8B Harrier II on a USN LHD. It would not be unrealistic to expect that between six and eight aircraft would be required to provide a sound capability base on each LHD. These numbers would be familiar to current AV-8B operators, most of whom are operating these squadron sizes from ships in the 20,000 tonne category i.e. smaller than the Canberra class LHDs. (USN)

A common misunderstanding within the ADF is that fixed wing helicopters can't operate from the same straight deck. Here a USMC Harrier takes off from a straight deck from the USN LHD IWO JIMA with helicopters parked to one side. (USN)



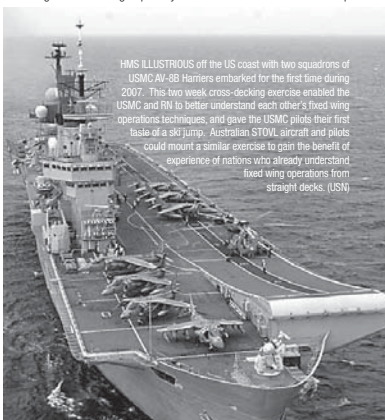
also complicate the number and types of magazine required. Weapons storage requirements can be very difficult to accommodate to restore to an existing design unless they were taken into account at final design acceptance. Whilst some examples can be recalled as seriously compromised weapons storage due to unexpected operational demands – the on deck storage of air weapons by the RN during the Falklands War is a recent example – it would be unwise to plan on this as the LHD will need to operate close to land and therefore be closer to possible threats. And not to mention that the deck area will be a very complex operating environment during actual amphibious operations – organic fixed and rotary wing, visiting aircraft, landing craft operations, maximum communications effort and fully alert defensive systems! Not the time to have weapons exposed on deck unnecessarily.

Depending on the weapons use predictions and storage capability, replenishment of weapons at sea will probably be required in order to avoid lengthy and highly inconvenient transits of the LHD to suitable shore based facilities. Whilst a number of smaller weapons could be re-supplied rapidly and reasonably easily using helicopter vertical replenishment, larger mass weapons and those with bulky storage cases will require conventional Replenishment at Sea. But where will the weapons come from? Not only will there need to be at least one suitable replenishment ship, but its supporting shore infrastructure will need to be matched to providing the weapons re-supply for the LHD capability. Transit times between potential operational theatres and suitably located and equipped shore facilities will probably be critical in supporting an amphibious role, especially if the organic fixed wing capability is the major enabler for sustained land operations.

THE ORGANISATION AND CULTURE

Finally it is time consider what is arguably the most difficult and complex topic within the Australian context, the fast jet organisation and its culture. Unlike the first two topics, the cultural issue is at it suggests, primarily one based on people and organisations rather than technical issues.

Let's start at the beginning. The RAAF is the only operator of fixed wing offensive aircraft within the ADF. Within the current configuration of the ADF air forces, it would seem a logical and mandatory assumption that an organic fixed wing capability on an LHD would be an RAAF Squadron



HMS ILLUSTRIOUS off the US coast with two squadrons of USMC AV-8B Harriers embarked for the first time during 2007. This two week cross-decking exercise enabled the USMC and RN to better understand each other's fixed wing operations techniques, and gave the USMC pilots their first taste of a ski jump. Australian STOVL aircraft and pilots could mount a similar exercise to gain the benefit of experience of nations who already understand fixed wing operations from straight decks. (USN)

THE WEAPONS

Fixed wing roles such as CAS, Strike and Air Defence cannot be achieved by the aircraft alone; the weapons are the essential element. The subject of weapons on both ships and aircraft is both complex and demanding. Being ship based we will want a sufficient range of weapon types and numbers to do those tasks which by default can only be accomplished reliably by the organic aircraft. And in the amphibious role, the usage rate of air to surface weapons can be very high in order to maintain the edge in force protection and progression of the ground battle.

Whilst the trend in developing smaller and highly accurate weapons may mitigate some magazine and handling space requirements, there will always be highly desirable weapons with longer range, endurance and payload that require large stowage areas. This requirement can be exacerbated if the weapon or its major components are designed to be stored individually in its own container. The storage and preparation spaces will therefore need to be scaled accordingly and also be equipped with the range of machinery and specialist manpower to support the potentially high usage rate.

Multiple magazines are very demanding on ship design and it is inevitable that painful compromises will be required with competing weapons storage requirements such as those for the embarked land forces. Storage incompatibility between weapon types based on characteristics such as explosive content, propellant type and "cook off" times will

also be required as the ship environment is shared. Within the limited number of the LHD there would of course be challenges to accommodating the air personnel as well as providing them with the training and experience to be able to operate in the ship environment. But given the high quality of ADF personnel and the attractive challenge of introducing such a potent and visible capability, it is highly likely that integrating an RAAF Squadron into the LHD environment would not be the limiting risk that some might imagine.

A single embarked squadron capability would itself need the support of a land based squadron to provide the training throughput of aircrew and maintenance personnel as well as providing the continuity and surge potential to reliably support operational tasking. Given that the embarked squadron may only be six - eight aircraft it should not be assumed that the squadron sizes would be equivalent to those currently found within the RAAF's fast jet force.

But what of the impact of supporting an organic maritime fixed wing capability to the RAAF itself? Within the timescale of this discussion, the RAAF is already operating three different fast jet types and will continue to be severely challenged to maintain the manpower to support existing capability and the transitions to new capabilities. The personnel challenges are significant and expensive to resolve. Pilots, engineers, systems maintainers and air operations specialists will all be required and dedicated to the maritime role. Luckily there are existing organisation models within the USMC and RVR/RAF that could be adopted but the inevitable truth is that whichever organisational model is adopted, or developed, the new organisations will be a clear addition to the existing RAAF fast jet force and not just a variation.

Perhaps the toughest challenge that an organic fixed wing capability will present is to those who fund, design and maintain the shape of our defence force. Developing the capability with a "least impact on funding and organisation" basis will inevitably fall to the RAAF first as a new aircraft type will be required. The existing fast jet fleet would need to be re-assessed, ongoing operational outputs revised and the surge associated with introduction of a new capability would require manning and management. Given the relatively limited size of the RAAF and especially the last jet force, such a change would be highly dramatic and it might be unrealistic to expect that the RAAF should shoulder the entire load itself, especially if a balanced national defence capability is to be maintained throughout the transition period to the new capability.

Up to now I have assumed that the significant change would be managed using a conventional force restructuring i.e. adapting existing forces



"We've done it before Minister". Seen here are nine Australian Army Blackhawk helicopters on the USN LHD USS BOXER undergoing familiarisation and tactics training in anticipation of the Canberra class LHDs arrival. Any adoption of fixed wing CAS for the Canberra class LHDs will rely on the RN and USN for exchange opportunities to relearn much that has been forgotten about fixed wing operations since the demise of Australia's aircraft carrier capability in the old HMAS MELBOURNE. (RAN)

and managing a coordinated transition with least impact on ongoing defence capability. But there are other options. The ADF could "adopt" all or part of a foreign Squadron and support structure to provide an instant initial capability, commence ADF training transition and enable early effective operational assessment. Alternatively and perhaps more feasibly, the ADF capability could be grown through developing it overseas within the existing organisations of either the UK or US and then transferred to the LHD when sufficiently mature. Included in both these options would be those ship based personnel essential to embarked flying operations mentioned earlier.

Regardless of the approach taken, a most critical step in transition will be the integration of the fixed wing capability into the LHD. Where organic fast jet capabilities exist there are also dedicated organisations that provide the training and assessments to ensure least risk during transition. This vital step would most safely and coherently be achieved through the training systems already in use by whichever foreign defence force is supporting the development of the air capability. The LHD will therefore need to plan on a significant period in either US or UK waters whilst the fixed wing capability is developed onboard and brought up to an operational employable level. To be able to achieve an operationally significant capability including day/night/poor weather with reasonable experience level will be a significant activity probably requiring between six months and a year.

CONCLUSION

So given the consideration of only three assessment criteria; aircraft, weapons and organisation and culture, what does a potential response by the CDF to the Minister's question look like?

"Well Minister, to start with we need to purchase at least one squadron of approximately 12 STOVL aircraft and training systems; train the pilots on a different variant of an existing aircraft but one that flies differently; develop our engineers and flying operations people overseas with one of our major allies, which we've done before, and integrate the new squadron onto the ship overseas using our allies support for up to a year. Needless to say this will have an impact on our existing plans within the RAAF fast jet force and those for the LHD, but we have excellent people and with careful management it is certainly achievable. When would you like to see 1st Pass?"

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CLOSE AIR SUPPORT AND NAVAL AVIATION

THE NATURAL COMBINATION THE NAVY VOL. 72 NO. 4

By Dr Norman Friedman

Internationally leading strategist, military technological analyst, and naval historian, Dr Norman Friedman, examines the issue confronting Australia given the adoption of an amphibious warfare capability – that is the need for close air support for troops and how land based long range aircraft cannot provide it.

The Royal Australian Navy is building two large amphibious ships, the largest warships in its history, to take the Australian Army where it needs to go within the very large area for which Australia is responsible, or within which developments are a direct Australian concern. When those troops arrive, however, the navy is not being equipped to provide them with close air support beyond a few attack helicopters. In the recent past, that has not been a great problem, but only because Australian troops have generally been employed in peacekeeping, and hence have not faced determined opposition. It would be foolish to imagine that this happy situation will last indefinitely. No one in Canberra expects it to. That is why the Australian army has tanks and artillery, which it continues to modernise.

Probably since some time during World War II it has been obvious that troops need close air support in order to win, and often simply in order to survive enemy attack. For example, aircraft seem to be the only way to give them the reach to deal with enemy forces approaching to attack them. They may also be the main means of beating off an enemy's close air support. Even armies without much organic air power have understood the disadvantage under which they labour. For example, Mao refused to

enter the Korean War until Stalin promised him Soviet air support. Stalin then reneged, and to Mao this was one of his worst crimes – which, the Chinese have argued ever since, killed many thousands of their troops.

The U.S. Marine Corps, which is often seen as the appropriate model for the very mobile Australian Army, certainly takes close air support seriously. It regards its fixed-wing aircraft as its mobile long-range artillery, and on that basis it fiercely resists attempts to take them away. It takes these aircraft to its battles on board the same large-deck amphibious ships which carry its troops and the helicopters which take them to the fight. Like the Australian Army, the Marines have attack helicopters, but they do not regard them as nearly sufficient. For example, they cannot beat off enemy fixed-wing aircraft, and the Marines cannot deploy powerful enough air defence weapons to deal with enemy aircraft armed with stand-off weapons. It takes high-performance fixed-wing airplanes to do that. Hence the Marines' strong support of the STOVL version of the new Joint Strike Fighter, which is to be deployed on board the large-deck amphibious ships.

At present the Australian Army is promised close air support in the form of land-based aircraft of the Royal Australian Air Force. On paper, that

http://navyleague.org.au/wp-content/uploads/2012/06/The-Navy-Vol_72_No_4-Oct-2010.pdf

seems reasonable. Australia has invested in tanks and tanks which can extend the range of these aircraft to most of the region for which the country feels responsible. How is that different from aircraft deployed closer to the battle aboard ships?

Unfortunately the differences are deep and important. To a soldier, two things matter. One is how many airplanes can be maintained overhead, loaded with weapons – even if it is overhead, an airplane which has expended its weapons gives little comfort. Hence several are needed, present all the time. The other is how well the pilot can deliver those weapons. These may seem to be separate issues, but they turn out to be interrelated.

Modern air forces have learned to hit fixed pre-assigned targets. That task emphasizes the need for performance, to survive the air defences



An RAAF 'Classic Hornet' with two 2,000lb laser guided bombs and two long range fuel tanks taxiing out for a bombing sortie. Land based aircraft will always be far from the amphibious operation and waste time and fuel to transit to and fro. Added to this is the time to rearm and pilot rest. Having CAS assets much closer saves time, pilot fatigue and money, as well as a better capability outcome.

around the targets, and for avionics which allows aircraft to hit these pre-designated targets precisely. The pilot's task is mainly to defeat enemy defenders; actually hitting the target is relatively simple, particularly if he is using a GPS-guided bomb or missile. Those working out the target list decide what is most important, and what can be left to a later sortie.

Close air support is entirely different. The battle moves, and within the battle zone the importance of a particular moving target depends on what is happening – which may change very quickly. Only those fighting the battle, or commanding troops on the battlefield, have any idea of what is important to hit. It may also be quite difficult to distinguish friend from foe, particularly since many armies use such similar equipment. Attacks are inevitably mounted on a call-fire basis; they cannot be preplanned. It is also easy to make mistakes, which may waste the entire payload of a fighter-bomber.

It takes several hours for an airplane from a distant air base to reach the battle. Things happen fast, so there is little point in relying on distant airplanes answering urgent calls from the troops. Airplanes based far away must already be present if they are to contribute to the battle. Moreover, how many airplanes are orbiting within reach of the battle determines whether troops desperate for support can get it once one airplane has dropped its war load. Having only one airplane in place is a recipe for dead troops. It is unfortunately easy for a pilot or ground controller to mistakenly assign an available airplane to the wrong target.

How many hours the battle is from home determines how many airplanes must simultaneously be in the air to maintain some given number over the battle. For example, imagine a battle a thousand nautical miles from a base, say two hours' flying time away. Imagine that being on station near or over the battle entails staying there for an hour. Each sortie takes

five hours (plus tanking time) – two to go out, one over the battle, and two back. That means five airplanes (actually more), always in the air, for each one orbiting over the battlefield. The essence of close air support is that the airplanes must deal with the unexpected, so a ground commander cannot know in advance just when the airplanes will be needed. Ideally they should be available twenty-four hours a day. Probably three or four should be over the battle area at any one time. Then distant close air support requires fifteen or twenty airplanes always in the air, every hour, every day during which a battle can occur. Realistic figures would be higher, because airplanes take time to take-off and to land, and also to be tanked in mid-air.

Alternatively, it takes twenty-four five- or six-hour sorties to provide just one airplane over the battlefield all the time. Airplanes and pilots cannot fly continuously; they wear out. A pilot probably cannot fly more than one lengthy sortie per day, and an airplane is probably good for two. These figures explain why simply maintaining four airplanes continuously over Afghanistan, to provide close air support as needed, has been a considerable strain on U.S. forces.

Tanking can extend the time an airplane launched a thousand miles away can stay in the battle area, and thus would seem to make it possible to provide the necessary support with a more economical air force. Unfortunately pilots tire. Close air support is exacting work, because it very often entails attacking enemy troops uncomfortably close to those being supported. It does not take too much inattention to make fatal mistakes. Again, Afghanistan provides a case in point. A few years ago two U.S. Air National Guard F-16s bombed Canadian troops carrying out a live-fire exercise, because their pilots did not realise exactly who they were overflying (they mistook firing in the exercise for enemy fire, which would have identified the enemy troops they were seeking). They had been told about the live-fire exercise at their morning briefing, but they had also flown for too many hours since then, and they had too much to keep track of. During the investigation it emerged that in order to fly long missions, pilots were typically given pills to keep them alert. Such pills also often reduce attention to detail.

The fundamental problem is that the paper figures which show how far an airplane can fly and how long it can be kept in the air are unintentionally misleading. The issue is continuous air presence – including continuous pilot attentiveness – and how it can best be provided. It is always better for the airplanes to be as close to the action as possible. If they are close enough, they need not orbit continuously on station, because they can get to the action when they are urgently needed. Once they have attacked, they can go home for more weapons, and they can turn rapidly

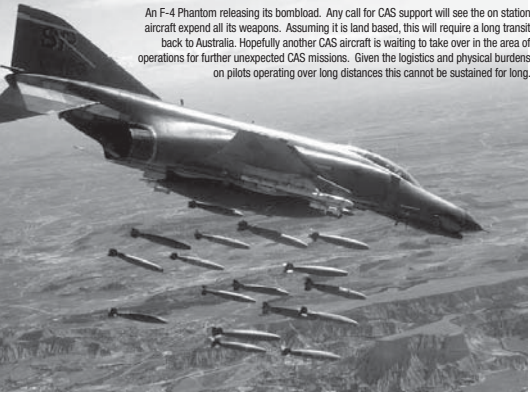


A USMC AH-1 Cobra attack helicopter lifting off from a USN LHD. Despite each USN LHD embarking four Cobra the Marines do not regard the attack helicopter as nearly sufficient for their expected CAS requirements once ashore. The Australian Army should take note. (USN)

An RAAF Super Hornet during an in-flight refuelling manoeuvre on its maiden delivery island hoping flight across the Pacific to Australia. Tanking fighter aircraft has more to do with extending strike operations and not CAS for at all situations over a battlefield. (RAAF)



An F-4 Phantom releasing its bombload. Any call for CAS support will see the on-station aircraft expend all its weapons. Assuming it is land based, this will require a long transit back to Australia. Hopefully another CAS aircraft is waiting to take over in the area of operations for further unexpected CAS missions. Given the logistics and physical burdens on pilots operating over long distances this cannot be sustained for long.



around to re-attack. Moreover, the closer the airplanes are, the less they are affected by local weather far from the battle. During the NATO war in Kosovo, the very large land-based NATO air arm was often grounded by weather a few hundred miles from a battle area where the air was quite clear.

It may also be argued that the new generation of extremely small guided weapons somehow solves the load-out problem, because if a fighter can carry enough weapons, they will suffice for its orbiting time over the battlefield. It is certainly true that smaller weapons can be dropped closer to friendly troops, hence are more usable, but it seems unlikely that a few hundred-pound bombs have the effect of one of two thousand-pounders or missiles on armored vehicles. No one has solved the load-out problem.

Land-based air forces cannot solve the air base problem, because modern airplanes need considerable support, not to mention long runways. Thus it is difficult or impossible to quickly set up a viable air base near a battle zone (the problem is reduced somewhat for STOVL airplanes like the Harrier, but even then it is hardly eliminated). At one time all it took to host fighter-bombers for several days was a clear grass strip, which could be created in hours, and some talented mechanics. The best way to provide a lot of close air support was to fly in some fighter-bombers, truck in their gasoline and bombs, and set up a temporary base before hopping somewhere else. That has not been the case for decades, since jet aircraft took over from their piston-engined predecessors. Air forces around the world have long argued that extended aircraft range and tanking solve the problem. Unfortunately, they

hardly theoretical, but they are often overlooked. Experience has shown that distant land-based aircraft generally cannot be relied upon to respond to emergencies. Too much can happen between base and battle, and conditions at the base may preclude urgent action. Moreover, the airplane which relieves those already on the scene is not back at the base, it is already in the air, and it cannot get to the battle any more quickly, because it is already moving as fast as it can. Close-air support is a very good definition of a series of emergencies. Troops die if air support is not there when it is needed. In war after war, armies without air support have fared poorly or worse. Airplanes really do expend all their weapons in attacks, and not all attacks succeed.

These considerations apply to a wide variety of situations. For example, in 1943 in the North Atlantic long-range land-based patrol aircraft provided convoys with much-needed support – with a naval equivalent of close-air support, if you like. It was impossible to provide a convoy with more than one such airplane continuously in support, and given available numbers and long distances it had to stay in place for four or eight hours at a time before it could be relieved on station. The numbers are different from what they would be in a current army example, but the factors are the same: the convoy had to make do with whatever that one airplane brought with it, and its weapons had to suffice for the four or eight hours. At the time, the German U-boats might attack submerged, but they had to run on the surface to get into position; they were far too slow when submerged. The job of the airplane was to make the surface too unhealthy for the U-boats, in effect neutralising them. To do that the airplane had depth bombs and rockets.

On this occasion, the airplane spotted a wolf pack preparing to attack the convoy. It did what it was supposed to do, attacking them. Unfortunately it used up its weapons without sinking any U-boats. That happens; attacks do not always work as expected. More unfortunately, no more airplanes could possibly arrive for eight hours. The relief for this airplane was already in the air, but it could

not fly any faster. The pilot understood that when the U-boats surfaced, he conducted dummy attacks, as though he still had weapons. At first the U-boat commanders did not realise what was happening, so they submerged to avoid being hit. Unfortunately it did not take long for them to understand that the airplane was now unarmed. The pilot and crew watched the wolf pack attack the convoy, with terrible results.

The only solution to the problem would have been a base for anti-submarine aircraft so close to the convoy that airplanes could quickly replenish their weapons to reattack. That materialised in the form of the escort carrier, which proved extremely effective (escort carriers were often used for another kind of anti-submarine warfare, due to changing conditions, but that is beside the point). Land-based maritime patrol aircraft continued to be valuable, but more to intercept submarines discovered by other means (code-breaking, for example, during World War II, and SOSUS during the Cold War) than for direct support of convoys. In effect the long-range aircraft switched from the close air support mission to the sort of preplanned strike mission that air forces generally prefer. Ocean surveillance made that sort of operation well worth while, just as other kinds of surveillance are needed to support preplanned strikes against land targets.

Both the historical record and the basic logic of the situation, then, suggest that it is the grossest folly to imagine that a limited number of long-range land-based fighter-bombers are an adequate substitute for a small number of fighter-bombers near the scene of an operation. Advocates of land-based air power reject any such suggestion, but they have neither historical experience nor analysis on their side. Matters are particularly bad for a country like Australia, whose force of fighter-bombers is very limited in numbers because each airplane is so expensive. In the past, Australian defence policy has emphasized the direct defence of the country. Given limited numbers, it is clearly impossible to station aircraft all around the periphery of the country, even all around the area which might be subject to attack. The solution was to build unoccupied airfields, moving the finite fighter force to whichever one was in range of the threat. That policy carries with it real problems, but it was certainly a way to compromise between aircraft numbers and geography. With the demise of long-range bombers in South Asia, it is no longer so obvious that the air threat is the important one, so the peripheral defence strategy may no longer make much sense. The need to project Australian power into the region remains. Unfortunately, the scattered-base policy cannot make up for the problem of distance, which demands such large numbers of land-based aircraft to support even one operation at long range. Does it

really make sense to pay so much to transport a first-class army without providing that army with real air cover?



Two F-35 JSF in flight. The STOVL version of the JSF offers many logistics and training synergies with the RAAF's land based version and would enable future Australian CAS requirement from the LHDs to be met. Further, these synergies and added operational flexibility would save the ADF many millions of dollars in added operational costs to get the land based JSF to the battle. It should also be noted that the fused, integrated and linked sensor package in one JSF far outweighs the reconnaissance and surveillance capability of many of Army's fleet of Tiger armed reconnaissance helicopters. Thus negating the need for them on the LHDs and freeing space for JSF employment. (USAF)

The Tawara class LHD USS PELELIU. Four AV-8B Harrier II can be seen parked at the stern of the flight deck with numerous helicopters. The USMC doggedly defends their CAS capability as experience has shown that it provides superior at call fire support for the troops disembarked from the LHD. This should speak volumes to the ADF as the USMC are the recognised experts on amphibious warfare from LHD platforms. (USN)



USS IWO JIMA in fog. Land based aircraft are susceptible to fog whereas ship based aircraft are not, as the ship can steam out of it. This was one of the lessons of NATO's Kosovo campaign. (USN)



Not opinions expressed in this article are the author's, and should not necessarily be attributed to the U.S. Navy, the U.S. Defense Department, or any other entity with which he has been associated.

F-35Bs Crawl, Walk, Run to Transformation 27 Jun 2014 Marc V. Schanz "The F-35B strike fighter is a "transformational" capability, on par with how the MV-22 tiltrotor platform revolutionized expeditionary operations, Lt. Gen. Kenneth Glueck, head of Marine Corps Combat Development Command, told reporters on Thursday. But some of its capabilities will take years to perfect, he said. "I would say we are in the crawl stage on that," said Glueck when asked about the maturity of data links and systems to disseminate the jet's electronics and command and control capabilities. The F-35B is "transformational because of what it does," he said. "It is a battlefield integrator," and when its systems mature, it will be able to deliver information about the overall picture of a conflict down to marines and troops on the ground [and RAN ships/LHDs], he said. The F-35B will eventually replace three aircraft across the Marine Corps: the F/A-18, EA-6B, and AV-8B, said Glueck. "It will be a disruptive technology in the beginning," he said. "It's going to take a while to realize what we need on the ground to take full advantage of all the capabilities," he added." <http://www.airforcemag.com/DRArchive/Pages/2014/June%202014/June%2027%202014/F-35Bs-Crawl,-Walk,-Run-to-Transformation.aspx>



<http://resources0.news.com.au/images/2014/05/14/1226917/779864-5353bdec-db34-11e3-917f-8bca2ad8cf46.jpg>

Sunrise... HMAS Canberra being put through its paces in Jervis Bay, NSW. Picture: Paul Newman — Early 2014

Jump jets for Australia?

<http://www.lowyinterpreter.org/post/2014/05/02/f35-Jump-jets-for-Australia-aircraft-carrier.aspx>

02 May 2014 Sam Roggeveen



It has just been pointed out to me that in his press conference of 23 April announcing the decision to buy 58 Joint Strike Fighters (JSFs) for the Royal Australian Air Force, Prime Minister Abbott made a tantalising reference to future additional purchases of the JSF. If it means what I think it means, it could be highly significant. I'm sure readers will let me know if anyone else has picked up on this quote*, but as far as I can see, no one has. Here it is, with my emphasis:

We are certainly retaining the option to purchase an additional squadron — a further 18 Joint Strike Fighters and we haven't decided precisely what type it might be — that will be something that will be looked at in the context of the coming Defence white paper.

Why is the reference to 'type' significant? The F-35 Joint Strike Fighter comes in three versions: A, B and C. The A version is built for air forces, because it's designed to take off and land on normal runways. The C version is built for the US Navy; it has a larger wing, a 'tailhook' and other associated gear so that it can take off and land on US aircraft carriers with short runways.

Then there's the B version, the 'jump jet' which is built for the US Marine Corps, UK Royal Navy, and the Italian Navy. It is also designed to take off and land on carriers, but not the carriers used by the US Navy. America's super carriers use 'catapults' to fling fighters off the bow of the ship at high speed. Landing is also at high speed, with a 'tailhook' at the back of the plane catching on an arresting wire, which slows the plane down as soon as it lands.

But the Marines, Royal Navy and Italian Navy don't operate that type of carrier. They have smaller ships with no catapults or arresting wires, meaning fighters need to be able to take-off without the help of a catapult and land vertically, because there is no arresting gear to slow them down.

So when Mr Abbott talks about the 'type' of F-35 we might buy in future, he can't be talking about the C version; only the US Navy needs them. He can only be suggesting that his government is examining the possibility of buying the F-35B jump jet, which presumably we would operate off the Royal Australian Navy's new 'flat tops', the *Canberra* and *Adelaide*.

These two ships can be equipped to operate fast jets; Spain flies Harrier jump jets off its almost-identical flat-tops, and both *Canberra* and *Adelaide* will have a 'ski jump' to assist take-off of such jets. Nevertheless, it would represent a substantial policy change. The ADF has always said that the *Canberra* and *Adelaide* would operate helicopters only, that the ski jumps were being left on just because it would cost more to remove them, and that Australia had no intention of buying the F-35B.

Judging by Mr Abbott's comments, we will learn more once the White Paper is published. But in the meantime, it looks as if the Australian Government is considering re-entering the aircraft carrier club, of which we have not been a member since HMAS *Melbourne* was retired in 1982. That would be a big strategic shift which will reverberate throughout the region.

* Looks like The Australian's Greg Sheridan got there first. Thanks to reader Iain for the tip:

One final note on Abbott. In announcing the purchase all up of 72 Joint Strike Fighters, the Prime Minister indicated he was sympathetic to buying more and that there would be a close look at what variant of the JSF an extra squadron might be.

No one has picked this up, but what Abbott was talking about was the possibility of buying short take-off and vertical landing JSFs, which could be placed on the navy's big LHD ships to transform them in effect into aircraft carriers. Abbott is planning an Australian Defence Force that has much greater power projection capabilities. This will make us a more valuable ally to the US.

Johnston raises possibility of acquiring F-35Bs 19 May 2014 australianaviation.com.au
<http://australianaviation.com.au/2014/05/johnston-raises-possibility-of-acquiring-f-35bs/>

“Defence Minister Senator David Johnston has again raised the possibility of Australia acquiring a number of Lockheed Martin F-35B short take off & vertical landing (STOVL) versions of the Joint Strike Fighter for operation from the RAN’s new Canberra class LHD vessels.

Speaking to The Weekend West on May 17, Senator Johnston said the acquisition of the F-35B was “an option which has been considered from day one.” His comments echo those he made to an ASPI dinner in October 2012 where he described the LHDs as “...STOVL capable.”

Defence officials have consistently tried to pour cold water on the possibility of Australia buying F-35Bs over the years, despite its commonality with the conventional takeoff F-35A version of which the RAAF is acquiring 72 examples.

The Canberra class LHDs are being built optimised for amphibious operations using water craft and helicopters, and do not have sufficient fuel and weapons bunkering to operate F-35Bs without a considerable upgrade in the RAN’s support ship fleet. Further, & while the possibility of cross-decking with F-35Bs of the USMC, the UK and other partner nations exists and will likely be encouraged, the LHDs do not have the thermion heat-resistant deck coating required to accommodate the F-35B’s exhaust for extended operations.

The F-35A and B models share about 60 per cent of their structure and a much higher percentage of their key systems and have similar handling characteristics in conventional flight regimes, meaning the logistics and initial training requirements would be broadly similar. But the F-35B is projected to cost about 20 per cent more than the F-35A, will be operationally limited to 7.5g [7g] and has about 30 per cent less range due to the need to accommodate the large lift fan, and will require a specialist flight training regime for deck operations and specialist maintenance training for under-way sustainment and support.”

White Paper to consider F-35Bs for LHDs – report 23 May 2014

australianaviation.com.au <http://australianaviation.com.au/2014/05/white-paper-to-consider-f-35bs-for-lhds-report/>

“Prime Minister Tony Abbott has instructed the authors of the new Defence White Paper currently in preparation to consider the acquisition of the STOVL F-35B variant of the F-35 Joint Strike Fighter to operate from the Navy’s forthcoming LHD amphibious ships. “It is understood Mr Abbott has instructed planners working on his defence white paper to examine the possibility of putting a squadron of 12 of the short takeoff and vertical landing version of the JSFs — the F-35B — on to the ships,” a report in The Australian newspaper on Friday says.

A spokesperson for the Prime Minister contacted by the newspaper did not confirm or deny the suggestion the F-35B would be considered as part of the White Paper process, only noting that the White Paper’s Force Structure Review would: “examine a range of capabilities & will provide the government with options to ensure Australia maintains a sustainable, versatile and highly capable defence force in coming decades”.

However, on April 23 when Prime Minister Abbott announced the decision to acquire a further 58 F-35As for the RAAF to take the total buy to 72, he made passing reference to the fact that the F-35 variant slated to be acquired for a final batch of up to 28 jets (to replace the Super Hornet) some time next decade had not yet been determined.

“We are certainly retaining the option to purchase an additional squadron – a further 18 Joint Strike Fighters and we haven’t decided precisely what type it might be – that will be something that will be looked at in the context of the coming Defence White Paper,” the PM said. While at the time RAAF officials explained to Australian Aviation that the figure of 18 aircraft was a slip of the tongue and should have been 28 jets, but the comment about “what type it might be” went largely unnoticed at the time.

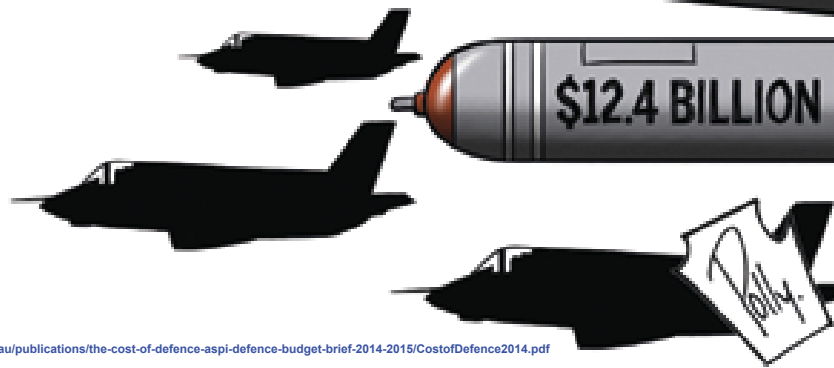
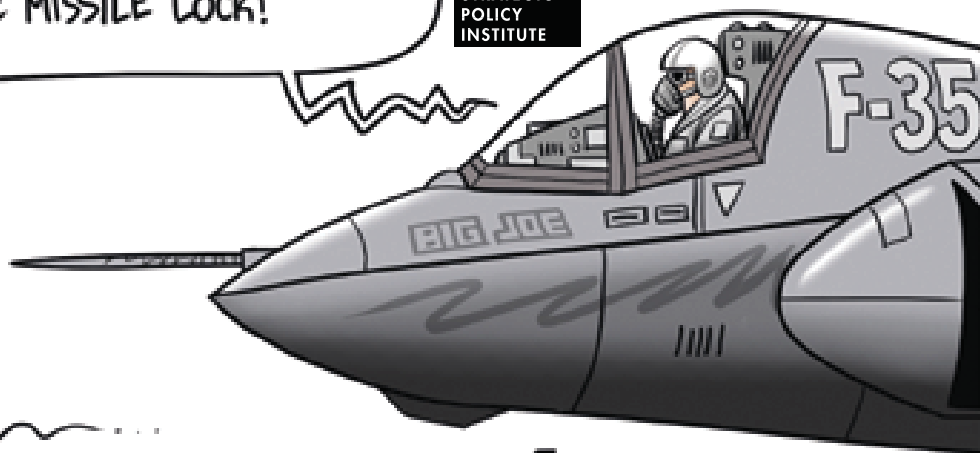
But the question of F-35Bs being acquired for the ADF was subsequently flagged by Defence Minister David Johnston in an interview with The Weekend West on May 17, where he said the acquisition of the F-35B was “an option which has been considered from day one.”

“...No doubt the situation will become obvious in the development of the 2015 Defence White Paper. When it does, we should expect to see two things. First, the size of the force will grow. An extra battalion or two to crew the new LHD amphibious vessels would help bring things into balance, **as would a squadron of jump jet variants of the F-35 to reinstate the fleet air arm aboard the LHD.**

The Cost of Defence | ASPI Defence Budget Brief 2014–2015

FLIGHT LIEUTENANT HOCKEY TO
SQUADRON LEADER ABBOTT....
WE HAVE MISSILE LOCK!

ASPI
AUSTRALIAN
STRATEGIC
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Such possibilities aren't to be discounted. Back in 2008 Andrew Davies and I modelled the sorts of defence forces we could have if we spent around 2% of GDP in the 2020s (see the ASPI paper Strategic Choices: Defending Australia in the 21st Century) and we were surprised by just how much capability could be afforded....” (page 141)

F-35B JSF for the ADF—a viable option in the 2015 White Paper? (Part 1)

Malcolm Davis 28 May 2014

- The Strategist - <http://www.aspistrategist.org.au> -

<http://www.aspistrategist.org.au/f-35b-jsf-for-the-adf-a-viable-option-in-the-2015-white-paper-part-1/>

Defence watchers have been surprised by recent suggestions emerging from the Abbott Government that Australia could consider acquiring the Lockheed-Martin F-35B Joint Strike Fighter to complement the 72 F-35A JSFs already ordered. What might initially have been attributed to Prime Minister Tony Abbott being a bit vague in his message about the type of aircraft being considered, has now been clarified by the Defence Minister David Johnston, re-inforcing that the 35B is under consideration, and in fact that the writing team for the 2015 Defence White Paper has been 'instructed' to examine the possibility of acquiring such aircraft.

The assumption in considering the short-take-off and vertical-landing (STOVL) version of the JSF is that they would operate from the Royal Australian Navy's two *Canberra* class LHD vessels, thus providing Navy with what many would see as a 'mini-aircraft carrier' capability for the first time since the disposal of HMAS *Melbourne* to China in the early 1980s.

The LHDs might look like small aircraft carriers, but they're certainly not designed to be such vessels. In fact, there are severe challenges in operating the F-35B on the *Canberra* class LHDs that would preclude them from becoming aircraft carriers—even small ones. Challenges of operating F-35Bs from the LHDs include a lack of fuel and weapons storage; unsuitable deck surfaces to sustain high-tempo air operations; an inability to maintain the aircraft aboard; and the small size of any air wing limiting its ability to make a decisive impact on operations. In addition, the deployment of the F-35B JSF onto those vessels would have to come at the expense of other capabilities.

It's possible to 'lilypad' the F-35B on the LHDs as part of a cross-decking operation with allies—in effect, land and take off with a quick refuel and re-arm. But that's not the same as sustained carrier operations of the sort the US Marine Corps currently undertake with the AV-8B Harrier II off their much larger *Wasp* class LHDs and *America* class LHAs. Add to those challenges the fact that the design of the F-35B, which incorporates a large and heavy vertical lift fan, makes it the slowest and least maneuverable of the three JSF variants, with the shortest range and smallest payload, and the problems with that choice begin to mount substantially.

So why should the Abbott Government send such strong signals about investing in the F-35B STOVL JSF, given the above challenges? Under the 2013 Defence White Paper, Principal Task One (the defence of Australia) and Principal Task Two (security and stability in the South Pacific and Timor Leste) of Australian defence strategy are seen to be force structure determinants, so choices on ADF Force Structure must make sense in achieving those goals.

The use of the F-35B to support ADF ground forces ashore undertaking stabilisation operations in fragile states within the South Pacific under Principal Task Two is one option but it's likely that helicopters operating from the LHDs would be more effective, and of greater utility. And none of the Pacific Island states have air forces that could contest the ADF's ability to gain and sustain control of the air to enable joint operations. The F-35B would probably be overkill for a Pacific Island operation.

It's the defence of Australia principal task, which includes ensuring control of Australia's air and maritime approaches that seems more relevant to any decision to purchase the F-35B. The 2013 Defence White Paper reinforced the importance of controlling Australia's sea and air approaches. That requires a 'credible force with effective capabilities for sea and air control and denial, strike and power projection', according to the white paper, and operational demands might require the ADF to operate well beyond the combat radius of the land-based F-35A JSF. In such a scenario, a Joint Task Force would be completely dependent on the naval surface combatant's area air defence capabilities to counter air and missile threats.

In considering acquiring the F-35B, the Joint Task Force would have an added layer of air defence, and the aircraft would provide options for the Joint Task Force Commander in terms of antiship and land-strike, as well as reconnaissance. In addition, such a capability could also support operations under Principal Tasks Three and Four as part of a coalition. But it's also important to frame any debate over whether the F-35B could be a viable option for the ADF in the future by realistically considering the operational environment in which the F-35B will undertake operations. Where are we going to use those aircraft, against whom, and under what circumstances?

[2] the type of aircraft being considered: <http://www.lowyinterpreter.org/post/2014/05/02/f35-Jump-jets-for-Australia-aircraft-carrier.aspx?COLLCC=546350233&>

[3] under consideration: <http://australianaviation.com.au/2014/05/johnston-raises-possibility-of-acquiring-f-35bs/> 'instructed' to examine the possibility: <http://australianaviation.com.au/2014/05/white-paper-to-consider-f-35bs-for-lhds-report/>

[5] at the expense of other capabilities: <http://www.lowyinterpreter.org/post/2014/05/21/Asia-Pacific-security-is-the-F-35B-relevant.aspx?COLLCC=794015484&>

[6] Official U.S. Navy: <https://www.flickr.com/photos/usnavy/8249001141>

30 May 2014 Malcolm Davis

F-35B JSF for the ADF—a viable option in the 2015 White Paper? (Part 2)

In my last post, I considered the operational and technical challenges of Australia acquiring F-35B STOVL Joint Strike Fighters and operating them from the *Canberra* class LHDs. In an ideal budget environment, were the decision to acquire the F-35B in the 2015 Defence White Paper to be made, the Abbott Government would also acquire two or three dedicated aviation support vessels to support them, and leave the LHDs purely for undertaking amphibious operations. But as the May 2014 budget has made clear, Australia doesn't live within an 'ideal budgetary environment' and it seems unlikely additional ships will be forthcoming. If Australia does acquire the F-35B, they'll have to operate from the LHDs (with all the technical and operational challenges that that would involve) or from forward land-bases as part of an expeditionary operation.

I also raised the issue of how the F-35B would be used in relation to the declared Principal Tasks in the 2013 Defence White Paper. In considering the actual implementation of the Principal Tasks, the question of where the ADF might operate, against which powers, and under what conditions is important. Strategy is practical—not theoretical—and Australia's maritime strategy has to have utility in the real world if it's to be credible. Despite the 2013 White Paper's rather rosy view of China's role in Asia, it's becoming clear that China's rapid military modernisation, its assertive behavior in the East and South China Sea, and the growing regional security dilemmas emerging in the form of regional military modernisation, will increase the risk of conflict in the future. In that future, the risk must be that Australia will be drawn into a regional conflict involving the United States and China.

In that scenario it's likely that US military forces would have access to Australian military facilities in the north and west. It also seems plausible that the ADF, working alongside US air and naval forces, would be required to respond to Chinese attempts to deny US forces a sanctuary in Australia from which to conduct operations against China. That could involve Chinese forces seeking to contest Australian air and sea approaches, and launch attacks on US forces operating from Australian facilities. Based on language in the 2013 White Paper, the ADF's response to such a challenge would be to '... deter attacks or coercion against Australia by demonstrating our capability to impose prohibitive costs on potential aggressors and deny them the ability to control our maritime approaches'. Furthermore, the ADF might also '... undertake operations against adversary's bases and forces in transit, as far from Australia as possible. ... using strike capabilities and the sustained projection of power by joint task forces, including amphibious operations in some circumstances'.

Quote from: F-35B JSF for the ADF—a viable option in the 2015 White Paper? (Part 1)

30 May 2014 Malcolm Davis

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In considering acquiring the F-35B, the Joint Task Force would have an added layer of air defence, and the aircraft would provide options for the Joint Task Force Commander in terms of anti-ship and land-strike, as well as reconnaissance. In addition, such a capability could also support operations under Principal Tasks Three & Four as part of a coalition. But it’s also important to frame any debate over whether the F-35B could be a viable option for the ADF in the future by realistically considering the operational environment in which the F-35B will undertake operations....”

<http://www.aspistrategist.org.au/f-35b-jsf-for-the-adf-a-viable-option-in-the-2015-white-paper-part-1/>

Does the F-35B STOVL JSF operating from Canberra class LHDs offer a viable capability in this scenario? The technical and operational challenges noted in my first post are real and can’t be ignored, and would need to be resolved for the F-35B/LHD combination to be effective. More broadly, a more serious risk is surface ship survivability in the face of growing antiship cruise missile threats from submarines and aircraft. The strategic geography of Asia makes anti-access warfare even more effective, especially for naval mines, missile-armed fast attack craft, and missile-armed submarines that the Chinese Navy is highly proficient with.

It’s in countering the advantages bestowed by strategic geography on an adversary practising anti-access operations where a small force of F-35Bs deployed on LHDs might play a significant role. The F-35 Joint Strike Fighter’s key advantages are purported to be stealth, integrated avionics and an ability to network with off-board sensors—all of which contribute to the pilot in the F-35 having an information advantage over an opponent, whether that opponent is in the air, on land or on the sea. If the F-35B is seen as a key node in an intelligence, surveillance and reconnaissance (ISR) network that contributes towards an expeditionary force gaining a knowledge advantage at the tactical level, then a force of F-35Bs on board LHDs will add to the joint task force survivability. Information gathered by the sensor systems can be exploited by the F-35B to attack detected targets, or the F-35B can act as a sensor in a ‘sensor to shooter’ link, with the ‘shooter’ being a naval vessel or a submarine. Furthermore, the F-35B can exploit austere bases on land—known as forward arming and refuelling points (FARPs)—to operate in support of naval task forces in archipelagic waters, thus easing operational challenges and risks for the LHDs.

Certainly, if the LHDs are to be sent forward, with the F-35B on board as part of an Australian effort to ensure air and sea control within our maritime approaches, they would need to be well protected by an accompanying naval task force. The risk is that much of the RAN’s existing operational strength could be absorbed by such a role, reducing its operational flexibility, or demanding greater investment in additional ships such as more AWDs. Suddenly, the 2% of GDP spending aspiration of the Abbott Government mightn’t be nearly enough, and so the fundamental challenge of matching strategic ends with national means becomes critical. Australia should begin its consideration of F-35B JSF for the LHDs fully aware of the potential follow-on costs.

In conclusion, there are risks associated with pursuing the F-35B STOVL Joint Strike Fighter for the ADF. The LHD/F-35B combination is certainly not a match made in heaven. Of the three variants, the F-35B is the least effective in terms of performance and payload, and the most expensive. Only a small number could be carried onboard the LHDs, and at the expense of other important capabilities. But an F-35B acquisition could offer the ADF a more flexible way to undertake the Principal Tasks, even in the face of growing threats from an adversary’s anti-access ability.

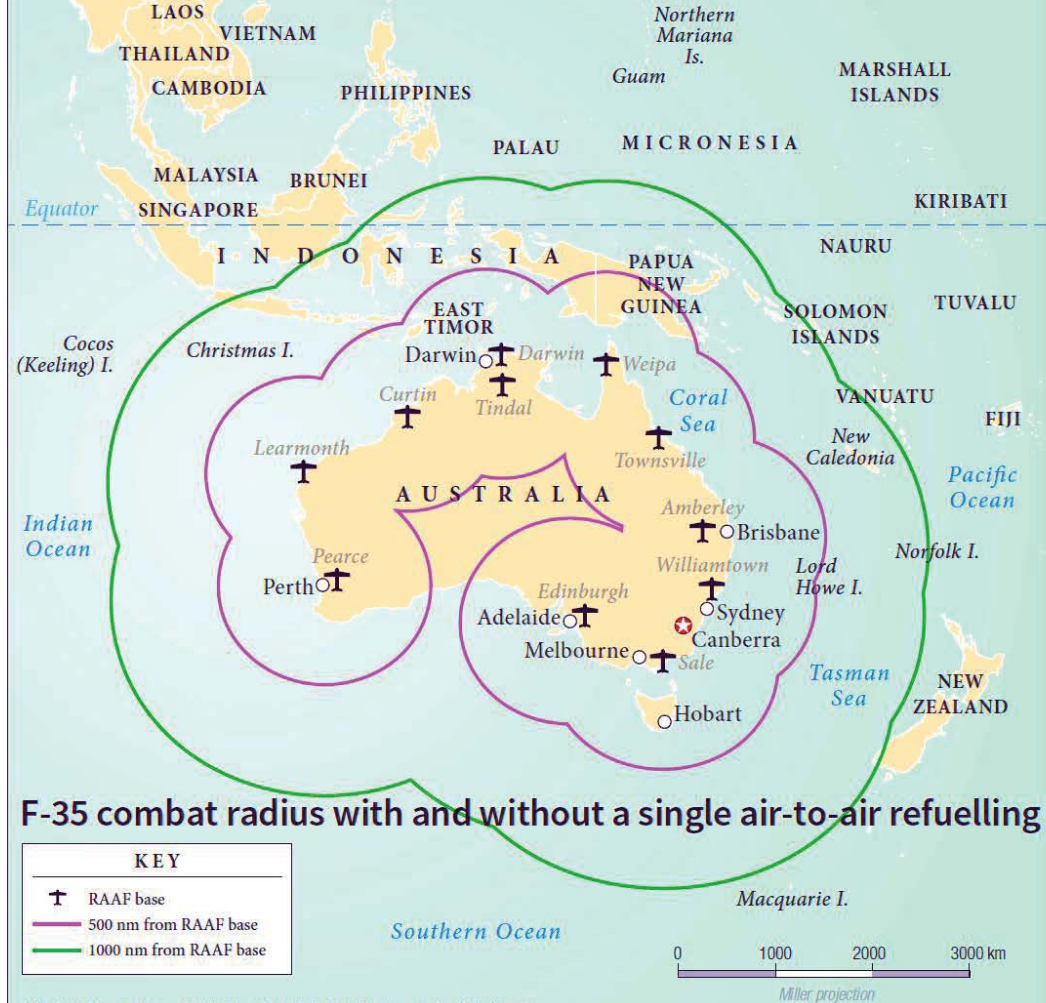
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<http://www.aspistrategist.org.au/f-35b-jsf-for-the-adf-a-viable-option-in-the-2015-white-paper-part-2/>

[2] post: <http://www.aspistrategist.org.au/f-35b-jsf-for-the-adf-a-viable-option-in-the-2015-white-paper-part-1/>

[3] Marines: https://www.flickr.com/photos/marine_corps/9622889940

The combined capabilities of aircraft and missile will represent a sophisticated strike capability against most maritime targets. So given an F-35 purchase, the next 15 years would see Australia's maritime strike capability progressively improve from good to excellent.



ASPI acknowledges that the map above includes territory that is disputed between countries. ASPI takes no position on these or other territorial disputes in the area covered by the map. The boundaries and names shown on this map do not imply official endorsement or acceptance by ASPI.

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Taking wing: time to decide on the F-35 Joint Strike Fighter
https://www.aspi.org.au/publications/taking-wing-time-to-decide-on-the-f-35-joint-strike-fighter/S170_F35_decision.pdf

“...it’s becoming clear that China’s rapid military modernisation, its assertive behavior in the East and South China Sea, and the growing regional security dilemmas emerging in the form of regional military modernisation, will increase the risk of conflict in the future. In that future, the risk must be that Australia will be drawn into a regional conflict involving the United States and China.

In that scenario it’s likely that US military forces would have access to Australian military facilities in the north and west. It also seems plausible that the ADF, working alongside US air and naval forces, would be required to respond to Chinese attempts to deny US forces a sanctuary in Australia from which to conduct operations against China. That could involve Chinese forces seeking to contest Australian air and sea approaches, and launch attacks on US forces operating from Australian facilities. Based on language in the 2013 White Paper, the ADF’s response to such a challenge would be to ‘...deter attacks or coercion against Australia by demonstrating our capability to impose prohibitive costs on potential aggressors and deny them the ability to control our maritime approaches’. Furthermore, the ADF might also ‘...undertake operations against adversary’s bases and forces in transit, as far from Australia as possible. ...using strike capabilities and the sustained projection of power by joint task forces, including amphibious operations in some circumstances’...

...It’s in countering the advantages bestowed by strategic geography on an adversary practising anti-access operations where a small force of F-35Bs deployed on LHDs might play a significant role. **The F-35 Joint Strike Fighter’s key advantages are purported to be stealth, integrated avionics and an ability to network with off-board sensors—all of which contribute to the pilot in the F-35 having an information advantage over an opponent, whether that opponent is in the air, on land or on the sea. If the F-35B is seen as a key node in an intelligence, surveillance and reconnaissance (ISR) network that contributes towards an expeditionary force gaining a knowledge advantage at the tactical level, then a force of F-35Bs on board LHDs will add to the joint task force survivability. Information gathered by the sensor systems can be exploited by the F-35B to attack detected targets, or the F-35B can act as a sensor in a ‘sensor to shooter’ link, with the ‘shooter’ being a naval vessel or a submarine. Furthermore, the F-35B can exploit austere bases on land—known as forward arming and refuelling points (FARPs)—to operate in support of naval task forces in archipelagic waters, thus easing operational challenges and risks for the LHDs....**

...Only a small number could be carried onboard the LHDs, [shades of FOUR A4Gs aboard HMAS Melbourne, 1969-72] and at the expense of other important capabilities. But an F-35B acquisition could offer the ADF a more flexible way to undertake the Principal Tasks, even in the face of growing threats from an adversary’s anti-access ability.”

"...The "JUAN CARLOS I" is a single hull ship made of steel with the superstructure on the starboard side. Her design is based on a combination of military and commercial standards and specifications; the structure, equipment and materials follow Lloyd's Register of Shipping's civil standards, whilst her combat system, ordnance handling and stowage systems, systems of supply at sea, flight deck and the damage control system follow military standards. The ship as being designed with four mission profiles:

AMPHIBIOUS SHIP: Capable of transporting a Marine Infantry Force to carry out landing , supporting operations on land.

FORCE PROJECTION SHIP: Transporting forces of any army to a theatre of operations.

AIRCRAFT CARRIER: A temporary platform for carrier-based naval aircraft, acting as a flight deck for strategic projection airborne vectors (Navy's Air Wing), capable of becoming a temporary platform to substitute the aircraft-carrier, "PRINCIPE DE ASTURIAS", when she is not available due to downtime (repairs, modifications, etc.).

HUMANITARIAN AID OPERATIONS SHIP: NON-WAR operations, humanitarian assistance, evacuation of the crisis areas, hospital ship in areas affected by natural disaster, etc.

...For its part, the runway has a 12° gradient or ski-jump afore to facilitate the takeoff of STOVL & to improve the loading capacity of fuel & weaponry....

...The flight deck has been designed to operate, launch, receive and provide support, both day and night, for planes and helicopters such as the third Squadron's AB-212, the fifth Squadron's SH-3D, and the ninth Squadron's AV-8B Harrier II Plus. As well as the aircraft in service with the Navy, the ship is able to receive the Army's CH-47 Chinook, Eurocopter Cougar and Tiger as well as the NH-90 when it enters into service with the Navy and with the Spanish Army.

In a significant qualitative leap, this ship is also designed to operate with the STOVL version of the JSF, the F-35B Lightning II, if the Spanish Navy decides to acquire this exceptional plane. A touchdown point has also been reserved astern of the flight deck that is specially adapted (in dimensions & resistance) for the special needs of the new V-22 Osprey tilt-rotor aircraft.

For the transfer of aircraft between the hangar and the flight deck, the Juan Carlos I has two elevators, each with a capacity of 25 tonnes and sufficient size to be able to carry up to the new F-35B Lightning II, or a helicopter the size of a Chinook. The capacity of the hangar is variable depending on the mission profile. This means an area of 1,000 m² would be available for an amphibious type profile. This surface area could be increased by a further 2,046 m², using the upper garage to have greater capacity for the aircraft. This means the hangar would reach 3,000 m² for an aircraft carrier type profile. The hangar itself, situated further astern, can house up to 12 medium-sized helicopters. In the case of the LHD operating as a temporary aircraft carrier, the vehicles and material would be substituted by between 10 and 12 STOVL planes, as well as the dozen helicopters previously mentioned. In order to provide support for airborne operations, it is estimated that the ship has sufficient fuel, spare parts and arms so that the embarked aircraft could carry out their operations without the ship needing replenishment for up to a maximum of 50 days.

The planned airborne capacity is for her to transport and operate up to 30 aircraft including medium-sized and heavy helicopters in amphibious operation profiles, or between 10 and 12 F-35B planes or AV-8B+, plus a similar number of medium-sized helicopters when acting with an aircraft carrier mission profile at times when the Principe de Asturias R-11 is not operational...."

Jump jets on navy's agenda as Tony Abbott orders air strike rethink

03 Jun 2014 David Wroe

<http://www.smh.com.au/federal-politics/political-news/jump-jets-on-navys-agenda-as-tony-abbott-orders-air-strike-rethink-20140603-39gl0.html>

"Prime Minister Tony Abbott's order to examine turning the navy's amphibious assault ships into aircraft carriers for jump jets will require a major rethink by Defence, top military brass have indicated. Facing a Senate hearing on Monday, Defence chiefs said little work had so far been done on the possibility of buying a short take-off & vertical landing variant of the Joint Strike Fighter - an idea that has seized the interest of the Prime Minister. Under questioning by Labor defence spokesman Stephen Conroy, defence chiefs confirmed for the first time that Mr Abbott had asked them to look at the merit of buying the F-35B jump jets under the forthcoming Defence White Paper & accompanying Force Structure Review. Under the proposal, they would be flown from the navy's 2 Landing Helicopter Dock amphibious assault ships, which are due to come into service over the next 12 to 18 months.

Chief of Air Force Air Marshal Geoff Brown said the force had not asked for the F-35B but added the idea should be examined along with all other credible options. "Like all things when you have a new White Paper, you should always examine all sorts of options ... It wasn't something the air force has particularly pushed," he said.

He said significant changes would be needed for the LHD ships to accommodate up to 12 of the fighters. "One of the big issues with having fixed-wing aeroplanes come back onto a ship is you've actually got to get them back in poor weather, so there would be new radars required on the ship as well as instrument landing systems, so there'd be some extensive modifications around that."

Chief of Navy, Vice-Admiral Ray Griggs, said further modifications to the ship would include making the deck heat resistant, and changes to fuel storage and fuel lines, weapons magazines and classified compartments for storage. "This has been a fairly superficial examination up until now because there hasn't been a serious consideration of this capability going into the ship."

Chief of the Defence Force, General David Hurley, said it was too early even to say how the F-35B would fit into the Australian Defence Force. Much work was needed to decide even how useful they would be, how much they would cost and what sacrifices would be needed to buy them. "I think we're in a situation where a new government has come in, there's a White Paper been evolving for a while... The Prime Minister has... a view about a capability he... thinks might be relevant to the ADF. He's asked us to look at that. "We have a process in place at the moment that will allow us to have a look at that and depending on where we come out on that process, we would then go into all those technical decisions about nature of ship and force structure implications for the ADF."

“...**CHAIR:** Who is next? Senator Conroy.

Senator CONROY: Regarding the new LHDs, a couple of weeks ago The Australian reported that the Prime Minister has, ‘Instructed planners working on his Defence white paper to examine the possibility of putting a squadron of 12 of the short take-off and vertical landing version of the JSFs—the F-35B—on to the ships.’ Are you familiar with that article, Vice Admiral Griggs?

Vice Adm. Griggs: I am.

Senator CONROY: Has the Navy been asked to provide any input to this possibility?

Vice Adm. Griggs: What is happening is that the whole issue of short or vertical take-off aircraft is being considered as part of the force structure review and the white paper process. We will participate

in that, as will Air Force. I welcome that.

Senator CONROY: Thanks for coming to the table. How much modification will be needed to modify the LHDs to launch, land and carry the JSF B variants? Air Marshal Brown might want to comment on—

Vice Adm. Griggs: No, he probably does not.

Air Marshal Brown: Depends on your answer.

Vice Adm. Griggs: There has been some work already done, and it was done during the 2008-09 force structure review white paper process, to understand what the implications would be. It largely revolves around ablative coating on the flight deck because of the heat generated from the F35-B. It relates to fuel storage and fuel lines. It relates to amendments or modifications we would have to make to magazines on the ships to take the weapons that support the F35-B, and there are other aspects like some of the classified compartments that we would need

to make sure existed to support the mission system for the F35-B. I think I have covered most of the issues. [At last some clarification]

Senator CONROY: You mentioned storage, planes equipment, fuel, munitions and support crew. Can you just outline what those changes would need to be? Where are we up to with the LHDs? Where are they being put together?

Vice Adm. Griggs: In Williamstown.

Senator CONROY: I thought so. I saw it on the weekend. I live in Williamstown, as you probably remember. What sort of changes in storage for the actual planes, or the equipment, fuel, munitions, and support crew would you need to make? Because for being put together they seem to be a fairly long way down the track right now.

Vice Adm. Griggs: The ship—

Senator CONROY: Yes.

Vice Adm. Griggs: Canberra will deliver some time in the third quarter of this year, probably around September.

Senator CONROY: It looked in pretty good shape.

Vice Adm. Griggs: So, it is not that far away. We have to, obviously, do some more work on this, because I would say this has been a fairly superficial examination up until now because there has not been a serious consideration of this capability going into the ship.

Senator CONROY: Air Marshal Brown, did you ask for this capability? Did the Air Force request this?

Air Marshal Brown: Like all things, when you have a new white paper you should always examine all sorts of options. It was not something that Air Force has particularly pushed. I would just like to add to Vice Admiral Griggs's modifications required to the ship. One of the big issues with having fixed wing aeroplanes come back onto a ship is you have actually got to get them back in poor weather. So, there would be new radars required on the ship as well as instrument landing systems. So, there will be some

extensive modifications around that.

Gen. Hurley: I think the start point of this, as Vice Admiral Griggs has pointed out, is there is the need—if we look at the phases we go through, there are needs and then requirements. We are starting at what are the requirements, that is, how do we adapt the ship and what does a ship that launches vertical take-off aircraft look like. There are two parts to the Prime Minister's request. One is to drive it back to see how would this fit into the force structure of the future, how would it meet the needs of the future and so forth, and then we would do the prioritisation, stack it up against other needs and so forth into the future—they come out of the white paper. Once you have gone through all that, if you were to say, 'Okay we need to have this type of capability and we are going to now go through what that would cost and then what the opportunity costs are', then we will go down and say, 'Okay, how would you modify a ship to put this capability in?' That would be part of that costing process. It is a number

of steps to actually get to that detailed questioning you are asking at the moment.

Senator CONROY: I appreciate that, General Hurley. I am simply going on a newspaper article that bobbed up and seeking to establish for the committee an understanding of what would be involved in making that sort of change right now. We are a fair way down getting the strike fighters, we are a fair way down of—last time I looked on the weekend, it was getting more impressively large and to suddenly throw a curveball in like this at relatively the last minute—I appreciate we do have things in the pipeline—it just seemed like an odd thing to do.

Mr Richardson: Could I just add—

Senator CONROY: Mr Richardson, join us.

Mr Richardson: It is a reasonable question about that option, and it is being examined in the context of the force structure review.

Senator CONROY: Are you able

to take this on notice? Air Marshal Brown indicated radars would be an extensive change. Vice Admiral Griggs described some. Are there any other changes to the structure of the ship? You mentioned the deck; obviously that makes sense.

Air Marshal Brown: I will just defer to the secretary, I think there is a lot.

Senator CONROY: Does the deck need to be reinforced or is it just a paint job?

Air Marshal Brown: There is a lot of—

Senator CONROY: A special paint, but an application.

Air Marshal Brown: There is a lot of work to be done conceptually before we get to that stage, so it would be a little speculative to just give you a list of modifications to the ship at this stage.

Vice Adm. Griggs: I think we have given you a sense of the sort of things that we have—

Senator CONROY: Would there be different personnel, training, aircraft

maintenance or pilots needed in the circumstance? I see you are nodding there. Is there anything that you can tell us on that?

Air Marshal Brown: I think it is early days as to how much. There certainly would be differences in training as to how much that would require. There would be issues that we would have to go through. There would be a different logistics system as well for that aeroplane so, again, a fair bit of work to go through.

Senator CONROY: It has been a long time since the Navy had a ship capable of launching aircraft. What sort of organisational changes would you need to make to carry that capability out today? Would they be operated by Navy pilots or Air Force pilots? Who would own them?

Gen. Hurley: I would own them.

Senator CONROY: That goes without saying that the CDF would own them. I am just interested if there was going to be a dogfight there, no pun intended.

Gen. Hurley: No, I am trying to

stop one. We need to go back to the processes that we have in place with the white paper force structure review and look at the place of a capability in this. Those types of questions that you are asking are long-term questions. For us to speculate whether we have a new fleet air arm that is bigger which now has fixed wing capabilities to strike off a carrier looking aeroplane, frankly it is just too early. We are not anywhere near that mode. Although they are interesting and intriguing questions and will keep our younger people very busy around the coffee table at the moment, they are pure speculation.

Senator CONROY: Our Prime Minister is tricky like that. You have got to watch him.

Gen. Hurley: It is pure speculation.

Senator CONROY: I am quoting the Prime Minister's leak to The Australian. I have not double-checked but I am willing to bet it said exclusively.

Gen. Hurley: I think we are in the situation where new governments

come in. There has been a white paper evolving for a while. We have had a platform that is about to come into the service which is essentially based around delivering an amphibious capability built around ship-to-shore, which is helicopter borne and the small boats from the well of the ship. The Prime Minister has a view about a capability that he thinks might be relevant to the ADF. He has asked us to look at that. We have a process in place at the moment that will allow us to have a look at that and, depending where we come out on that process, we would then go into all of those technical decisions about the nature of ship and force structure implications for the ADF. I do not want to touch it yet until I know whether I am going to have one.

Senator CONROY: Minister, you just cannot take your eye off that Prime Minister, can you? He is just full of good ideas.

Senator Johnston: I think you might concede the Prime Minister is interested in exploring options. He

wants a versatile, capable ADF and there is no harm in exploring with the experts what the options are. I think that is perfectly normal and natural and he should certainly not be criticised for it.

Senator CONROY: I was just saying that you have got to keep your eye on him every minute. He keeps jumping in there on you. Can I just clarify—and I appreciate the point you are making, General Hurley, that no-one has actually made a decision about it, but just for the purpose of the committee understanding what it would mean if you were to go down that path, without going into too much detail—the discussion relates to the fourth operational squadron of JSFs purchased in addition to the existing 72 which are already on order. When is the last of those 72 expected to be delivered to Australia?

Air Marshal Brown: We expect the last of the JSFs in that tranche in 2022.

Senator CONROY: When is the second LHD expected to enter

service?

Vice Adm. Griggs: 2016.

Senator CONROY: So if we were to choose to proceed with the purchase of any B-variant JSFs as a fourth operational squadron they would likely come into service well after both of the current LHDs enter service. Is that correct?

Gen. Hurley: That would be correct.

Senator CONROY: That would seem to be the case?

Senator Johnston: You would think so.

Senator CONROY: I was at Forgacs in Newcastle recently and I had the 1-3-8 rule explained to me. It was said that if something cost \$1 to build on the workshop floor at a facility like Forgacs that it would cost \$3 to build once these blocks have been combined and it would cost \$8 to do it once you are working inside the whole of a commissioned Navy vessel. Does that sound about right?

Vice Adm. Griggs: There is no doubt it costs more to modify them to design and to build, yes.

Senator IAN MACDONALD: I thought it was 1-2-5.

Senator CONROY: Maybe they are already gilding the lily on me. They are buttering me up in advance. With that in mind, does it seem like a sensible financial decision to make significant alterations to the LHDs once they are well into their operational lives within the Navy fleet?

Mr Richardson: We are not at that point.

Senator CONROY: But if you were to make that decision? They are in the water in 2016.

Mr Richardson: We are not at that point. The first step is part of the force structure review. Anything beyond that is speculative at this point.

Senator CONROY: This is just like two plus two equals four. If the ships are already in the water it costs more to adapt them to a new Air Force purchase if we make a new Air Force purchase.

Mr Richardson: Of course it does.

Senator CONROY: Depending on whether it is an Air Force or a Navy purchase in that sense?

Mr Richardson: Yes.

Senator CONROY: That is just maths?

Mr Richardson: That is right.

Senator CONROY: It is not about the high level. That is what you would be thinking about when you would be having a conversation in the Defence white paper?

Mr Richardson: Yes, that is right.

Senator CONROY: Would it make more sense to buy or build a purpose built light aircraft carrier to act as a platform for any future JSF B-variants? This is not just a backdoor way to sneak an aircraft carrier into the game, is it?

Senator IAN MACDONALD: That is certainly hypothetical.

Mr Richardson: It is.

Senator CONROY: I am saying that it is going to cost a lot more to make the changes. You would be the first vice admiral to have an aircraft

carrier on your watch for a while.

Mr Richardson: You are getting way ahead of where we are at.

Mr King: The ships are in service for 35 years. In the course of their life, requirements of them change and all the matters that have been raised like costs and amount of change, the national interest is considered in doing that. It is true that there is a different cost after you enter service, but if it is in the national interest and that is a cheaper way to get a capability—and I am referring to the general ship modifications—then that is what a country does, but it is a long way off such a decision.

Senator CONROY: How much do you think it would cost to modify the LHDs to accommodate the variant?

Mr Richardson: We are not prepared to speculate on anything like that in advance of having done the work.

Senator CONROY: The Prime Minister's office has put that into the public domain.

Mr Richardson: We are not prepared to speculate. The Prime Minister has not speculated on that.

Senator CONROY: I said that the Prime Minister's office has put that into the public domain.

Mr Richardson: I do not believe the Prime Minister's office speculated on costs. You are asking us to speculate on costs before we have done any work, and it would be inappropriate for us to do so.

Senator CONROY: I will ask you a technical question rather than a cost question. Would an LHD modified to operate as a launching platform for the JSF also be able to operate as an amphibious vessel as well?

Vice Adm. Griggs: Yes, but there are trade-offs that you would have to make.

Senator CONROY: Would it still be possible to load the same number of helicopters and landing craft that are planned for the existing LHDs?

Gen. Hurley: It is just impossible to answer that question because we do not know whether (a) we will have

the platform, (b) what modifications are actually required and (c) what would be the change to capabilities to the ship.

Senator CONROY: We do know a few things, though.

Gen. Hurley: To be very honest, we cannot answer questions of that nature. That is just asking us to do the impossible.

Senator IAN MACDONALD: The better question might be whether there are any other LHD type vessels around the world that have been built by Spain or anyone else that have a fixed wing aircraft take-off capability?

Vice Adm. Griggs: The LHD that we have?

Senator IAN MACDONALD: Yes. Is any other navy using it as an aircraft carrier?

Vice Adm. Griggs: The Spanish do.

Senator IAN MACDONALD: Do they?

Vice Adm. Griggs: They use it as part of the mix of their aircraft that

they have.

Senator IAN MACDONALD: What sort of aircraft do they run off?

Vice Adm. Griggs: AV-8B Harriers.

Senator IAN MACDONALD: The English jump jet?

Vice Adm. Griggs: The jump jet.

Senator IAN MACDONALD: Do they jump them off or do they fly them off?

Vice Adm. Griggs: They ramp them off the ramp.

Senator CONROY: Thank you, Senator MacDonald. With all due respect, General Hurley, there are some things that are fixed and, as Vice Admiral Griggs indicated, there are trade-offs so the question is: is it possible to load the same number of helicopters and landing craft if you have joint strike fighters on board? That is short of doubling the size which you cannot do because it is a fixed size—

Gen. Hurley: I do not know. No-one at the table knows and no-one at the table should be asked to

speculate on it. I do not know.

Senator IAN MACDONALD: That is purely hypothetical and not under the rules of estimates.

Senator CONROY: You are not actually chairing it, Senator MacDonald.

CHAIR: Can we have some order?

Gen. Hurley: I do not even know. It depends what sort of mix of helicopters. Do you want CH-47s and Tigers and MRH-90s? What does the mix look like? What are you going to substitute? What are you going to carry for a particular mission?

Senator CONROY: Perhaps you did not hear the end of my question. I talked about being planned, so you actually know what you have planned for the existing—

Gen. Hurley: We know what mixes are possible but we do not know what changes to the ship would be required; therefore, how would we know which helicopters we cannot carry and what impact that would have on the operation?

Senator CONROY: We can play a sillier game and say: could you squeeze some joint strike fighters in with all of the existing material that you have planned to be on them at the moment?

Gen. Hurley: I do not know because I do not know what is required to put a STOVL onto the LHD.

Senator CONROY: I am sure that Vice Admiral Griggs could help us. Could you squeeze a joint strike fighter—

Gen. Hurley: Vice Admiral Griggs will not answer the question. I will answer the question, Senator. You are asking us to speculate on something we have no idea about.

CHAIR: Senator Conroy, the witnesses have made it very clear several times that they are not prepared to speculate, and I think you should respect that....

...**Senator CONROY:** Are you looking forward to having a joint strike fighter plonked in the middle of it?

Lt Gen. Morrison: I think that all of the answers that you have been given from this side of the estimates table about joint strike fighters do not need any additions from me.

Senator CONROY: It sounds like it might get in the way of your group. It is not like you have asked for it. Air Marshal indicated they did not ask for it; Admiral Griggs has indicated that he has not asked for it and from the sound of it you have not asked for it. 'Abbott aims for aircraft carriers' is the headline. I am just trying to get an understanding of what is involved in that. Thank you for that. I am happy to pass over to someone else, Chair, if there is anyone else. I have more questions in this area but if someone else wanted to jump in; Senator MacDonald is always keen....

...**Senator EDWARDS:** Thank you for the clarification on those matters...."

<http://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A%22committees%2Festimates%2Fc5d61275-a1aa-4194-b861-cfe08f848ab3%2F0002%22>

“...A STOVL F-35B for Air Force?”

CAF [AM Geoff Brown RAAF] also revealed that Air Force is currently studying the potential operations of a short take off vertical landing (STOVL) F-35B from the decks of Navy's new Landing Helicopter Dock ships.

The Abbott government is reportedly interested in expanding the LHD role by the addition of combat jets and analysis is now being undertaken to determine what will be required. Air Force has previously (and repeatedly) said that the F-35B was not under consideration and that modelling showed the LHDs could be adequately protected by shore-based F-35As.

"Any idea is worth a look at, because the situation changes, circumstances change. STOVLs have their place, they are a more expensive aeroplane, they have a lot less range and they don't have the weapons capability," he noted.

"It depends on how you see the LHD. If you want to convert it to take STOVL, there are a lot of considerations that you have to take into account and JSF/STOVL by itself isn't a capability. It needs weapons and it needs fuel.

"And I think that if you go and look at the changes you have to put in place to operate STOVL off an LHD you will see that it's got its challenges. That's what we'll work through over the next few months is to articulate what those challenges are, what additional cost, if that's the way we decide we want to go."

'I hate the word game changer, but it just is'

As part of a series on the F-35, Leigh Watson talks to the US officer paving the aircraft's way into service

<http://www.defence.gov.au/Publications/NewsPapers/Raaf/editions/5808/5808.pdf>

SHARING ideas to introduce the F-35 into service is not limited to the F-35A model or to activities at Arizona's Luke Air Force Base, where the Australian aircraft is hosted, the officer in charge of aviation programs for the US Marine Corps (USMC) says.

LTGEN Jon Davis, the USMC's Deputy Commandant for Aviation, believes the difference in size between his corps and the much smaller RAAF should not stop the two from learning from each other.

"Scale is relative. We're both learning the same things," he said during a recent visit to Australia.

"The brains – what makes the aeroplane special – are all the same ... Our test pilots can go from an F-35A to F-35B to F-35C. It takes off and lands differently but we're employing it the very same way.

"I've just signed the paperwork to transition that F/A-18 exchange billet to an F-35B billet in Beaufort starting in 2017. So we'll have

Australians flying F-35Bs with the USMC in the near term."

LTGEN Davis said he appreciated the invitation from the previous and current CAFs to share ideas, especially since the USMC was working on many of the same things as the RAAF.

"We have a very tight and growing relationship in terms of learning from each other," he said.

The USMC is leading the world in introducing the F-35 and LTGEN Davis said he was happy to pass on any lessons learnt.

"We achieved initial operating capability for the F-35 in July last year and that squadron, VMFA 121, will move to Iwakuni, Japan ... We will have 16 F-35s in Iwakuni by July of 2017 as a permanent basing," he said.

"Each time we deploy the aeroplane we learn, and we share those things with the larger community," LTGEN Davis said.

After a year of operations, he had seen the force grow through

"top-down design and bottom-up innovation", which aligns with RAAF's Plan Jericho.

"The young officers are doing incredible things – things I never thought possible, with techniques, tactics and procedures to leverage the capability, systems and sensors in the aeroplane and working as a team," LTGEN Davis said.

"The young captains and majors are doing things they couldn't do in other aeroplanes, and they are doing it very well. Now we have a capability we've never had before, so it opens up opportunities to do more."

In charge of aviation programs for the USMC, including procurement, policy, training, personnel and equipment for about 1300 aircraft and 54,000 marines, LTGEN Davis has a job ahead of him in transitioning to the F-35B and F-35C.

"It's a challenge, but it's a good challenge. I'm proud and excited to be a part of this capability that's coming in. I hate the word game changer, but it just is," he said.

AIR FORCE May 19, 2016



US Marine Corps Deputy Commandant for Aviation LTGEN Jon Davis

Photo: SGT Pete Gammie



Williams Foundation Dinner

“The F-35 in ADF Service”

Chief of Air Force: Air Marshal Geoff Brown AO
Thursday 29 May 2014

In March this year I spoke at the Williams Foundation Seminar on combat operations in 2025 and beyond, and I actually said then that most of what we'd have in 2025 was in place. It's nice to be here at the end of May and say that it's now all in place. We will have a combat fleet of JSFs supplemented by Super Hornets. They will be well supported by systems like Wedgetail, Growler, KC-30, and air defence systems like Vigilance and over-the-horizon radar, and I even think the Maritime Patrol Fleets, P-8s and Tritons, will all contribute to the air combat system.

All of those capabilities will enhance not only the air combat force, but the whole ADF. Now, each system by itself is inherently a very capable system, but they were designed to be used as integrated systems, and they will fundamentally change how Air Force interacts with Navy and Army and our allies.

In the previous speech at the Williams Foundation I said that just having an F-35 doesn't confer an air combat capability on us. We need to employ it as a system of systems, and we need to develop the concepts and tactics on how to use it best. It's vital that we actually embrace that change.

Now, I'm going to illustrate a couple of stories where sometimes we've been a little slow to embrace the changes in technology in the Air Force - and I'd argue the Air Force is usually a pretty forward-thinking organisation. I can give you plenty of examples where we've been very innovative in our thinking. But I'll give a couple of examples of the dangers that we face with the F-35 coming in.

I had the great fortune to convert from the F/A-18 to the F-111 quite late in my career - I'd spent about ten years on the F/A-18 - and got to fly the F-111, which is a magnificent aeroplane, and it had gone through an upgrade program called the AUP. Fundamentally, that upgrade program had been sold as a maintainability issue so that we could actually keep the aircraft for longer. What it had actually done was replaced the analogue avionics with digital avionics. One of the first times I got to fly it was on an about 1,000 nautical mile mission, all at low level. The one thing that sort of surprised me was about every 70 to 80 miles we'd go over a feature, as a turn point - so as we went, we did about 12 turn points - and this seemed a little strange to me, given the modernisation that had occurred in the aeroplane. So I asked the team "Why did we put so many turn points in this mission?" And they explained to me, in all seriousness, that in the old jet that had an analogue inertial navigation system, if you didn't update it every 70 miles, the system would drift off. I said, "Well, what bit of two laser ring gyros and twin GPSs haven't we got hold of?"

Now, I should caveat that, I came to this aeroplane just after the AUP was completed and for a while we had a mixed fleet, when we really hadn't thought through the advantages of it.

The other one that really surprised me with the F-111 was that, after coming from the F/A-18 and having a head-up display and all these multifunction displays for the past ten years, I hopped in the F-111, where there were two multifunction displays courtesy of the upgrade program, and I thought "Wow, this is good." And the first time I flew it I looked at what

was actually displayed on the multifunction displays and thought, "Hmm, this isn't actually much good for a pilot." It was great for the navigator, 'because he had to interpret whatever hieroglyphics were on these multifunction displays.

And so I flew the aircraft for another couple of months and thought about it and thought, "Well, you know, this aircraft's actually got a digital backbone. Why can't we display the same things on the F-111 that we do on the Hornet?" And one of the great advantages of the Hornet was that it had a situational awareness display, so you could just actually look down and you could see your track and you could do everything like that. On the F-111 you had a rolling set of lats [latitudes] and longs [longitudes]. Well, guess what, in the analogue version they had a rolling set of lats and longs as well. And, luckily, we had a software development cell for the F-111, and the guys were quite competent, so I walked up one day with my little picture, out of my OCU notes, of a situational awareness display, and I hopped in front of the co-developer and said "Look, why can't I have one of these on the jet?" and he said "Well, you can." I said, "Well, why don't we have one?" "Well, nobody's ever asked us." And they basically said it was easy to achieve. It wasn't quite as easy as they said - it took us about six or seven months to actually do it. But I just put those two points out there to illustrate that we can often be constrained by previous mindsets.

Now, I hasten to add that we weren't totally Neanderthals in the F-111 world. We did a lot of great, great things. We did Pavé Tack reconnaissance ten years before it was invented by the United States Air Force, as non-traditional ISR. On the F/A-18, we had swing roll F/A-18s well before the USAF thought about it. But we were still constrained when we actually introduced that aeroplane.

It's been interesting with the Super Hornet. When we first introduced the Super Hornet with the AESA radar, we basically said to ourselves, "Well, it's a Hornet with a radar that detects things at three to four times the range."

We were really lucky that the USAF had given us some slots on the F-22 and, a further bit of amazing good fortune, that our personnel people actually posted the people back into Super Hornets after they'd flown the F-22. It doesn't always happen. The influence of those guys on the Super Hornet tactics very much changed the way that we use the aircraft and actually accelerated us quite a bit. I'd like to point to an interesting quote by Lieutenant Colonel Chip Berke, who was at the Williams Foundation Seminar. Chip is experienced in the F-22 and he's an experienced USMC F-35 driver, and the most interesting quote in the Williams Foundation to me was when he said "The F-35 doesn't replace anything. If you look at the F-35 as a replacement for the Hornet or the Super Hornet, you will undermine from day one the real capability of this aircraft. It does not replace anything. It is unique, it is revolutionary, it is in a world never before defined by tactical platforms. Legacy aircraft are tactical platforms that make tactical decisions and fly tactical missions that impact the overall strategic objective. I believe there is a requirement to view the F-35 as a platform that can operate across the spectrum from tactical to strategic or anywhere in between, as required."

I think Chip highlighted a really key opportunity, not only for the Royal Australian Air Force, but I think also for the whole Australian Defence Force. Can we transform the way we fight? It certainly increases the capability of legacy platforms and, if I was to quote Chip again, "the only thing better than four F-22s is four F-22s and four Hornets. Better for the Hornets and better for the Raptors."

So, if I was to paraphrase it in terms of where we'll be, what's better than four JSFs? It's four JSFs and four Super Hornets and maybe some Growlers and Wedgetail and our Air Warfare Destroyer. You know, as we go forward with the F-35, the things that we've got to be able to do is integrate seamlessly with capabilities like the Air Warfare Destroyer and also the Anzacs that have got the new AESA radar. I'm an absolute fan of the work that CEA has done on

those Anzac frigates. It's leading edge technology. I think the combination of the aircraft and the ships, will be absolutely critical for dealing with the sort of threats that we'll face. And there's enormous opportunities even in BMD if we can get that seamless integration.

So, on the 23rd of April the Government did make the decision for the additional 58 JSF aircraft, which takes us to 72. The first one rolls off the assembly line next month. What this means is that we actually don't have a lot of time to start thinking through these issues and doing the work that we need to do – to change the way we operate, change the way we train and change the way we actually support the Force. We've actually got to start from this moment on, to stop thinking about an individual F-35 program. We need to have a look at it as not only an integrated air combat system, but what it means for the ADF and, I'd argue, the Australian Defence Organisation.

What I'd like to do is just briefly work through the value chain of the F-35. I'll start in operations and I'll work my way towards fundamental inputs to capability, and we'll just have a bit of a look at some areas that we could change. I almost get a hoarse voice trying to explain to people why 5th generation capabilities are important in the F-35 and why speed and manoeuvrability don't necessarily have the same impact that they previously had. So what is 5th generation? It's low observability, it's a low infrared signature, it's low electronic emissions, it's an AESA radar, it's the data links associated with that, but the most important thing in my mind that the JSF brings is the fused picture – that situational awareness that it actually brings to the operator.

Now, we say those words - situational awareness - a lot, but not many people actually define what it means. So when I talk to the team about it, I draw three diagrams, and it describes what has happened, what is happening and what might happen. And your level of situational awareness is a combination of all those things. If you look at the difference between an F-35 and a legacy platform, you don't have to manipulate the sensors. You've got a fused picture on the display, you don't have to have as much communications between the flights; the pilot's fundamentally got a lot more brain space to actually look at the tactical situation and go forward.

One of the things that the critics of the F-35 don't get is, in all the studies of air combat, the amazing statistic is that 5% of the pilots have taken 95% of the kills. Now, when you do the analysis of those 95% of the kills and what makes the difference with those 5% of pilots, it was their superior situational awareness in all the situations that they faced that made the difference. And the F-35 gives you a massive leap in situational awareness, and that's the key factor in 5th generation capability. It's the integrated fused picture.

Now, we're already seeing some of that in the rest of the ADF. We're successfully fusing the picture between Wedgetail and the Navy. One of the great decisions we made with Wedgetail was that on each one of the crews there's a Navy Air Intercept Controller – I've got one Mission Commander who's a Navy Lieutenant Commander at the moment – and our recent experience on some exercises with the Super Hornet and Wedgetail have really shown the power of that integration.

Now, I have been thinking about the JSF. When we look at the tactical situation, the things you need to do are you need to be able to find, fix, track, target, engage and assess. That's the cycle. The JSF can do that all by itself, but it is far more powerful if you look at the find and fix and you use a lot of the systems we've got from Vigilante to JORN to SBIRS, to maybe even the Triton and P-8. They're all part of that find and fix. And if I was to look at track – Wedgetail, AWD, Growler are all parts of that. The engage – well, that's the job of Super Hornet, JSF and Growler, and maybe, if we really get far enough ahead, some integrated fire control with the Navy. That's all well within the realms of possibilities. The more nodes

you've got, the better off it is for the entire system. And that's what it increases the capability of the entire system.

We need to be able to share that situational awareness right across the network of the ADF, right down to the soldier on the ground. You know, it is the battlespace awareness that actually enables the most capabilities. The trick for us is to get the right information to the right person at the right time.

Let's just step back and have a look at the Air Operations Centre. That's actually core to the way Air Force does business. But I think, as we go forward, it's one of the areas that we need to change. In 1991 the Air Operations Centre was great for warfare where you could have a separate air campaign. By 2003, and having been right in the middle of it, it was a pretty clunky system. It's probably still a pretty clunky system. In 2003 the dynamic nature of the initial operations in Iraqi freedom meant that we were writing an air tasking order and on a daily basis we were changing 60 per cent of the tasking on the floor. If we continue with the same sort of construct on the AOC, with capabilities like JSF and the level of integration that we can get to, we're fundamentally not going to get the best capabilities that we can out of that jet or any of the other supporting systems.

But I think probably the biggest change that I've seen at the operational level – there's been a big change in the accuracy and flexibility of kinetic weapons – but the biggest change that I've seen in the last ten years is in ISR - intelligence, surveillance and reconnaissance. We don't even talk about it in terms of three separate words now – it's become like radar. It's ISR.

And I saw a fantastic example of that on a visit to Washington one day at Langley Air Force Base. I happened to be out there at their DGCS when the Libyan Operation was going on, and what's happened with intelligence is that it's actually been totally operationalised. It is there in real-time at the moment supporting the war fighter on the ground. So I was actually behind these three operators – they had three large screens in front of them – and there was a Reaper feed coming in. There was an armoured vehicle that the guys operating out of Creech couldn't identify as to what sort of vehicle it was and had problems declaring whether it was hostile or not. So, back in the intelligence section was a guy on the right hand side who was actually trawling through all the United States national databases to actually identify this vehicle in real time. That's the sort of capabilities that are there.

We've established some of that nascent capability at Edinburgh on a joint project down there – it's a pilot program - but let me tell you the level of integration that we've got at the moment. I call it swivel chair integration. In front of these guys are six separate systems. So, to actually get an answer, an intelligent answer, they've got to potentially data mine six separate systems. So, when you do the analysis on it, my analysts, highly trained analysts, spend 75 per cent of their time looking for the information and only 25 per cent of their time actually analysing it. The thing we've got to change there is we've actually got to reverse that. And we can do that. I think DSTO has done some great work in that particular area. The systems are there. We just need to work through the projects to get it.

The Defence enterprise itself has a lot of seams. Certainly, within the strategic agencies we've got to look at that. The technical and policy differences have really got to disappear if we're to truly get the value out of these 5th generation systems. The glue projects, like JP-2096, are fundamentally important to actually getting the best out of that aeroplane. We need to go from those six separate systems into an Intel cloud that we can actually pull the data through. The capability is out there. We just haven't driven ourselves towards it fast enough.

Preparedness was the other issue that I think we can make some real gains in with the JSF. The pilot has no longer got to be a sensor operator and a fuser in his head. What that means is the fighter pilot in a JSF will be much more capable much earlier than previously, because of the fused nature of the system. On average, I think most of the F/A-18 pilots around here



– it just fundamentally doesn't work and it's never worked because it just doesn't have the human dimension of design. The design that you put people in fundamentally affects the human psyche: it affects their spirit. Highly centralised organisations cannot produce the results that small teams do.

And just to give you another example of the change, I talked about the exercise that we'd recently done with the Super Hornets. We had a very high end exercise probably two or three months ago. The Super Hornets went up against an aggressor force, a very high end aggressor force, and the result was 210 victories to ten. Now, for all the older fighter pilots in the room, if we did better than seven to one we thought we were having a pretty good exercise.

Now, that is just the difference with changed tactics and an AESA radar. The JSF will be far superior to that. But how do we train? And here's the issue – an AESA radar on an aircraft actually means that in the live environment you have a lot of trouble challenging the aircraft. You know, simulation is absolutely key to getting the best out of these new capabilities. And a combination of live and virtual is where we need to go.

I think, from a whole of Defence Force point of view, simulation has got to get a much bigger focus than we've got at the moment. It just can't be on individual platforms. We've got to create an integrated simulation environment if we're truly going to move into those 5th generation capabilities.

And probably the other area as I move further back the value chain is in capability management. Now, I'll put a rider on before I say the next few words so I don't offend too many colleagues in the room. Defence is staffed by some of the most talented and committed people that you'll meet anywhere in the world, but we are really hamstrung by the organisational structures that we put those people in. And I think we've seen in some of the significant challenges we've had with the functional supporting silos, they aren't necessarily well aligned to our capability outputs. We've seen the manifestation of underinvestment in the infrastructure, and I really think the first-principles review of the Defence Organisation is an enormous opportunity for Defence if we take a different mindset into it. There are examples of some incredibly innovative acquisition organisations. Diggerworks I think is a great example of how we could and should do work.

We've got to fundamentally move away from an industrial acquisition process. It's way too slow to actually keep up with where we need to be in the future, and it will not keep up with the capabilities of JSF and Wedgetail and what we need to do in the future. We're hamstrung. It's like the frontline's got an iPad and the rest of us are working on an Apple II, because of our organisational construct.

I often talk to my COs and I talk about the difficulty of actually getting anything done in the Defence Organisation. And I use the example "It's like having a whole lot of corks in water in a bucket." And so what you've got to do is you've got to identify every stakeholder (cork) and then you've got to put your hand over all those corks and keep them down for the entire time that you want to do something. If one of them pops up, you're going to have to start again. And I think a lot of people in this room can actually understand that sort of description.

Probably a worse indictment for us is - if I don't want something to happen in Defence, my tactic is to send it on whatever process we've designed, because that is an absolute guarantee that it will not succeed.

Like I said, the first-principles review is an enormous opportunity. The threat here is the high priests of centralism. I'm not seeing it at the moment, and I'm very encouraged by Brendon [Sargeant], by a lot of the work that you're doing, but, in general, centralism has a stranglehold on management thinking, not only in Defence, but I'd argue in even big corporates as well. The best way to get something done is to form a small team. This whole idea, the litany that they come up with, of economies of scale – that they prevent duplication

– it just fundamentally doesn't work and it's never worked because it just doesn't have the human dimension of design. The design that you put people in fundamentally affects the human psyche: it affects their spirit. Highly centralised organisations cannot produce the results that small teams do.

That's probably enough preaching from the pulpit on that particular subject. But, we've already started a number of moves within Air Force to transform ourselves and be ready for this capability. We've fundamentally started to change the way we deliver combat support we've changed the way we deliver maintenance, and, importantly, we've started to look at a mid-term transformation plan which I'll call Jericho. Now, we've named it Jericho for a couple of reasons. There's the biblical reason, but more so, the appeal of the name for me was the Allied Operation by 464 Squadron into France, where they knocked down the walls of the prison, the Gestapo prison, for the French Resistance; breaking down walls was central to the success of Operation Jericho. Breaking down the walls and breaking down the stovepipes of Defence is central if we're actually going to realise the full capability of 5th generation capabilities.

I hasten to add here, it isn't a single service issue. We'll work very closely with Army and Navy on how we transform, because that superior situational awareness is not only for the guy in the cockpit of the F-35; it's for the combat team in the AWD or the Anzac frigate, and it should also be for the combat team on the ground.

Now, my appeal here, with such a big industrial base here, is that we actually need industry to help us in the development of this plan. There's a lot of great technology being developed out there and I think it's essential that we partner with the industrial players so that we can maximise the opportunities of that 5th generation air force. In lots of ways, who better to engage than the people that actually designed us a 5th generation system?

For industry, you need to consider how to work with us, not just on a platform basis and not just in terms of an RFT (request for tender); we need help with the intellectual horsepower of thinking through how we actually maximise those 5th generation capabilities. If we don't break down those stovepipes and walls that exist, I think we'll be fundamentally missing a great opportunity that we have with the new technology that we have presented before us. Right now, I feel as though I'm flying that digital F-111 and nobody's shown me exactly what we can achieve.

Thanks very much.



Fore Aircraft Elevator

With an elevation capacity of 27 tonnes and going from the Hangar to the Flight Deck

Ordnance Elevator

With an elevation capacity of 5 tonnes and going from Deck 5 to the Flight Deck

Sky-Jump

12' ramp for plane take-off

Fore Propellers
1,500 KWA fore transversal thrust propulsors

Bridge
Platform Control Room

Sperry Radar
Navigation radar

SAAS Aries Radar
Surface surveillance and helicopter control radar

Radar LANZA 3D + IFF

Radar for Aircraft Control

Flight Dispatcher

Room assigned for flight control operations

SAAS Aries Radar
Surface surveillance and helicopter control radar

Radar PAR

Aerial control radar for Helicopter approach

Solids Station

Station for supply at sea of solids using sliding eyebolt

Stern Aircraft Elevator

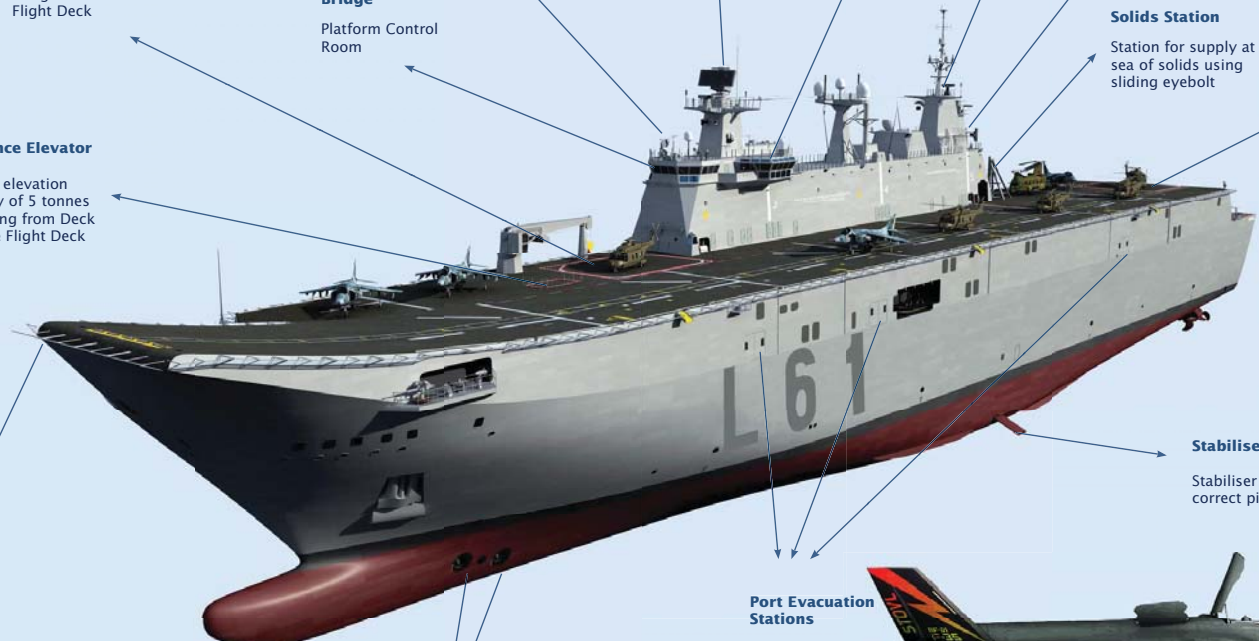
With an elevation capacity of 27 tonnes and going from the Hangar to the Flight Deck

Stabiliser Fins

Stabiliser fins to correct pitch and roll

Port Evacuation Stations

Automatic personnel evacuation stations each with capacity for 400 people



Flight Dispatcher

Room assigned for flight control operations

Hangar, Light Cargo Garage

Room used for transport of Aircraft and/or Light Vehicles (2,880 m²)

Sky-Jump

12' ramp for plane take-off

Emergency Flight Dispatcher

Airborne Operations Control Room in emergency situations

Accommodation Zone

Deck 2 used for berthing and mess areas for Crew and Embarked Forces

Stern Aircraft Elevator

With an elevation capacity of 27 tonnes going from the Hangar to the Flight Deck

Spaces for Stores and Machines

Decks 5 and 6 used for spaces for Machines, Refrigerated Spaces, Storerooms and Stores

Heavy Cargo Garage

Room used for the transport of Heavy Vehicles with a maximum of 65 tonnes (1,400 m²)

Ballast Tanks

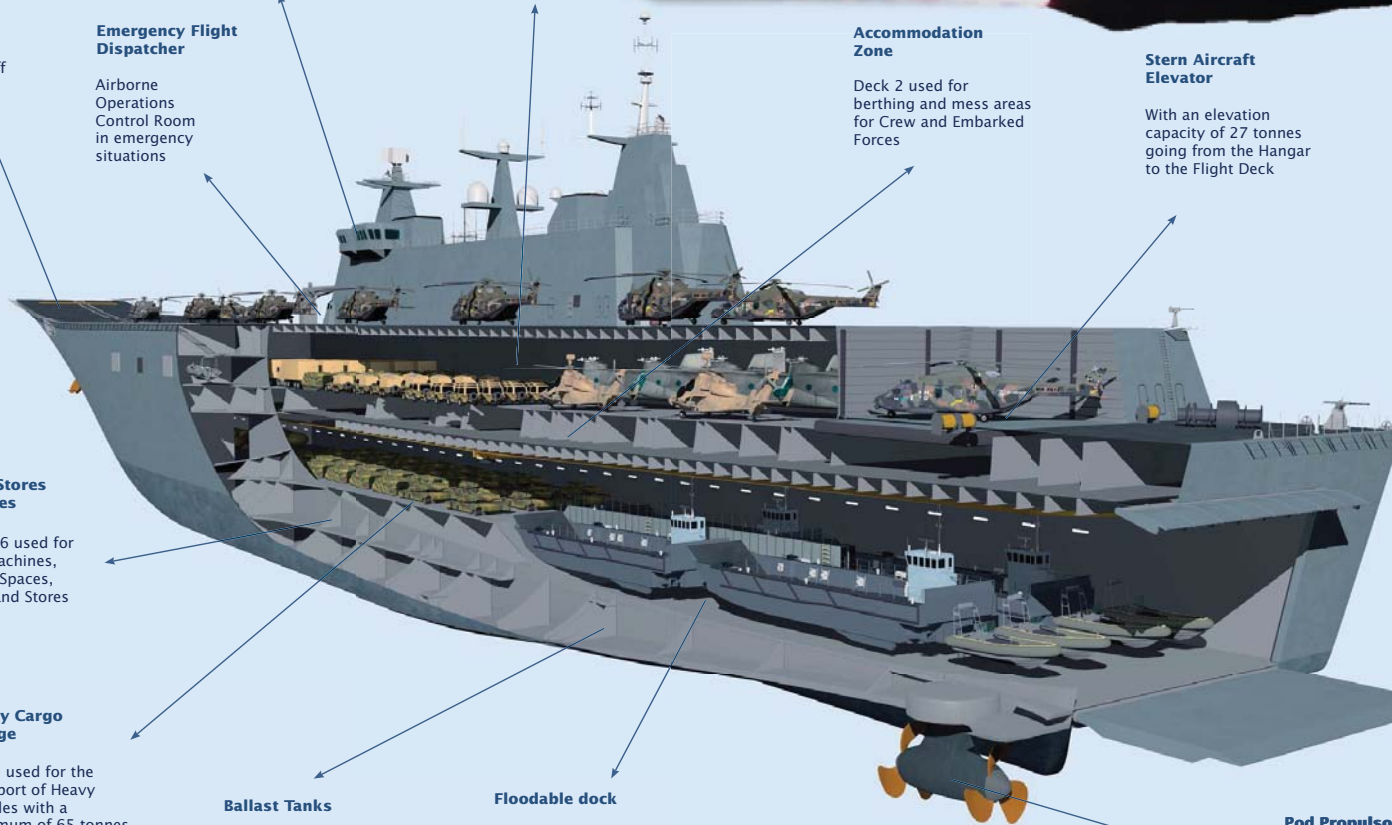
Tanks used for ballast to achieve the appropriate draught for flooding the Dock

Floodable dock

Space used for the transport and setting afloat of 4 LCM's and 4 SuperCats

Pod Propulsors

Azimuthal electrical propulsors with two Propellers each one directly connected with 11,000 KWA





This ship is the biggest warship ever built in Spain and is named after H.R.M. King Juan Carlos I by the Ministry of Defence Ministerial Order 600/16679/06. This is in keeping with the Spanish Navy's long tradition of naming one of its main ships after the reigning monarch, a tradition that has been in place since the House of Borbon came to the Spanish throne in 1700. The same honour was awarded to the following ships:

- The ship "Real Felipe", built in 1732 at the Guarnizo shipyards (Santander).
- The ship "Real Carlos", built in 1787 at the Havana shipyards.
- The ship "Fernando VII", launched in Ferrol in 1791.
- The ship "Isabel II", built in 1852 at La Carraca.
- The cruiser "Alfonso XII", built in Ferrol in 1892.
- The battleship "Alfonso XII", built in Ferrol in 1913.

Contractual and Construction Milestones



The process of obtaining the ship started in May 2002 when the Naval Chiefs of Staff drafted a document setting out the Navy's need for at least one multi-purpose ship that would contribute to the capacity for strategic deployment of Marine and Army Forces and would also constitute a platform that could enable carrier-based aircraft operations. The contract specifications were drawn up in 2003 containing a detailed definition of what the ship was to be like, and in March 2004 the Navy and Navantia signed the Execution Order.

The process started in January 2005 with the cutting of the first plate, and in July 2006 the first block was laid on slipway number three at Navantia's Shipyard in Ferrol. This ship was built using the most advanced modular naval shipbuilding techniques, preparing the ship in parts (blocks) that were subsequently assembled on the slipway. The ship was launched on 10 March 2008 at a ceremony presided over by H.R.M. the King and was christened by H.R.M. Queen Sofia. She remained berthed in dock 10 at Navantia for the remainder of the subsequent shipbuilding process. The sea trials were carried out in September 2009, and later in May and August 2010.

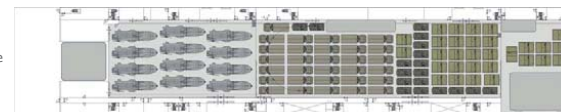
The ship was added to the Navy's Official List of Ships on 30 September 2010 with pennant number "L-61" at a ceremony presided over by H.R.M. King Juan Carlos I. It is integrated into Group Two of the Fleet Naval Action Force. Her base station is the Rota Naval Base. The addition of the LHD "Juan Carlos I" to the Navy means an enormous quantitative and qualitative leap as far as capacities are concerned.

The "JUAN CARLOS I" is a single hull ship made of steel with the superstructure on the starboard side. Her design is based on a combination of military and commercial standards and specifications; the structure, equipment and materials follow Lloyd's Register of Shipping's civil standards, whilst her combat system, ordnance handling and stowage systems, systems of supply at sea, flight deck and the damage control system follow military standards.

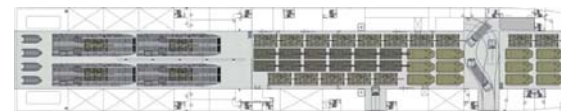
The ship as being designed with four mission profiles:

AMPHIBIOUS SHIP: Capable of transporting a Marine Infantry Force to carry out landing, supporting operations on land.

M.I. Force Landing transport scheme



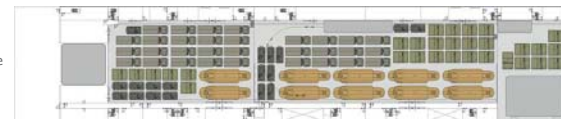
Hangar and upper garage



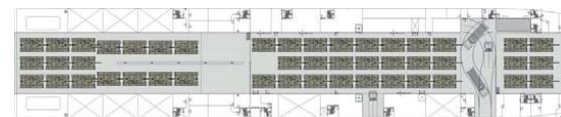
Dock and lower garage

FORCE PROJECTION SHIP: Transporting forces of any army to a theatre of operations.

Army Force landing transport scheme.



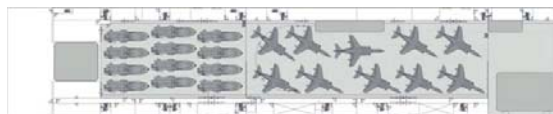
Hangar and upper garage



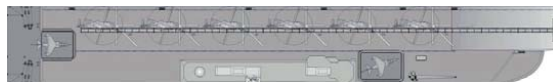
Dock and lower garage

AIRCRAFT CARRIER: A temporary platform for carrier-based naval aircraft, acting as a flight deck for strategic projection airborne vectors (Navy's Air Wing), capable of becoming a temporary platform to substitute the aircraft-carrier, "PRINCIPE DE ASTURIAS", when she is not available due to downtime (repairs, modifications, etc.).

Aircraft carrier scheme



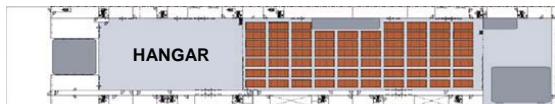
Hangar and upper garage



Flight deck with 6 NH-90 helicopters in simultaneous operations

HUMANITARIAN AID OPERATIONS SHIP: NON-WAR operations, humanitarian assistance, evacuation of crisis areas, hospital ship in areas affected by natural disaster, etc.

Humanitarian assistance container transport scheme



Hangar and upper garage



Dock and lower garage

Leading Dimensions and Characteristics

The "JUAN CARLOS I" is the biggest ship and displacement that the Spanish Navy has ever had. Her leading dimensions are:



- Length overall	231 metres
- Maximum beam	32 metres
- Draught at full load	7.1 metres
- Height	58 metres
- Flight deck height over water level	20 metres
- Maximum displacement	26,000 tonnes
- Maximum displacement in Amphibious Operation ..	30,000 tonnes
- Maximum speed	21 knots
- Range	9,000 miles at 15 knots
- Crew	261 persons

The "JUAN CARLOS I" is the Spanish Navy's first electrical propulsion ship with PODs. The POD propulsors consist of permanent magnet electrical motors mounted below the hull over a system that enables them to go in any direction. Each POD has two fixed pitch propellers. The "JUAN CARLOS I" PODs have been developed by the SCHOTTEL-SIEMENS consortium. Their maximum consumed power is 11 MW each, capable of providing the ship with maximum speeds of 21 knots.

The ship's electrical power is generated by two MAN 32/40 diesel engines capable of generating 7680 kW each, and a 19,750 kW General Electric LM-2500 gas turbine. The final electrical generation capacity is 34 MW, which would be sufficient to supply a town of 10,000 homes.

The entire propulsion system is supervised by the SICP (Integrated Platform Control System), made up of a network of automats and computers to provide monitoring and control of all the electrical and auxiliary plant, handling more than 50,000 signals in real-time.

It has two 1,500 kW manoeuvre propellers afore, which along with the PODs' azimuthal capacity provide the ship with excellent manoeuvrability.



Sensors, weapons and combat system

With the exception of the SPERRY navigation radar, the ship's radars have been designed and manufactured by INDRA:

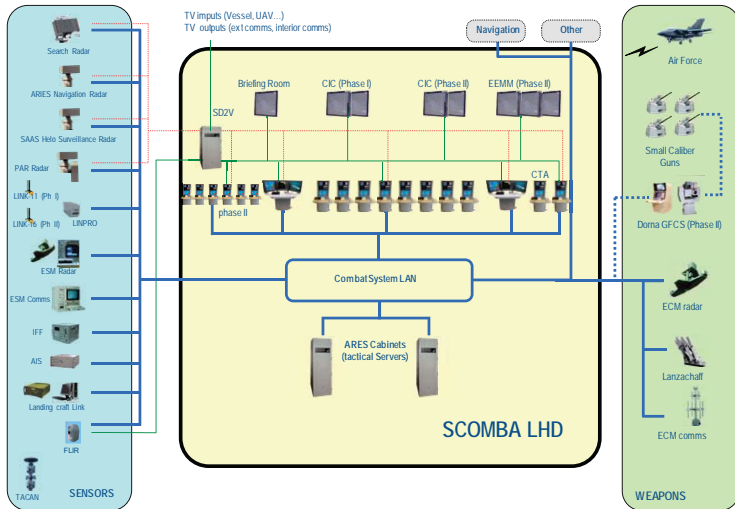
- LANZA-N three-dimensional radar: This is an aerial exploration radar with a maximum range of 180 miles and is the naval version of the radar used by the Spanish Army in its aerial surveillance radars.
- ARIES Radars: Set of two twin surface surveillance and helicopter control radars, one fore and the other aft of the superstructure.
- PAR (Precise Approach Radar): Approach radar used to control aircraft coming in to land on the flight deck and for control of air space.

REGULUS and RIGEL electronic warfare equipment, which are also domestic developments from INDRA.

Data from the sensors are processed in the SCOMBA combat system. The SCOMBA programme was developed by the Navantia Sistemas FABIA for new buildings of ships for the Spanish Navy; a common nucleus of combat systems was created with a capacity to be used in any type of ship, exploiting the information of their particular sensors. SCOMBA integrates the entirety of the ship's sensors and has a capacity to integrate easily any new sensor or weapon that is required in the future.

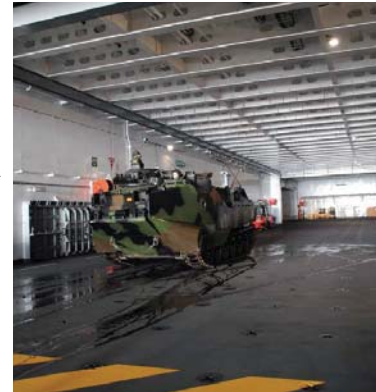


Amphibious Capacity and Force Projection



The total cargo and force projection capacity of the "JUAN CARLOS I" is comparable to that jointly provided by the "PRINCIPE DE ASTURIAS" and the two "GALICIA" Class LPDs. She has 5,445 m² of useful surface area for cargo, distributed on three decks:

- Garage for heavy loads, with 1,410 m² and a capacity to house 29 Leopard or similar battle tanks, AAV amphibious vehicles and practically any type of caterpillar track vehicle, as well as 16 tonne TEU cargo containers. Its length is 90 metres, with a width of 16 metres. On the starboard side there are two side ramps that enable the embarkation of vehicles and cargo from the dock.
- The dock, with a surface area of 1,165 m², is capable of stowing 17 Leopard type battle tanks, thirty two 16 tonnes TEU cargo containers or 4 LCM and 4 supercat vessels. It has a length of 69.3 metres and breadth 16.8 m. and can be flooded until reaching 3 metres of draught in its interior. It is divided into two dry dock or "beach" areas and can operate with LCM craft, AAV amphibious assault vehicles and LCAC hovercraft. There is a ramp astern which on opening communicates it with the exterior, and it has a capacity to operate as a Ro-Ro ramp.
- Light cargo garage (deck 1) of 1,880 m², with a capacity to house light vehicles (Lorries, Hummer, BMR or Mowag Piranha) or sixty seven 16 tonnes TEU cargo containers. It has a length of 92 metres and breadth of 20 metres, and has a fixed transfer ramp on the port side for vehicles to go to and from the heavy cargo garage.
- A 900 m² hangar on the same deck as the light load garage, with length 42 m. and breadth 20 m. It has a capacity to take 9 Harriers or 8 Chinooks.



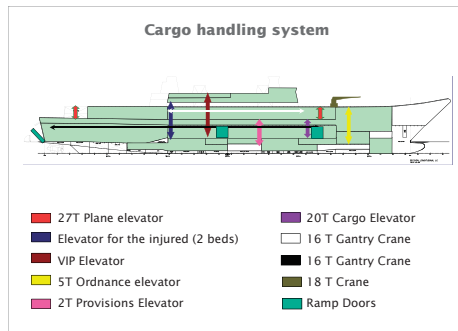
The ship has been conceived as a "protected unit" in the sense that her defence is charged specifically to other units that may be submarine, surface or airborne and is in all cases a "valuable unit" because of its nature and the cargo she carries on board. For this reason the weapons on board are limited to four 20 mm cannons that provide moderate close-in self defence. She has a reserve of space and weight so that self-defence weapons may be integrated in a later phase: MK-38 assemblies (automatic system with remote control from the CIC) for asymmetric defence and 2 SEA RAM assemblies for anti-missile defence.

On a Command and Control level, the ship should integrate all the domestic and NATO systems in a wide set of classified networks that confer the capability to act as command ship at brigade level in amphibious operations and even as the naval HQ HRF command ship.





There are elevators between the different cargo decks and gantry cranes on these same decks, which provide great flexibility in the movement of cargo, vehicles and aircraft. The main ones are two aircraft elevators, which communicate with the hangar and light cargo garage, and the vehicle elevator, which communicates with the two garages.



The LHD has a capacity to berth a total of 1,435 personnel, as per the following normal distribution:

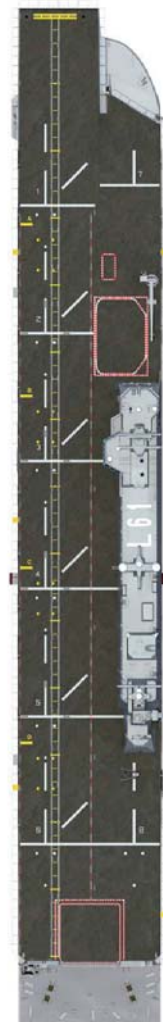
- Crew	254
- Embarked or transport forces	883
- Chiefs of Staff	103
- Embarked Air Wing Unit	172
- Naval Beach Group	23



Flight Deck Capacities

The need for a continuous flight deck was considered for its sizing, with the possibility of carrying out simultaneous flight operations with a least six medium-sized or 4 heavy helicopters. Assessment was also made of the space that would be needed for the hangar and the support and maintenance services of embarked aircraft.

The flight deck, with a maximum length of 202.9 metres and beam of 32 metres, goes from the prow to near the poop and has a design that brings to mind that of the other Spanish aircraft carrier, the *Príncipe de Asturias*. In the same way as this, the Spanish LHD has a kind of small jump to a lower level than the flight deck at the poop where part of the manoeuvring elements of an awning is found, as are various weapon systems for the ship's self-defence. The position of the two aircraft elevators are: one fore of the island superstructure on the starboard side and the other at the end of the flight deck. For its part, the runway has a 12' gradient or ski-jump afore to facilitate the takeoff of STOVL and to improve the loading capacity of fuel and weaponry. The design of this ramp is identical to that of the *Príncipe de Asturias*. On the runway it is possible to find up to 6 touchdown points for medium-sized helicopters (such as for example Sikorsky SH-3 Sea King, SH-60 Seahawk, or the more modern Eurocopter NH-90). As an alternative to the simultaneous operation on the flight deck of up to 6 medium-sized helicopters, up to 4 touchdown points are planned for heavy helicopters (such as the CH-47 Chinook or the CH-53 Super Stallion), which would also be able to operate simultaneously.





The flight deck has been designed to operate, launch, receive and provide support, both day and night, to planes and helicopters such as the third Squadron's AB-212, the fifth Squadron's SH-3D, and the ninth Squadron's AV-8B Harrier II Plus. As well as the aircraft in service with the Navy, the ship is able to receive the Army's CH-47 Chinook, Eurocopter Cougar and Tiger as well as the NH-90 when it enters into service with the Navy and with the Spanish Army. In a significant qualitative leap, this ship is also designed to operate with the STOVL version of the JSF, the F-35B Lightning II, if the Spanish Navy decides to acquire this exceptional plane. A touchdown point has also been reserved astern of the flight deck that is specially adapted (in dimensions and resistance) for the special needs of the new V-22 Osprey tilt-rotor aircraft.

For the transfer of aircraft between the hangar and the flight deck, the Juan Carlos I has two elevators, each with a capacity of 25 tonnes and sufficient size to be able to carry up to the new F-35B Lightning II, or a helicopter the size of a Chinook. The capacity of the hangar is variable depending on the mission profile. This means an area of 1,000 m² would be available for an amphibious type profile. This surface area could be increased by a further 2,046 m², using the upper garage to have greater capacity for the aircraft. This means the hangar would reach 3,000 m² for an aircraft carrier type profile. The hangar itself, situated further astern, can house up to 12 medium-sized helicopters. In the case of the LHD operating as a temporary aircraft carrier, the vehicles and material would be substituted by between 10 and 12 STOVL planes, as well as the dozen helicopters previously mentioned. In order to provide support for airborne operations, it is estimated that the ship has sufficient fuel, spare parts and arms so that the embarked aircraft could carry out their operations without the ship needing replenishment for up to a maximum of 50 days.

The planned airborne capacity is for her to transport and operate up to 30 aircraft including medium-sized and heavy helicopters in amphibious operation profiles, or between 10 and 12 F35B planes or AV-8B+, plus a similar number of medium-sized helicopters when acting with an aircraft carrier mission profile at times when the Príncipe de Asturias R-11 is not operational.

JCI as an 'aircraft carrier' detail



These missions cover the spectrum that goes from any type of humanitarian assistance through to the concept of the ship as a coordination centre for civil authorities in any type of disaster. To do so, she possesses a capacity to house the civilian population (up to 1000 additional personnel, housed on the cargo decks in a CIMIC town, with reverse osmosis drinking water plants that enable the supply of drinking water to a total of 5000 people, and with her electrical plant enabling the supply of energy to small urban areas).

The ship has a complete hospital with ROLE 2+ capacity in accordance with OTAN classification. There are two operating theatres (one of them with a capacity for trauma care), a critical patient unit, a 14 bed hospital ward, a 4 bed infectious area, laboratory, radiology facilities, dental surgery, pharmacy, a sterilisation room and an area for classification of the injured. One of her main characteristics is an enormous capacity to produce medicinal oxygen, being able to cover all the requirements of the ship herself as well as to supply other displaced medical units.

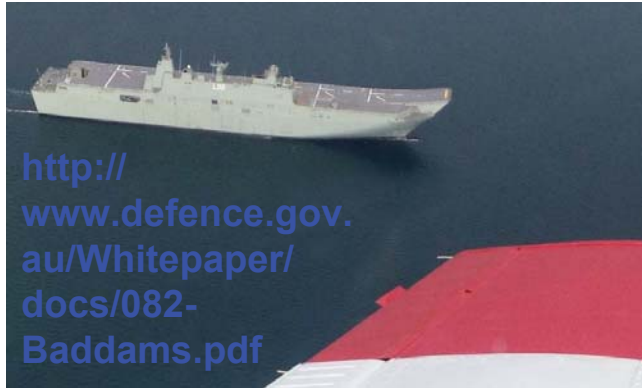
The telemedicine system enables the support of all medical specialties from a reference Central Hospital, including surgical intervention, it also will be possible to carry out remote monitoring of patients when necessary.



PROXIMITY MEANS CAPABILITY

Operating F-35Bs from the Canberra-class LHDs

By David Baddams
October 2014



EXECUTIVE SUMMARY

The submission argues that acquisition and operation of the F-35B aircraft from the Canberra-class Land Helicopter Docks (LHD) is affordable, feasible and desirable. Embarked air power would give the Government of Australia (GoA) and the Australian Defence Force (ADF) a significant and necessary increase in decisive air power to support deployed ADF forces and assist the prosecution of foreign policy objectives.

The submission describes the strategic and military considerations surrounding embarked air power. It addresses the technical and organisational issues involved and outlines a scenario where embarked air power would have a decisive impact in ADF operations.

Finally, it provides conclusions and recommendations for consideration by the Defence Review.

In the autumn of 2014 the Minister for Defence, Senator the Hon. David Johnston, advocated the purchase of F-35B aircraft for the ADF for embarked operations in the two LHDs. The Prime Minister, Hon. Tony Abbott MP, subsequently endorsed this concept. He stated these 28 aircraft could be the final tranche of F-35s for the ADF, of the long-projected fleet of 100 aircraft, and that significant examination and analysis of the F-35B/LHD concept be made in the Defence White Paper. The Opposition assistant defence spokesman, Hon. David Feeney MP, has maintained an active, well-noted and non-partisan interest in this matter.

Further, in a recent and notable speech at the Williams Foundation,¹ Air Marshal Geoff Brown, AO, launched Plan Jericho, with the principal aims of breaking down barriers within the ADF and industry, and developing all intellectual aspects needed to extract the full capabilities of the F-35. Integration of the F-35B with ADF amphibious task groups (ATG) is a logical and desirable aiming point for Plan Jericho and its ambitions to maximise the utility of 100 F-35s.

At the same time the Defence Issues Paper listed a number of pertinent questions and issues for the 2015 White Paper to address.

This submission endorses the view of the Minister and Prime Minister that the acquisition of 28 F-35Bs should be comprehensively examined and should form an integral part of answering questions posed in the Defence Issues Paper. In particular, it presents evidence that availability of embarked air power to the ADF and the GoA would provide an exponential increase in capability for force commanders and policy options for Cabinet.

Five sections follow. The first addresses strategic and military issues of embarked air power. The second examines technical aspects, the third how such a capability might be organised, and the fourth how this capability's effectiveness may be maximised. The fifth sets out conclusions and recommendations for the Strategic Defence Review.

¹ "Plan Jericho". September 27, 2014. Retrieved from <http://australianaviation.com.au/2014/05/raaf-plans-to-break-down-barriers-to-realising-f-35s-full-potential/>

Embarked Air Power and Amphibious Task Groups

ATGs have four primary capabilities, these being large scale assault, raiding, withdrawal and feint^{2,3}. Such operations routinely occur far from land air bases, and embarked air power has often been combined with amphibious operations;⁴

- Korea, 1950. Initially, with no significant airfields available, American, British and Australian⁵ embarked aircraft were the only assets available to support ground operations. They later enabled the flanking amphibious assault at Inchon,
- Aden, 1967. The British withdrew a Royal Marine Commando and a battalion of Paratroopers under fire from a remote land base, using a task force equipped with strike aircraft and helicopters,
- Belize, 1972. The British used embarked air power to deter a threatened invasion of Belize by Guatemala,
- Falklands, 1982. The campaign was wholly dependent on embarked air power, which allowed an amphibious task force to deploy ashore and defeat a well equipped and much larger defending force,
- Timor L' Este, 1999. An Australian-led coalition included American embarked air power providing a visible demonstration of overwhelming force, and
- Libya, 2012. Initial air operations were carried out by American⁶ and French embarked air power. Land-based air operations were impacted by the Maltese government's refusal of Host Nation Support to allow use of their much closer airfields.

Attributes of Embarked Air Power

² Hobbs ,D. (2010). Carrier borne close air support – a historical perspective. The Navy, Volume 72 No. 4, 11-15.

³ Feint can also be used to describe the capability of 'poise' – the location of a force equipped with embarked air power can be adjusted to exert the required diplomatic and political pressure on a situation at the time and place of the Government's choosing.

⁴ A number of UK operations are shown to underline the fact that successful embarked air power does not require USN-sized forces or very large nuclear aircraft carriers.

⁵ HMAS Sydney, flying Sea Furies, set a record for the number of fixed wing sorties mounted in a 24 hour period during operations in Korea.

⁶ The USN employed LHDs operating STOVL aircraft as well as a conventional aircraft carrier.

Embarked air power massively reduces the distance between base and target. Positioning aircraft closer to the task generates significantly more 'air' per aircraft. This can be elegantly summarised as Proximity Means Capability⁷.

Proximity to the task also allows timely and rapid delivery of intensive and reactive support to ground forces and other elements as the operational situation develops.

Sea-based forces can be moved around – up to hundreds of nautical miles per day - to address emerging operational needs wherever they arise. This ability to move around also denies adversaries knowledge of force operating locations, unlike land bases.

Significant political advantages accrue. Embarked air power can operate without the political uncertainties and geographical constraints of Host Nation Support (HNS) and without overflight clearance, giving national governments and air commanders immense freedom of action as situations develop⁸.

Finally, the potential of embarked air power to poise generates an exceptionally useful political tool. The arrival and presence of an ADF LHD with F-35Bs on deck would significantly increase the amount of diplomatic leverage at hand and policy options for the GoA.

Land-Based Air Power

Land-based air power delivers some military effect at very long ranges, as current Iraq operations show, but is not immune from the effects of distance and time. Due to the flying time expended in transit to and from the target, it delivers relatively limited effect per aircraft: the actual numbers of aircraft over or near the target area at any one time are a fraction of the total force in the air.

Such operations are also extraordinarily expensive to mount and maintain. The long transits to and from target areas, plus the supporting air-to-air refuelling aircraft consume enormous amounts of fuel as well as airframe hours. Crew fatigue considerations generate additional concerns.

⁷ It may be noted that while RAAF F/A-18Fs currently operate from the UAE, identical USN aircraft are based hundreds of miles closer on carriers located in the Northern Gulf.

⁸ Current issues with obtaining permission to use Turkish airfields to launch coalition air strikes on Syria and Iraq demonstrate this point.

The same issues would apply for supporting an ADF ATG. Sustaining 24-hour strike-fighter cover over a deployed force as close as Timor L'Este, would not be possible for current or projected ADF land-based air assets. The ADF fast jet fleet would need to be at least doubled before sustained 24-hour support could even be considered viable.

Similarly, attempting to use land-based air power to provide sustained air defence over an ATG at sea is not practicable, and provably so.⁹.

Finally, it should be noted that current air operations over Iraq and Syria are being prosecuted in conditions of total air supremacy, with no effective ground air defences and no opposing air forces. They are also being carried out with restricted communications with friendly ground forces¹⁰. It would be presumptuous to assert that this is a typical template for the ADF in the decades ahead.

Plan Jericho should realistically reflect the practical capability limits of long-range F-35 operations from land bases.

The Impact of STOVL

Almost 40 years after the UK and US pioneered and subsequently perfected the use of STOVL aircraft from ships it is still not widely understood by the ADF how disruptive a technology it is. Simply put, the use of STOVL allows ships of as little as 15,000 tonnes to deliver credible air power. The ADF LHDs, at 27,000 tonnes, are among the largest and most advanced STOVL-capable ships ever built. For all but the USA - and possibly China - future embarked air power will mean F-35Bs utilising STOVL-capable ships.

Future Threats

The capability of the LHDs suggests a Concept of Operations (CONOPS) including amphibious operations far from continental Australia. Threat scenarios for such operations must reflect the increasing air power being developed by Indian and Pacific oceans nations. Several allied and friendly regional powers are countering significant emerging threats with

⁹ The only known recent attempt to provide land based fleet air cover was the UK's use of RAF Phantoms for Fleet Air Defence in the late 1970s. This proved unworkable unless the fleet was within 100 miles of land and specified 'air raid' times were provided.

¹⁰ The current challenges with achieving the desired effect on ISIS operations in Northern Syria using solely long-range air power should be noted.

aviation ships of their own: India is building a potent capability, Japan has sign-posted interest in using its Izumo-class for F-35Bs, and South Korea is considering a similar use for its Dokdo-class.

In planning deployment of the LHDs the GoA must address how an ATG would protect itself against an adversary's sea or land-based air attack. Emerging threats to the High Value Assets (HVA) and personnel of an Australian ATG cannot be ignored.

Relying solely on Hobart-class destroyers (DDG) and Anzac-class frigates (FFH) with limited numbers of area/point missiles is not a satisfactory solution. The DDGs will provide a secondary layer of air defence and the FFHs a tertiary layer, but decades of experience have proved that attacking strike aircraft will invariably possess and use advantages of range and persistence over ship-based missile defences. An effective primary layer air defence solution exists in the F-35B.

Impact of Future Technology

The F-35 is a generational leap in lethality and survivability. Just as significantly, it offers a massive step forward in sensor capability and role as an information node. This capability would be closely integrated with the future AWACS and ISTAR assets to improve long-range threat awareness and tactical intelligence for an ATG. In particular, integration of embarked F-35B sensors with Wedgetail, Poseidon and the DDGs would provide essential and significant improvements in an ATG's air defence capability¹¹. This is a natural alignment with the aims of Plan Jericho.

Alliance Advantages

There is also potential for an ADF LHD to provide cross-decking and support for US Marine Corps and other allied F-35B operators during coalition operations. Similarly, ADF F-35Bs could use US or other allied ships. Cross-decking with STOVL aircraft is straight forward, and would offer realisable military and fiscal efficiencies and policy options for both the GoA and the relevant ally.

¹¹ The F-35B's supersonic capability allows it to launch from an 'alert' condition and engage air threats at long ranges. Its weapons systems allow instant reconfiguration between ground attack and air defence tasks, and the aircraft has dedicated weapons stations for AAM missiles such as AIM-9X

Utility of Embarked Air Power

This paper has explained some of the merits of embarked air power. It is stressed that it does not argue that embarked air power is a substitute for, or superior to, land-based air power in all circumstances.

Rather, it seeks to establish the fact that embarked air power has unique qualities that are ideally suited to the ADF and GoA.

It would also deliver air power that is more immediately usable. The UK's experience may be considered. Since the end of WWII the RAF has not destroyed - or even engaged - an aircraft in air-to-air combat. Every air-to-air kill has fallen to embarked fighters. This is not because embarked aircraft or pilots were better. The simple fact is that in nearly all the UK's post war operations, geography has meant that embarked strike-fighters were the first and closest to the battle. The GoA, ADF and their advisers need to consider this fact.



TECHNICAL ISSUES

Introduction

Operating combat aircraft from ships generates technical issues, most of which are associated with the limited space available on board. Many public discussions and responses from senior figures concerning possible F-35B operations from ADF LHDs highlight these issues as potentially serious obstacles – but they are being overstated, often startlingly so.

Ship/Aircraft Integration

Operating STOVL aircraft from ships is well understood by the USA, UK and other allies. The key issues are;

- The aircraft has to be able to take off and land from the ship with an effective payload, in all weathers, day and night,
- The ship must be able to sustain required flying rates and durations before replenishment,
- Ship and aircraft data systems must be integrated, including mission planning and post mission analysis systems,
- The aircraft has to physically fit on to and into the ship, along with its support systems, fuel, weapons and personnel,
- The ship must physically withstand operation of the aircraft – including weight, jet blast and noise, and
- The aircraft and the ship have to be electrically and electronically compatible – this is vital to the safe employment of modern weapons systems.

Why the F-35B can Operate From the LHD

The F-35B is designed to operate from USN LHDs, which are similar in overall layout and equipment to the Canberra-class¹². This requirement has driven the aircraft's design, as well as its concepts for both operation and support. The aircraft is electrically hardened, and has special provisions for minimising 'EEE' effects on ships

¹² The Joint Strike Fighter 'Joint Operational Requirements Document' (JORD) called for the STOVL aircraft to be 'operationally compatible with and supportable from' a USN Wasp-class LHD. This drove the aircraft's design, including key dimensions such as wingspan, length and height.

The F-35B is optimised to use ski jumps as fitted to the LHDs, and land on LHD-sized decks. These requirements have driven the design of advanced flight controls and propulsion systems. The ski jump provides massive advantages for F-35B operations, delivering significant improvements in launch weight - over a tonne - and safer launches, especially at night.

The LHD design already accommodates the F-35B. The original 'Juan Carlos' design was adjusted to accept F-35B, and included fuel and weapons stowages¹³. It is understood these key aviation spaces have been retained for the Canberra-class¹⁴. The LHD flight deck is slightly larger than that of the USN Wasp-class but the LHD hangars are much larger. The LHD elevators can accept the F-35B, and safely move them between deck and hangar.

In summary, any ship modifications to allow embarkation of F-35Bs could be carried out during a routine refit. Assertions to the contrary are not accurate.

The F-35B support system is also a good fit for the LHD. The logistics footprint, being the volume and weight of support equipment required to support an aircraft, was set out in the JSF JORD for each variant, and the footprint for the F-35B was the most compact and lightest of the three, due to compact and crowded USN LHD spaces.

Much publicity has been given to issues with deck heating from the F-35B's lift system. This has been the subject of close attention from the F-35 design and test teams, and there is a high level of understanding of the environmental effects. The main issue is potential effects on flight deck anti-friction coatings¹⁵. Meanwhile, the USN is making minor modifications to flight deck equipment to ensure that it fully resists jet blast. Experienced STOVL operators do not consider these to be significant issues.

The F-35B has the same exceptional sensor, communication and navigation suites as the F-35A, and will also use a new GPS landing system. A day/night bad-weather embarked capability will not require legacy electronic landing aids currently used by the US.

¹³ The US DoD supplied the Spanish ship design team with F-35B ship interface requirements

¹⁴ An ATG would always deploy with the support of tankers for underway replenishment.

¹⁵ The UK and the US have been testing improved flight deck coatings since 2005 – a new coating (Thermion) will be probably be used.

Those unfamiliar with generating air power at sea frequently assert that embarked operations are limited or constrained compared with those from a land base. This is not the case.

Concentrating aircraft with support personnel and equipment aboard a ship requires a different way of working, including extremely tight control of all aspects of aircraft operations including maintenance¹⁶, preparation for flight, aircraft movements on deck, launch and recovery. Unlike land-based operations, the clock is king. This generates a very high tempo of operations, and very high sortie rates. All elements required to generate 'air' are close together, not spread across the many square miles of a land base. Simply put, things have to get done faster onboard, they can be done faster, so they get done faster. The result is highly effective and efficient sortie generation¹⁷.

Time and again, relatively small units of embarked aircraft have consistently delivered and sustained numbers of available aircraft and sortie rates well beyond those associated with land-based operations. This is reflected in F-35 requirements, where required sortie rates for F-35B USMC LHD and UK CVF operations were the highest of all three variants.

Can a Mixed F-35 Fleet be Effectively Operated?

The F-35B has exceptionally high commonality with the F-35A, especially in areas that drive support costs. The mission systems suite - a key cost driver - is almost identical between the two variants, as are most of the vehicle systems, including the core of the main engine¹⁸.

The types are very similar in terms of operational capability, the main difference being that the F-35A can carry 2000-pound weapons internally against the F-35B's 1000-pound capability¹⁹. The F-35B can carry 2000-pound weapons externally if required.

¹⁶ While land-based aircraft are serviced on fixed calendar and flying hour based schedules, embarked aircraft use a totally different system of flexible servicing that is specifically designed to maximize aircraft availability over sustained periods.

¹⁷ The experience of the UK RN during the Falklands operation illustrates this. More recently, very high sortie rates were achieved by USMC AV-8B aircraft from LHDs in the Gulf and off Libya.

¹⁸ The commonality between F-35A and B in 2008 was: Mission systems - 95 to 100%, vehicle systems (flying controls, landing gear, etc) - 60%, and airframes 40%. For airframe and vehicle systems, another 30% of parts were built from common materials and parts.

¹⁹ Employment of 2000-pound class weapons is rare. Almost all sorties now use 500-pound class weapons, mainly to limit collateral damage.

The F-35A has a longer notional range than the F-35B, but proximity to target areas from an LHD not only closes that gap but renders it irrelevant. Also, for in-flight refuelling the F-35B is fitted with a probe/drogue system, rather than the F-35A's boom/receptacle system. Probe/drogue will allow faster refuelling of F-35B formations, as RAAF KC-30 tankers are fitted with two drogues against a single boom.

Aircrew training 'deltas' for an F-35B sub-fleet have been overstated. The F-35A and F-35B cockpits are essentially identical in layout and function. The up-and-away control characteristics of the two types are essentially identical, and the highly advanced flight controls of the F-35B will make launch and recovery on the ship far easier for the pilot to master than legacy STOVL aircraft. The training penalty for embarked F-35B operations will be far lower than that required for the first generation of STOVL aircraft.

In summary, operation and support of a mixed F-35A/B fleet is technically and operationally feasible.



WHAT EMBARKED AIR POWER OFFERS

This submission has demonstrated that an embarked F-35B capability would be politically and operationally advantageous and technically feasible. This section describes how such a capability might be employed to the ADF's advantage.

In a hypothetical example, the ADF could be called upon to operate in the littoral area to Australia's north. There are few airfields in this area capable of supporting combat aircraft operations. Without embarked air power, an air commander would have to base his aircraft north of mainland Australia. Such an operation might deliver two aircraft over the area of operations for 30 to 60 minutes a day. For the remaining 23 or so hours of the day the ATG - all its physical assets and personnel both ashore and afloat - would have no decisive strike capability and limited air defence. Airborne HVAs in the form of RAAF Wedgetails and Poseidons and Army's MRH-90 and Tiger helicopters would be extremely vulnerable.

Instead, the ADF would now reconfigure²⁰ one of its existing LHD air groups. Six or eight F-35Bs would be embarked in either of the two LHDs. The concept of Tailored Air Groups (TAG) - already adopted and developed for the LHDs - allows seamless 'flexing' of STOVL and rotary wing aircraft to meet the mission.²¹

The main tasks of the F-35Bs would be to provide intelligence to the ATG commander, directly support the troops ashore and provide air defence for afloat forces. Aircraft would operate in a 'swing' role²², being re-tasked in the air from air defence to strike to ISTAR missions as the situation demanded.

A unit of six aircraft unit could maintain two aircraft on task continuously, cycling on and off the deck in rotation, for around 14 days. With eight F-35Bs, four aircraft could be on task continuously during day operations, and two at night. Alternatively, aircraft at alert states could be launched and on task within fifteen minutes or less.

²⁰ Reconfiguration of the LHD to accept F-35s would be speeded using rapidly installed modular support containers to reconfigure the ship in under 24 hours

²¹ This is not a speculative opinion. The UK and the USMC have been tailoring their air groups in this way for some 20 years.

²² The 'swing role' concept was first demonstrated by UK STOVL aircraft operating from HMS Ark Royal over Kosovo. Sea Harrier aircraft were able to provide a combined air to air, ground attack and reconnaissance capability to air controllers and ground forces.

These aircraft could operate in fair weather and foul, day and night, restricted only by pilot availability, aircraft serviceability, and by fuel and ordnance stocks.²³ The F-35B embarked unit would require no more than 120 personnel to support it.

The capabilities set out above are achievable and low risk. They are precisely what has been regularly achieved with embarked STOVL aircraft on active deployments for over 30 years.

This scenario is not fanciful, and the comparisons shown here are provable. Deployed ATGs will require effective and sustained air power. Plan Jericho should be adjusted to accommodate this fact.



²³ Boast, M. (2010). The challenges of an organic fixed wing capability for Australia's LHDs. The Navy, Volume 72 No. 4, 27-31.

Generating an embarked air power capability would possibly prompt sensitive inter-service issues. It is stressed that re-establishment of RAN-owned fixed wing aviation is not necessary or practicable. A unique, lean and joint solution can deliver the high tempo operations required for effective embarked aviation. This would involve ships' crews and F-35 units, RAAF and RAN command staffs and core joint ADF staffs.

In developing concepts for command and control of embarked F-35Bs, the ADF must focus on operational delivery instead of petty issues of asset ownership, administrative differences or single-service tribalism. A possible solution could use the RAAF air combat group as ultimate proprietor of the F-35B force, with common training and support policies and facilities up to the point of sending aircraft to sea. F-35B units would be optimised for embarkation, formed with joint air force and naval personnel, but would be available for land based operations if required²⁴.

Up to the point of embarking for a ship-based period of operation, the units would remain under air command's command and control. At the point of embarkation, command and control could 'chop' to sea command. Responsibility for safe operation of the aircraft would also 'chop over' at the same time.²⁵

The issue of differing views of embarked air power has to be addressed: proponents of independent land-based air power are generally disinclined to support embarked air power. There are many reasons for this, but it is sufficient for the purposes of this submission to acknowledge the fact.

Therefore, the GoA might consider establishing an independent expert advisory panel to provide unbiased and experienced advice to ADF staff, public servants and politicians. Such a panel would provide invaluable perspectives on 'subject matter' knowledge²⁶. Australia is fortunate in that it has a strong pool of experienced practitioners of both land-based air and embarked STOVL operations to fill such a panel.

²⁴ It needs to be accepted that personnel who join land-based air forces are, by and large, neither prepared nor inclined to undertake periods at sea. UK JFH experience showed the need for a seagoing service to provide most of the personnel for effective embarkation of a squadron.

²⁵ It should be understood that the number of sea command air staffs required to provide this capability would not be excessive. The UK operated its aircraft using such a system for many years, with separate and small land and sea based air staffs.

²⁶ These are extensively used in the US DoD, and are called 'greybeard panels'.

This submission's conclusions are:

- Embarked air power has proven, over many decades, to offer nations in Australia's geographical situation decisive political and military advantages. It would do so for ADF operations in the Pacific littoral areas.
- A mixed of F-35A/F-35B fleet would offer superior air power to 100 land-based-only F-35As. F-35Bs could also operate from land.
- The mooted 28 F-35B aircraft would be able to support a sustained and militarily credible capability of six to eight aircraft for each LHD.
- High commonality between F-35A and F-35B would minimise the additional costs of a mixed fleet.
- Combining the F-35B with LHDs would offer greatly enhanced capabilities to the ADF, is a natural and logical fit to Plan Jericho and offers significant additional policy options to the GoA.
- Long range land-based air power projection offers some political advantages, but it has military limits that constrain its utility and will do so again in future conflicts. Plan Jericho needs to account for these limitations.
- Total reliance on land-based air power and ship-based missile defences to support ADF operations against emerging threats presents undeniable and unacceptable risk to ATG assets and personnel.
- The F-35B has been designed to operate from ships similar to the LHDs, and the LHD design was developed around the F-35B. Integrating the two presents low risk.
- Organisational and administrative issues need to be addressed at an early stage to clarify service roles and responsibilities.

The recommendations are:

- ADF and Department of Defence personnel should seek comprehensive expert briefings on STOVL and F-35B operations from appropriate sources in the USA and UK. This group should include a senior Member of Parliament from both the Government and the Opposition.
- Early consideration should be given to the command and control structures required to ensure that ADF F-35B assets would be combat ready and deployable to a maritime theatre of operations.
- CONOPS should be developed against scenarios for ADF deployments in the Pacific littoral area against credible and emerging threat assessments.
- These assessments should be assisted by an independent 'greybeard' panel to provide 'subject matter expert' knowledge of combat STOVL operations from LHD-sized ships.
- The costs of operating a mixed F-35A/B fleet should be subject to detailed modelling, seeking assistance from the US Department of Defense and UK Ministry of Defence to ensure that valid and independent cost models are used.
- F-35Bs should be procured for use in the Canberra-class LHDs as per the stated aims of the Minister for Defence and the Prime Minister.

The Author

David Baddams, 55, was a fighter pilot in the Royal Australian Navy from 1978 to 1984, and then the Royal Navy from 1984 to 1999. In the latter he commanded 800 Naval Air Squadron on multiple operational deployments, including strike fighter operations over Iraq from HMS Invincible in the North Arabian Gulf, and over Kosovo. In 2000 and 2001 he was the Hawk Production Flight Air Test Pilot for most of the RAAF's 33 Hawk lead-in fighter trainers. Since then he has been sales director for Britten-Norman, and in 2013 founded his own aviation support company, Snow Goose International. For SGI client BAE Systems he planned and piloted air support for Nuship Canberra in Port Phillip Bay during her final contractor's sea trials in August 2014. David was appointed MBE in 1998 for Leadership in Air Operations. He lives in Tamworth, New South Wales.

- The author wishes to thank Stephen George, Peter Greenfield and Ian Hunter for their help in the preparation of this submission.

24 NOV 2014 <http://navalinstitute.com.au/f-35-strike-fighters-from-the-canberra-class/>

F-35 strike fighters for the Canberra-class?

By David Baddams*

AIR power experts and aficionados cocked a collective eyebrow last autumn when Defence Minister David Johnston announced that F-35B strike fighters could operate from the two Canberra-class flat-tops.

Heavyweight endorsement by Prime Minister Tony Abbott propelled the Defence White Paper staff to examine the concept, and we await their words of wisdom in a 2015 review. The news has neither fuelled nor ignited political partisanship, and Labor's assistant defence spokesman David Feeney has maintained an active and lucid interest in the concept in social media for most of the year.

“...There is nothing “niche” in the relative or actual of these numbers. They are the sorts of numbers that current and probable F-35B operators use. So long as the powers-that-be are committed to supporting this through the F-35B’s life-of-type then the ADF can do this in a doddle....”



The RAAF then put itself into play the launch of Plan Jericho. Air Marshal Geoff Brown pushed the plan into the public sphere, giving notice to all and sundry that stale, obsolete and intellectually sclerotic gospels of current and former RAAF fast jet operations are unwelcome in its F-35 future. In short, Brown demands of all stakeholders that nothing should be excluded from delivering maximum impact from 100 Australian F-35s.

A mix of the 72 ground-based F-35As already on order and the mooted 28 F-35Bs for the Canberra ships is an easy and logical fit with Brown's thinking and plan, as it offers far more capability to the ADF and options for government than retaining the limitations of only continental, ground-based air power.

Proximity means capability. Ground-based F-35As in their remote rear echelon bases will neither match or surpass the high tempo, high sortie capability of embarked F-35Bs launching and recovering to a Canberra LHD deck only 100 miles from target. A distant ground-based F-35A's combat radius of 600 miles and extra ammunition is irrelevant when an ADF task group – its ships, helicopters, Wedgetail and Poseidon aircraft, land assets and several thousand personnel – are deployed, say, 1,500 miles from the nearest RAAF-friendly, F-35 capable base.

Extraordinarily expensive long-range transits, burning eye-watering amounts of fuel and racking up even pricier airframe-hour maintenance costs, can not, do not and will not offer round-the-clock strike fighter support for amphibiousness anywhere in the world. No-one does it, because it cannot be done. Assertions to the contrary are provably false.

Australia has a provable truth to hand. With only six or eight embarked F-35Bs the ADF could cycle decisive air power on and off a Canberra as, where and when chiefs choose, 24 hours per day, foul weather or fair, delivering immediate, on-call strike for ground forces and critical air defence to surface ships and their crews. Without that air cover all are exposed and vulnerable. Total reliance on the area and point defence missiles in the Hobart destroyers and Anzac frigates would be what Yes Minister's Sir Humphrey Appleby called “a courageous decision, Minister.” It was not a compliment.

Distance disarms capability. It degrades it. It reduces options. Oft-asserted claims that Host Nation Support and overflight clearance can be counted on for long-range, ground-based F-35A support for an LHD task group are woefully misplaced. HNS and overflight are frequently denied, even among formal treaty allies. Both the 1986 and 2011 air offensives over Libya were degraded and delayed by the denial of overflight by multiple Nato allies of the United States and the refusal of HNS by Malta. At the time of writing Nato's Turkey still refuses HNS to the US for strike-fighter operations against ISIS.



In all these cases the capability of ground-based fast air was degraded, leaving commanders and governments with fewer options and fast-jet pilots with precious little time where they needed to be but plenty of hours in operationally useless transit. At the same time, proximate air strike over Iraq continues apace and unabated from US flat-tops in the North Arabian Gulf, hundreds of miles and millions less flight-cost dollars closer to the coalface than ground-based fast jets based in the far south or in the Mediterranean. Commanders cannot wish-away the very real problems of HNS and overflight with optimism.

Bewildering rubbish masquerading as expert opinion and fact has flowed in the media as if on-tap beer since Johnston and Abbott piped the F-35B concept. From fiscal phantasms of \$500 million here, to \$12 billion there, and spurious nonsense about “decades” of implementation to “severe challenges” and “what for?” to “helicopter displacement” and “melting decks” and “niche capability” to we have not been treated to excellence by either journalists or very, very learned PhDs in the echo chambers of their think tanks. Their whistled-up and fabulous amounts of money cited are just that – fables. All up, the Australian F-35 programme is slated to deliver 100 aircraft and all they need, including permanent support systems, for around \$20 billion. The costs of buying 28 F-35Bs and the minor refits required to the Canberras will not bust that bank.

Minor refits indeed. The never-ending claim that the Canberras are not F-35 capable is the bloviating of spectacularly ill-informed mugwumps. The Canberras are delivered with the same hardened fast-jet deck and underpinnings as the Spanish navy’s lead ship, and all essential internal aviation spaces for fast jets have been retained. All of them. This was intentional and a specific factor in the acquisition process. The much-maligned aviation fuel bunkers and weapons stowage spaces have near-identical capacity to the enormous ones in the Spanish ship. Senior personnel have been poorly briefed if they state otherwise.

The fast jet and helo aviation capabilities of the French Mistral and Italian Cavour class were closely examined at the time, and the Spanish design came up trumps in all respects. Right now, the known requirements at refit for F-35Bs are a precision landing light called a HIHAT – it looks like a long green crucifix and is attached the middle mast – some sensor enhancements and Thermion coating on the flight deck. Some existing kit might need to be moved from A to B for electro-magnetic reasons. The glide slope kit, known as GLIS, is already fitted to the Canberras. This is the stuff of minor refit, and no more.

Refit and F-35Bs would deliver a motza more capability. More choices. There is no “niche capability” about six or eight embarked F-35Bs, where sensor fusion and data networking go merrily berserk when four are in the same airspace. That picture of threat and strike solution available to both pilots, controllers and commanders will offer startlingly long reach that any enemy is highly unlikely to penetrate without huge loss. He who sees first and shoots first wins. The days of close-up dogfighting or chasing missiles are long over, and a bad guy sneaking through a “niche” 4-ship of ADF F-35Bs protecting an LHD force would face being seen and shot at before he knew he or his ammunition was a target.

It is no good for pontificating PhDs of think-tankery to praise and extol emerging threats and the peril they pose to the LHDs and then dismiss the essential counterpunch as a tiny and extravagant toy. Further, their doctoral eminences need to learn that of 100 ADF F-35s only 60 or so will ever be in line service. The rest will be in attrition reserve, maintenance, repair or required for development work. The mooted 28 F-35Bs would easily provide three for attrition reserve, three in deep maintenance, one hangar queen, two flights of six or eight for the Canberras and a flight for conversion, training and reinforcement.

There is nothing “niche” in the relative or actual of these numbers. They are the sorts of numbers that current and probable F-35B operators use. So long as the powers-that-be are committed to supporting this through the F-35B’s life-of-type then the ADF can do this in a doddle.

The other big doddle is quashing single-service tribalism. The purchase and operation of F-35Bs must be seen as a whole ADF capability, not as sexy new aeroplanes for any particular service. It would be easy for the concept founder if the RAN ever insists on re-upping its own fixed wing structure. RAN fixed wing is not in hiatus, it is not dormant, it is not waiting for its moment. It is extinct. Like the equally extinct dinosaurs it can be seen and enjoyed only in museums.

A feasible option would be for a unique, lean and joint solution within the RAAF where usual ground air command chops to LHD air command at the point of embarkation. For this to work efficiently and practically it is likely that unit crews – an embarked unit of six or eight F-35Bs would require no more than 120 people – would need to be both light and dark blue. Should childish and tiresome single-service tribalism and small-mindedness blight the F-35B/LHD concept, then the Canberras will be no more than a joint Army-Navy asset, and not a whole ADF capability. Rigid, unimaginative and unprofessional single-service warriors who cannot abide this sort of thinking are likely to get short shrift from what can be called the Plan Jericho Effect.

A few other publicised matters, easily hit for six:

- (1) F-35Bs would not displace embarked helos where permanent deck parking rotations are used
- (2) No F-35B will ever – repeat, ever – melt a flight deck with appropriate surfacing. Full stop, end of story
- (3) What for? Strike fighter stuff, that’s what for. That’s also what the F-35As are for. Embarked F-35Bs also, by default, regenerate RAAF long-range strike lost with the retirement of the F-111s. That’s another what for
- (4) It might take a few years to generate the capability from decision to embarkation, but not “decades”. The same applies to the F-35A
- (5) Tiger helicopters are armed scouts, not flying artillery, and their ability to support ground forces is notably limited. On-call F-35B strike more than remedies that deficiency
- (6) No “specialized facilities” are required for embarked F-35Bs operations in the Canberra LHDs, although very minor changes to existing systems may be required
- (7) The Canberras are actually multirole ships, and the list of their aviation potential is as long as a very long arm, and
- (8) The only known “severe challenges” to this concept rest in the closed and thinly stocked minds of naysayers and their ilk, not in the technical and tactical dynamics.

Plan Jericho and the F-35B would be best served by long, comprehensive and detailed briefings in the UK and USA. There are no serving ADF personnel with STOVL experience and no departmental experts, either. No credible analysis or planning is possible in this welter of inexperience. Appropriate forces and bureaucratic personnel, among others, can easily avail themselves to allies that pioneered and perfected both embarked and ground-based STOVL over 40-odd years, and only from there consider the specifics of how it would best serve the ADF and the government.

Without embarked F-35Bs, the LHDs and all their people will be as batsmen facing a horrifying and unremitting fast bowling attack while F-35As are only 12th man, back in the pavilion having a sleep. That would be entirely contrary to the ambitions, intellect and ethos of Air Marshal Brown’s Plan Jericho.

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Would You Like an F-35 With Your Aegis?

10 June 2014 Zachary Keck



It's no coincidence that the Asian nations with Aegis combat systems are also the ones buying the F-35.

When it comes to understanding emerging military technologies, and the geopolitical implications that flow from them, few can top the analysis of Second Line of Defense.

A case in point is understanding the synergy of the Aegis combat system and the F-35 in the Asia-Pacific. For years now, Second of Line of Defense analysts have emphasized how the interaction between the F-35 and the Aegis combat system would greatly enhance U.S. and allied military power in the region. For example, in the January 2012 issue of Proceedings Magazine, Robin Laird, SLD co-founder and

friend of The Diplomat, noted that the Aegis would serve as the "wingman" for F-35 pilots. As Laird explained:

Upcoming tests will support a launch/engage-on-remote concept that links the Aegis ship to remote sensor data, increasing the coverage area and responsiveness. Once this capability is fully developed, SM-3 missiles – no longer constrained by the range of Aegis radar to detect an incoming missile – can be launched sooner and therefore fly farther to defeat the threat.

Imagine this capability linked to an F-35, which can see more than 800 miles throughout a 360-degree approach. U.S. allies are excited about the linkage prospects and the joint evolution of two highly upgradable weapon systems. Combining Aegis with the F-35 means joining their sensors for wide-area coverage.

In other words, the superior ISR capabilities of the F-35 will be used to enhance the Aegis combat system's effectiveness. That's because data collected by F-35s would be sent back to Aegis-equipped vessels out at sea, which would use their missile and missile defense capabilities to greater effect. This capability would be especially potent in dealing with China's land-based missile and anti-ship missile systems, especially when combined with the F-35's electronic and cyber capabilities.

As a result, Laird predicted that America's Pacific allies that are part of the Aegis network would become customers of the F-35. That prediction has proven to be amazingly prescient.

Besides the United States, three nations in the Asia-Pacific currently use or are in the process of building Aegis-equipped vessels. In Japan, the Maritime

Self Defense Forces' (MSDF) Kongō-class destroyers and the Atago-class guided missile destroyers – themselves an updated version of the Kongō-class – employ Aegis combat systems. South Korea's Navy also employs Aegis systems on their KD-III (Sejong the Great-class) destroyers. **And the Hobart-class air warfare destroyers that the Royal Australian Navy is currently building will be equipped with the Aegis combat system.**

Notably, the same three countries are also the only ones in the Asia-Pacific that have committed to the Joint Strike Fighter program, although other South-east Asian nations and possibly Taiwan could purchase F-35s in the future. In 2011, Japan committed to purchasing the F-35 as part of its F-X program to replace its aging F-4 aircraft fleet. Although the actual number of F-35s that Japan will buy remains

uncertain, the aircraft is already being integrated into its national security strategy.

Earlier this year, South Korea also officially announced it will purchase at least 40 F-35 JSFs for its FX-III program, beating out Boeing's F-15SE and Eurofighter's Typhoon. And while Australia was one of the founding members of the Joint Strike Fighter program, and agreed to purchase 14 F-35s in 2009, it went "all in" on the aircraft earlier this year when Prime Minister Tony Abbott announced Australia would purchase at least another 58 F-35s.

Both the Aegis and the Joint Strike Fighter, as well as the interaction between them, demonstrate how America is using military technology to strengthen its worldwide network of alliances. To begin with, the programs are both designed to strengthen the economic interdependence of

America's allies across the globe, with each nation utilizing comparative advantages in producing various parts for the Aegis and JSF, as well as further innovating them.

At the same time, systems like the F-35 and Aegis inherently foster greater interoperability between militaries that use them. This will be especially important for the U.S. in the Asia-Pacific, which currently lacks the kind of collective security mechanisms found in Europe or even the Persian Gulf. Although military systems like the F-35 and Aegis won't be as effective in integrating regional defense as an organization like NATO, they should help prevent the kind of disasters seen at the Battle of Java should the U.S. and its allies ever find themselves fighting together in an actual conflict.

<http://thediplomat.com/2014/06/would-you-like-an-f-35-to-go-with-your-aegis/>

Thoughts on the LHD and a fixed wing capability

30 May 2014

Commander David Hobbs, MBE, RN (Rtd)*

TO THE logical mind, the most surprising element of the 2007 decision to build two Canberra class LHDs was the acceptance by the Australian Government of advice from a lobby group that fighter aircraft based in Australia, with their limited radius of action and fixed supply chains, could provide support for these ships and their 'all-arms' battle groups wherever they might be deployed.

The Government had already stated its intention to procure the land-based F-35A Lightning II joint strike fighter but showed no interest in the STOVL F-35B variant (pictured) being developed specifically for amphibious operations with the US Marine Corps. Protagonists of the limited ability of 'land-locked' air forces to project power pointed to the availability of air-to-air refuelling to extend the range of fighters but there has, as yet, been no break-through that allows them to be re-armed in flight, and crew fatigue on long sorties must be a significant factor that degrades performance.

In 2008 the Sea Power Centre studied the relative value of shore and sea-borne aircraft and noted the observed historical fact that terminal air bases associated with distant crises are seldom secured beforehand and usually lack the capability to provide immediate support at the level of operations needed for crisis response. The

same document notes, on the other hand, that embarked aircraft are fully mobile, operational to their maximum level of performance on arrival in the crisis area and largely secure from ground-based interruptions and asymmetric attacks.

The experience of the USS Kearsarge, LHD-3, with six USMC AV-8B Harriers embarked, during operations off Libya in 2011 is relevant since the USMC must be considered the role model for the type of operations the ADF should be able to mount in order to achieve full potential from the Australian LHDs. Positioned just off the relevant area of coast, Kearsarge's aircraft were able to return to the ship frequently to refuel, re-arm and change pilots and her Harriers flew four times the number of sorties that the larger number of RAF aircraft based in the UK, Italy and Cyprus were able to achieve. Combat SAR helicopters were immediately available with a viable radius of action to rescue downed pilots. The French aircraft carrier Charles de Gaulle also flew a large number of sorties in the same operation; a performance described by USN authorities as 'quite exceptional'.

The best example of rapid and effective reaction to an unexpected crisis is the Falklands conflict of 1982. Possession of the two flat-tops, Hermes and Invincible, allowed the Royal Navy to deploy a task force with naval Sea Harriers and helicopters that were able to fight on, under and over the sea surface. RAF Harriers were subsequently able to join Hermes' air group but it needs to be pointed out that the ship's highly skilled aircraft

handlers were able to cope with their lack of experience and naval pilots were able to teach them how to operate in a maritime environment. In other words the RAF squadron was not in its primary environment and a force that relied on it for both offence and defence would have been weaker and less effective without the naval professionals who specialised in embarked flying.

A ship that was not as worked up and specialised could not have coped with the new-comers' inexperience and the example of Illustrious in 2007 is interesting. With no Harrier squadron of her own she embarked 16 AV-8Bs of USMC squadron VMA-542 which flew 152 sorties in twelve hours. In contrast an RAF Harrier squadron embarked in Ark Royal in similar circumstances in 2010 had to carry out several days deck landing training before being considered operational and, in the ensuing exercise, flew less sorties in five days than the USMC had flown in Illustrious in two. Unlike the Marines the RAF were not able to fly at night because of their lack of carrier experience. A land-based unit that undertakes random embarkations as a secondary function will never demonstrate full operational proficiency.

Future conflict in the Pacific region may well rely on control of the sea and that control may not be possible for navies that lack effective aircraft able to operate as an integral part of a triphibious task force. An increasing number of navies have carriers and LHD-type 'flat-tops' and Prime Minister Tony Abbot's May 2014 instruction to planners working on the next Defence White

Paper that they are to examine the possibility of putting a squadron of 12 F-35B Lightning II joint strike fighters onto the LHDs to "ensure that Australia maintains a sustainable, versatile and highly capable defence force" shows a ray of hope that the full potential of these ships might be realised. Fortunately their design originated from the Spanish Juan Carlos 1 which was intended to operate STOVL fighters as well as helicopters and even retains the 'ski-jump' (it cost less to leave it in place than to redesign the bow to remove it) but significant modifications would be needed to embark F-35Bs on a regular basis. These would include the fitting out of air weapons magazines and handling systems together with the autonomous logistic information system, ALIS, which is at the heart of F-35 operation and maintenance and other arrangements. Aircraft handlers would need training in the operation of both fixed and rotary wing aircraft on deck and sortie generation would require the installation of briefing and flight planning facilities, simulators for pilots to 'pre-fly' missions and maintain training standards.

None of this would be cheap but the result would be a significant boost in Australia's expeditionary capability and her standing in the region. Remember the effect HMAS Sydney's small air group had during the Korean War in 1951: her aircraft were on the spot and, therefore, much more effective than larger numbers of aircraft of theoretically greater capability a long way away. Her performance was recognised by Allied navies and described as 'quite

excellent' by the RN flag officer in charge of her task force.

If F-35Bs are procured for operation from the LHDs, the most logical approach would be to operate them as a naval air squadron in order to achieve synergy with, and capitalise on the very relevant experience of the USMC and the Spanish, Italian and British Navies with whom the unit will have to operate seamlessly in a crisis. The unit must specialise in Australian maritime operations but share logistic support and some aspects of common training with the F-35A community of the RAAF within an Australian Defence Force command structure. The French operate a similar structure with their naval and air force Rafales. A naval air squadron would also be conceptually better able to work as a team with specialised aircraft handlers on deck and the rest of a ship's company and maritime task forces. A naval background and status would also help with cross-deck operations or even deployments to Allied ships during coalition operations.

A decision on the procurement of F-35Bs has not yet been taken, of course, but the news that they are being considered is heartening. It to be hoped that those doing the considering will look at the big picture, the experience of Allies and Australia's own experience and not force Australia into a unique, fallible solution that will fail the nation when the inevitable crisis happens.

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served in the Royal Navy from 1964 until 1997 and flew fixed wing and rotary aircraft though a long career as a Fleet Air Arm pilot. He has flown Gannet, Hunter and Canberra aircraft as well as Wessex Commando Helicopters. His Log Book contains 2,300 hours with 800 deck landings, 150 of which were at night. His service afloat included the aircraft carriers Victorious, Hermes, Albion, Bulwark, Centaur, Ark Royal (IV) and Ark Royal (V).

After retirement from the active list as a commander in 1997 he became Curator and Principal Historian of the Fleet Air Arm Museum at Royal Naval Air Station Yeovilton in Somerset until 2006 when he became a full time author and lecturer.

He writes for several journals and magazines and in 2005 won the Aerospace Journalist of the Year, Best Defence Submission. He has written 12 books on naval aviation and co-authored nine more. A Century of Carrier Aviation – The evolution of Ships and Shipborne Aircraft has become a standard reference book on the history of flying at sea. His most recent book was The British Pacific Fleet. This is a definitive study of the Royal Navy's operations in the Indian and Pacific oceans in 1944-45. His interest in the history of maritime aviation in Australia is of long duration. He won the essay prize awarded by the Navy League of Australia in 2008.

David lectures and broadcasts on naval subjects worldwide and has been a regular presenter at King Hall Naval History Conferences. He has become well known to readers of Headmark for his book reviews and his incisive articles. He deploys his historical understanding of flying at sea in the twentieth century to illuminate the opportunities technology make possible in aviation in this new maritime century.

<http://navalinstitute.com.au/thoughts-on-the-lhd-and-a-fixed-wing-capability/>

Asia Pacific security: Is the F-35B relevant?

21 May 2014



With Prime Minister Tony Abbott implying recently that Australia could buy the F-35B 'jump jet' version of the Joint Strike Fighter (a suggestion reinforced this week by Defence Minister David Johnston), this is a good time to ask: what relevance could the F-35B have for the Asia Pacific? Designed as a STOVL (short take off and vertical landing) aircraft that can operate from amphibious warships and small carriers, the F-35B remains the most enigmatic element of the troubled Joint Strike Fighter (JSF) program.

We can disaggregate this issue into two questions. First, how will the F-35B expand the reach of US Navy capabilities in the Asia Pacific? And second, how can the F-35B improve the capabilities of partner navies in the Asia Pacific, especially the Republic of Korea Navy (ROKN), the Royal Australian Navy (RAN), and the Japanese Maritime Self Defense Force (JMSDF)?

The first question has three potential answers:

1. Amphibious warships (which resemble mini-carriers) carrying F-35Bs can fill in for big carriers in less critical parts of the world. The USS Kearsarge, for example, conducted air operations off Libya (with AV-8B Harriers and MV-22 Ospreys) during the 2011 civil war, allowing the large carriers to remain in other areas. The cycle of maintenance, repair and training for carriers and their air wings means the US Navy can only deploy a few of its ten carrier battle groups at any given time. Assigning lower priority stations to amphibious ships like the USS America and USS Tripoli reduces the strain on the carrier fleet as a whole.
2. Amphibious ships with F-35Bs could fill gaps in the high-intensity combat capabilities of the US Navy. The US Navy's vision of naval air employment relies on F-35s to play a very specific role at the centre of a system of F/A-18s, EA-18 Growlers, and unmanned aerial vehicles. F-35s act as network nodes that enhance the capability of the entire air wing. Accordingly, it's not quite right to think of the contribution of an F-35B squadron strictly in terms of the number of fighters it provides. Given that the future of the US Navy's F-35C remains uncertain, F-35Bs have a way to contribute to high-intensity carrier ops. However, the shorter range of the F-35B and the lower tempo of amphibious flight operations remain an obstacle for envisioning the F-35B in a high-intensity combat context.

3. F-35Bs give the US Marine Corps 'skin in the game' with respect to the Pacific pivot. The Marines (along with the Army) have struggled thus far to figure out how they fit into the Obama's Administration's grand strategic shift to the Asia Pacific. This has led to a degree of inter-service conflict over how the pivot will play out. Integrating the F-35B, flown exclusively by Marines, into the pivot helps undermine any political opposition from the USMC to devoting greater resources to the Asia Pacific.

What about other navies? Will the F-35B expand the capacity of US allies to support US operations in the Western Pacific?

At least three allies — South Korea, Japan, and Australia — could use the F-35B aboard their amphibious ships. Granted, none of the South Korean Dokdos, Japanese Izumos, or the Australian Canberras are ideal as platforms for the F-35B, but any could provide support in a pinch.

Conceivably, the Royal Navy could deploy one of its new large carriers to the Pacific as well, although the Royal Navy is no longer regarded as a serious player in Asia. Queen Elizabeth or Prince of Wales would present an entirely different level of capability than the small amphibious ships operated by Pacific navies, or even than the US Navy's bigger amphibious ships.

The obstacles to operating the F-35B from a small amphibious ship such as the Canberra class are substantial. The F-35B is less capable than the land-based version Australia has ordered, the F-35A, meaning small military forces such as the Australian Defence Force would need to commit immense resources to what amounts to a niche capability. Although the flat-decked amphibious ships of the ROKN, JMSDF and RAN could operate the F-35B, they can't do so very efficiently, and only at the cost of effectiveness in other operations. It's difficult to imagine F-35Bs launched from ROKS Dokdo or HMAS Canberra having a decisive impact on any imaginable conflict in the Asia Pacific.

And so until Korea, Japan, or Australia decide to commit to a dedicated carrier similar in size and capability to those of the Royal Navy (or at the very least to the Italian Cavour), the biggest impact of the F-35B in the Asia Pacific will be on US capability. If any of those three do decide to make the leap, however, the F-35B can provide a better bridge to naval aviation effectiveness than its STOVL predecessor, the Harrier.

<http://www.lowyinterpreter.org/post/2014/05/21/Asia-Pacific-security-is-the-F-35B-relevant.aspx>

Australia reveals interest in F-35B

23 Jul 2014 ANDREW MCLAUGHLIN

<http://www.flightglobal.com/news/articles/australia-reveals-interest-in-f-35b-400661/>



Australian defence chiefs have told a hearing of the Senate's Foreign Affairs, Defence and Trade Legislation committee that Prime Minister Tony Abbott's coalition government is considering whether to acquire a number of short take-off and vertical landing Lockheed Martin F-35Bs.

Canberra confirmed in April it will acquire 58 F-35A Lightning IIs for the Royal Australian Air Force under Project Air 6000 Phase 2A/2B, adding to the 14 already on order to replace the RAAF's Boeing F/A-18A/B "classic" Hornet fleet.

Australia has long-stated a requirement for 100 air combat aircraft. However, because it acquired 24 F/A-18F Super Hornets in 2009-2010 as a bridging capability between the retirement of the General Dynamics F-111C and the introduction of the F-35A, it has deferred a decision on Phase 2C of the project until the early- to mid-2020s.

The F-35B proposal is being pushed by Abbott's office, and if acquired the aircraft would be fielded from the Royal Australian Navy's two new LHD-class vessels – the first of which is to be commissioned as HMAS Canberra later this year.

“There has been a White Paper evolving for a while,” chief of the defence force Gen David Hurley said in response to opposition defence spokesman Senator Stephen Conroy. “The prime minister has a view about a capability that he thinks might be relevant to the ADF [Australian Defence Force]. He has asked us to look at that.

“We have a process in place at the moment that depending where we come out on that process, we would then go into all of those technical decisions about the nature of ship and force structure implications for the ADF.”

The two 27,000t LHDs currently under construction in Melbourne, Victoria are based on Spain’s King Juan Carlos 1 (L-61) vessel, built by Navantia. When ordered, the LHDs were intended for amphibious and regional humanitarian assistance missions. They have capacity for a battalion of troops, up to 100 vehicles, four large amphibious watercraft and a dozen or more helicopters to be embarked for such missions.

There has long been an intention to conduct operational ‘cross-decking’ operations with US Marine Corps and UK Royal Navy fixed and rotary-wing aircraft. However, in lieu of a planned Force Posture Review and new defence White Paper being finalised for release in early 2015, there are currently no guiding policy documents or stated strategic imperatives for Australia to pursue the option of acquiring F-35Bs and to operate these vessels as fixed wing aircraft carriers.

HMAS Canberra will be followed by HMAS Adelaide in 2016.

BACK TO SEA?

The government mulls equipping the Navy's LHDs with STOVL F-35Bs

WRITER: ANDREW McLAUGHLIN



Reccent reports that Prime Minister Tony Abbott is driving the current debate on whether to acquire a number of short takeoff and vertical landing (STOVL) F-35B JSFs to be operated from the two new Canberra class LHD ships have effectively been confirmed by senior Defence officials.

On May 17 Defence Minister Senator David Johnston told *The Weekend West* newspaper that the acquisition of the F-35B was "... an option which has been considered from day one." The option was further reinforced on May 23 when *The Australian* reported that PM Abbott is pushing to configure the Canberra class vessels as "aircraft carriers" and employ F-35Bs from them. Sources indicated at the time that the PM was driving this initiative personally and that he wants it considered as part of the next Defence White Paper.

Confirmation came when, testifying before the Foreign Affairs, Defence and Trade Legislation Committee during senate Estimates on June 2, Chief of Defence Force General David Hurley said the concept of a potential fixed-wing capability from the LHDs was being studied.

"There has been a White Paper evolving for a while," GEN Hurley said in response to a remark by opposition Defence spokesman, Senator Stephen Conroy that the Prime Minister's office had leaked the story to *The Australian*. "The Prime Minister has a view about a capability that he thinks might be relevant to the ADF," he has asked us to look at that. We have a process in place at the moment that will allow us to have a look at that and, depending where we come out on that process, we would then go into all of those technical decisions about the nature of ship and force structure implications for the ADF."

"The Prime Minister has a view about a capability that he thinks might be relevant to the ADF."

GEN HURLEY

● F-35B development aircraft BF-5 and BF-1 during sea trials with the USS Wasp in September 2013. (LOCKHEED MARTIN)

JULY 2014 AUSTRALIAN AVIATION 45

Issues

Australian Aviation previously explored the F-35BLHD idea in our May 2013 issue. While we drew no real conclusions at that time, the arguments generally came down on the negative side based on cost and the modifications that would be required to the LHDs. But now that the idea seems to be gaining some momentum with some heavyweight political backing, it is appropriate to re-visit the issues with some deeper analysis.

Certainly even in our wider region in recent times such as growing tensions in the South China Sea, the Korean Peninsula and in Thailand give weight to providing the ADF the capability to strategically project a combined amphibious and air combat force.

The politics surrounding the LHDs is intriguing, especially in light of the PM's and Minister's comments. When ordered, the Canberra class vessels were 'sold' as being able to embark, transport and deploy an embarked amphibious force, and to carry out or support humanitarian missions in our wider region. The bolstering of the ADF's amphibious capabilities and its ability to carry out large-scale humanitarian missions were easy to sell at the time with the Timor Leste and Solomon Islands assistance operations, and the 2004 Indian Ocean tsunami still fresh in the public's mind.

Whether the resumption of Navy fixed-wing aviation operations – a capability lost with the decommissioning of the light carrier *HMAS Melbourne* in 1982 – was a factor in the selection of the Canberra class vessels is not known. But parallels can be drawn with the UK's *Invincible* class 'through deck cruisers' of the 1970s and '80s and, more recently, Japan's new 20,000 tonne *Hyuga* and 27,000 tonne *Izumo* class 'destroyers'. Despite being initially categorised as surface combatants, the *Invincibles* went on to embark *Harriers* and *Sea Harriers* for most of their service careers and proved their worth in the Falklands and other operations, while the Japanese vessels are clearly more than just helicopter capable.

But in lieu of the Force Posture Review (FPR) and 2014 Defence White Paper (DWP) being finalised, there are currently no guiding policy documents or stated strategic imperatives to pursue the option of acquiring F-35Bs, and

so any reporting on this issue can only be regarded as speculative.

What is the mission?

The first question Defence planners will need to ask themselves and those in the government driving the concept is, "What mission do we envisage an F-35B-equipped LHD will perform?" Does the government want the LHDs to be able to project a real high-end fixed-wing capability into contested situations, or is the capability more likely to be used politically as a 'flag waver' designed to project influence over smaller powers in our region?

In the past, the deterrence 'trident' of RAN Oberon and Collins class submarines, Army SAS and commando regiments, and the RAAF's F-111

strategic strike fleet quietly but surely underpinned many of Australia's geopolitical policies in the region. Indeed, the submarines and special forces continue to do so today.

But despite offering longer reach and superior precision strike capabilities than those fielded on the F-111, the RAAF's current and future fleet of tanker and AEW&C-supported Hornets, Super Hornets, Growlers and F-35As just doesn't make the same political statement as the big swinging bomber once did.

At more than 27,000 tonnes and over 200m in length, the Canberra class LHDs are big ships – just one of them displaces more than the combined weight of HMS *Hermes* and HMS *Invincible* – the British carriers which were used so effectively in the 1982 Falklands campaign. So if used effectively, an Australian-flagged LHD embarking a mix of F-35Bs and amphibious or helicopter-borne special forces parked on the horizon near a potential failed state can wield significant geopolitical influence.

Amphibious mission trade-off

It is now incumbent on the government to decide and to properly define the priority for these very capable vessels. That is, if it decides to go down this path, how much of the Canberra class's considerable amphibious capability is it prepared to trade-off in order to accommodate a fixed-wing capability.

While Australian-specific concepts of operation have not yet been formulated, shipbuilder Navantia's brochure for Spain's L61 *King Juan Carlos 1* (JC1) – upon which NUSIPs



Canberra and *Adelaide* are based – gives us some guidance.

For a marine infantry force landing and sustained amphibious operation, the JC1 will typically embark 12 to 16 MRH 90-sized helicopters plus at least four dozen light and medium vehicles on the hangar deck and upper garage, and about 30 heavy and armoured vehicles, four LCM-1E landing craft, and a dozen smaller watercraft such as RHIBs on the dock and lower garage deck.

If configured for the transportation of forces to an area of operations to be offloaded at a dockside, the JC1 would typically embark up to 10 CH-47 heavylift helicopters and about 60 light and medium vehicles on the hangar deck and upper garage, and up to 50 heavy or armoured vehicles on the dock and lower garage deck. For humanitarian assistance missions, the JC1 can carry up to 140 shipping containers on the upper and lower garage decks, while retaining a helo capability of about eight to 12 MRH 90 medium, or six to eight CH-47 heavylift helicopters.

It is assumed operations utilising the three above configurations will likely be conducted either in relatively benign areas of operations, or in contested operations if organic or partner nation anti-air and anti-submarine coverage is available.

If configured for pure aircraft carrier operations, the JC1 is shown embarking 12 medium sized helicopters and 10 to 12 AV-8B Harrier IIs. Even though the F-35B weighs about twice that of an AV-8B, the JC1's decks were designed and built with the possibility of Spain acquiring F-35Bs in the future. Space should also not be an issue, as both aircraft share a similar hangar and flightdeck footprint, although the F-35B's embarked maintenance and support footprint is yet to be fully tested at sea.

With Spain's decommissioning of the *Principe de Asturias* in 2013 due to budget cuts, the JC1 has had to assume at least part of the aircraft carrier role. The Spanish categorise the ship as a 'Buque de Proyección Estratégica' (Strategic Projection Vessel), and they currently operate a mix of Sea King, Tiger, and Chinook helicopters as well as the Harriers from it.

Naturally, the JC1 – and by inference the *Canberra* class – is able to mix and match elements of all of these capabilities where practical due to the vessels' large size and inherent

46 AUSTRALIAN AVIATION JULY 2014



flexibility. But it goes without saying that some of each capability would be traded-off in order to accommodate another.

Where a mix of fixed-wing and amphibious capabilities may be required is if amphibious operations are to be conducted in an opposed landing against an adversary with air combat and close air support capabilities. While naval air power will never be a substitute for heavy and sustained land-based air power operations, its ability to dampen 'spot fires' or respond to rapidly evolving scenarios is unquestioned, especially when operating far away from home or 'host nation' bases.

Imagine a scenario where Australia is required to deploy 10 to 12 land-based air combat jets into an area of operations. Such a deployment would likely be dependent on sustained organic or coalition tanker support, as well as host nation basing and all the political sensitivities that go with that. Conversely, the deployment of an LHD with a dozen F-35Bs embarked – despite the STOVL version's shortcomings compared to the RAAF's more capable F-35A – requires no host nation basing and little or no tanker support, makes a similar political statement, and arguably provides greater operational flexibility.

Technical issues

Whereas the JC1 has been built to operate fixed-wing aircraft from day one, *Canberra* and *Adelaide* have both been 'built for, not with' some of the

● Sea Kings and Harriers aboard Spain's King Juan Carlos I Spanish Navy

key ingredients necessary to conduct sustained fixed-wing operations. Some of the design-in features of the JC1 and *Canberra* class vessels such as the bow ski-jump ramp, aircraft elevators and aircraft hangar have been designed to accommodate the F-35B from the outset. But the RAN's LHDs have not been equipped with a heat-resistant deck coating required for sustained operations with F-35Bs and other types such as the V-22 Osprey which can ablate and corrode deck surfaces with their hot downward exhausts.

A spray-on treatment called Thermion which is comprised of ceramic and aluminium elements was designed by UK engineers about a decade ago to provide a wear-resistant surface which doubles as corrosion protection of the flightdeck as well as land-based landing pads, and was reportedly trialled successfully on the USS *Wasp* during F-35B sea trials.

● An F-35B takes off from the USS *Wasp* Lockheed Martin



JULY 2014 AUSTRALIAN AVIATION 47



Defence insiders suggest *Canberra* is slated to conduct cross-decking exercises with USMC V-22s quite early in its service life, after which time the suitability of the existing flightdeck to withstand exhaust temperatures will be assessed.

Indeed, during the June 2 Senate Estimates, Chief of Navy VADM Ray Griggs remarked: "There has been some work already done... during the 2008-09 force structure review white paper process, to understand what the implications would be. It largely revolves around ablative coating on the flightdeck because of the heat generated from the F-35B."

The LHD's deck lighting will also need to be upgraded to highlight the ski jump and runway for takeoffs, and to guide taxiing pilots to flightdeck parking positions. The vessels would also require the installation of a HHAT island-mounted landing-aid lighting system which provides an indication of hover height and relative ship movement to a STOVL aircraft's pilot in the side hover position.

Compared to helicopters, fixed-wing aircraft require greater fidelity of a vessel's electronic landing aid systems, so the *Canberra* class LHDs would require the addition of a three-dimensional search radar, the installation of aircraft precision approach sensor such as the Joint Precision Approach and Landing System (JPALS), and the integration of these sensors into the vessel's combat system. JPALS is an all-weather system which uses real-time GPS differential

corrections which are transmitted to an aircraft over secure comms and shows an ILS-style display.

To accommodate the additional sensors, it may also be necessary to reposition other sensors in order to avoid electro-magnetic interference. But this is a relatively common modification made to ships as they receive new capabilities – for example the Anzac frigate ASMD upgrade currently underway – and the engineering is well understood.

Training & support

From the point of view of the ADF's 'raise, train, and sustain' concept of supporting capabilities, the F-35A and B models share a high percentage of their structure design and materials and most of their key systems, and from all reports they have similar handling characteristics in conventional flight regimes. This means the maintenance, logistics and initial training requirements for the two sub-types would be broadly similar. But the F-35B will also require a specialist flight training system for STOVL and deck operations, land-based training facilities such as a ski-jump and dedicated simulator, and specialist maintenance training, logistics and other support facilities to sustain ship-borne operations.

The ability to support the F-35B at sea is still an element of the capability that hasn't been tested fully, but it is unlikely maintenance and support functions can be carried out within those spaces currently allocated for far less complex helicopters. Similarly,

● NUSIP *Canberra* during recent sea trials. Defence

space for crew briefing rooms, and secure spaces for data and information assurance, and for low-observable coatings maintenance would need to be found.

Fuel and weapons storage

There has been some speculation that the *Canberra* class has a lack of aviation jet fuel and weapons storage compared to its Spanish JC1 parent design. The F-35B has about four times the fuel capacity of an MRH 90 and needs to be refuelled just as often during sustained air operations, so the LHD is going to require underway replenishment far more often, or additional fuel and other aircraft fluids storage is going to be required.

The RAN's problems with underway replenishment are currently being partially addressed by the government's recent announcement that designs from Navantia and Korea's Daewoo have been shortlisted to replace the ageing *HMAS Success* and the interim *HMAS Sirius* by the early 2020s. Both designs are far more capable than the ships they will replace, although with only two vessels – one based on the coast – it will be difficult to cover all bases in an area of operations, especially a thirsty LHD with a fixed-wing component aboard.

But with the JC1 as an operational template, modifications to the LHDs may be costly but would likely not be difficult, and could be performed to coincide with the vessels' first major refits in the mid to late 2020s. This would give the ADF a decade to fully learn how to operate these large vessels and to develop some concepts of operations through cross-decking opportunities before fully committing to its own fixed-wing element, and would be timed neatly for the planned AIR 6000 Phase 2C aircraft acquisition.

In the meantime, Defence will be busy developing the concept to better inform the force posture and white paper processes. "We are starting at what are the requirements that is, how do we adapt the ship and what does a ship that launches vertical takeoff aircraft look like," GEN Hurley told Senate Estimates. "There are two parts to the Prime Minister's request: One is to drive it back to see how would this fit into the force structure of the future, how would it meet the needs of the future and so forth, and then we would do the prioritisation, stack it up against other needs... into the future."

“This would give the ADF a decade to fully learn how to operate these large vessels.”

F-35s, V-22s, And Samsung Tablets: Junior Marines Pioneer New Tech, Tactics

SYDNEY J. FREEDBERG JR. 21 May 2014

[http://
breakingdefense.co
m/2014/05/f-35s-
v-22s-and-samsung-
tablets-junior-
marines-pioneer-
new-tech-tactics/](http://breakingdefense.com/2014/05/f-35s-v-22s-and-samsung-tablets-junior-marines-pioneer-new-tech-tactics/)

Joint Strike Fighter Pro

A Marine F-35B in vertical landing mode.

For the valedictory wargame of the Marine Corps's [Infantry Officer Course](#), young second lieutenants launched an airborne raid on San Clemente Island off the California coast to try out new tactics and techniques with V-22s and F-35s. Their mission: fly in on [V-22 Ospreys](#), wipe out simulated [missile launch sites](#) so US warships could move in, then march 14 miles overnight to seize a forward airfield for Marine Corps [F-35B fighters](#). Their air support: not actual F-35s — the [controversial stealth jet](#) is still not fully operational — but a "CATBird" test aircraft, a modified airliner carrying all the real fighter's sensors. Their ultimate weapon: Samsung tablets.

Frustrated with their standard-issue communications gear, the young Marines had [improvised a wireless network](#) using commercial devices. Marines on foot and Marines in the back of fast-flying V-22s could exchange intelligence, rewrite plans, and receive reconnaissance data from the simulated F-35. When ground units couldn't transmit directly to each other because of terrain blocking the signal, they relayed the message via a V-22 flying overhead. When their backpackable 40-pound Wasp drones couldn't send surveillance footage to the tablets, the Marines just took digital photos of the Wasp control screen and sent them to each other.

The raid on San Clemente was just one in a series of tactical and technological experiments being conducted by the Infantry Officer Course. This coming September, IOC plans to do another exercise in Yuma, Ariz. incorporating actual F-35s — flown by the same Marine Corps squadron tasked to bring the jet to its "initial operational capability" next year.

After spending [18 years and \\$80 billion](#) to develop the F-35 fighter, the US military now has to figure out how to use it in real-world operations. At the cutting edge of this effort are not generals, admirals, or defense industry experts, but a small group of young Marines. The most senior is a few years shy of 40, and the majority are recently commissioned second lieutenants in their early 20s. It's a perfect example of how [small-scale, bottom-up innovation](#) — with some timely assistance from the top — just might save [the world's biggest military bureaucracy](#) from itself.

Battlefield WiFi is the key to getting the most out of the F-35's sophisticated sensors — indeed, to the future force as a whole — and that's an arena in which a generation raised on iPhones has an advantage. So last year, when the Iraq and Afghanistan veteran who's now the Infantry Officer Corps director, Maj. Scott Cuomo, ran into technical troubles with his first experiments networking ground and air forces together, he handed the problem to his students.

"I'm almost 37," Cuomo said self-deprecatingly. "These are guys 12, 13, 14 years younger than me."

Cuomo and company have done most of their work so far with the [V-22 Osprey](#), pioneering both technologies and tactics. "Ten years ago," bragged Lt. Gen. Robert Schmidle, "the pundits said you can't fast-rope out of a V-22, there's too much downwash. These lieutenants didn't know it, so they did it." Cuomo was in fact the third man out of the first aircraft, preceded by two 220-pound Marines using their bulk to anchor the line against the blast from the V-22's rotors.

It was that early 2013 exercise that brought the young Marines to the attention of Schmidle, at that time the Marine Corps' deputy commandant for aviation, and the three-star general promised a very surprised Maj. Cuomo to get him whatever he needed for future experiments. That's how they got a mock F-35 to plug into their battle network for the March raid on San Clemente Island.

Networking ground troops with F-35s is a big deal, and not just for Marines. The [Air Force](#) and [Navy](#) are also buying the fighters, a planned 2,443 across all three services, and one of F-35's missions — replacing the [vaunted but aging A-10 Warthog](#) — will be to strike targets just ahead of Marines and Army soldiers on the ground. If the fast-moving, high-flying F-35 is supposed to provide the same precise firepower as the low-and-slow A-10, let alone reams of reconnaissance data, it needs a direct connection to the foot troops calling for close air support. And while [the Army and Air Force are working together](#) much less dysfunctionally than ever before, the Marines are still the only service that has both foot troops and fighter jets. That puts them in prime position to thrash out how F-35s and infantry can work together.

"Everything in the Marine Corps has to go down to the ground maneuver commanders....That's the whole reason marine aviation exists to begin with," Schmidle told the Association of the US Navy recently. "I'd like to link everything together from our F-35s to the V-22s to all of our helicopters" and down to ground forces.

That's the mission where Cuomo and his young Marines have taken point. So how are they doing it?

From Flying Blind To Real-Time Intel

Maj. Cuomo has led the Infantry Officer Course in four major airborne experiments since March 2013. In that time the Marines have progressed from flying almost blind to sharing data among ground troops, V-22s, drones, and the mock F-35, with real F-35s intended to join in this September.

In March 2013, the IOC Marines staged their first V-22 raid, flying from Quantico to Parris Island. Cuomo found the aircraft's speed and range impressive — but it outstripped the Marines' command-and-control capabilities. "While flying, we couldn't communicate at all," Cuomo said. "You take off with a certain set of information, you land with the same information."

That meant the Marines' intelligence was two hours out of date when they landed. Even after landing, they had to lug around 43 pounds of unreliable communications gear to share data — intermittently — with higher headquarters. Meanwhile, the "enemy" forces had a system they could fit, literally, in the palms of their hands. "We basically gave them iPhones and said, 'have at it,'" Cuomo recalled. "They ran circles around us."

Long-range aircraft without long-range communications aren't much use. In Iraq and

Afghanistan, Cuomo had fought with "reinforcements three minutes away," he told me. But the Marines don't plan to fight that way in the future. To the contrary, [increasing threats from long-range anti-ship cruise missiles](#) (ASCMs) will keep Navy ships further out to sea, which meant Marines will have to fly further just to reach the shoreline: in the worst case, 300 to 400 miles.

Cuomo had planned V-22 raids over such distances while off the shore of Libya with the [USS Bataan amphibious ready group](#) in 2011, but never executed them. "I was a little disappointed," he said. "I don't think we had employed the V-22 to the maximum extent possible." The desire to explore those capabilities led his experiments at the Infantry Officer Course.

So after a second mock raid flying from Quantico to Florida in August 2013 — intended to test the V-22 in tropical conditions — Cuomo got Lt. Gen. Schmidle's support for a much more ambitious exercise. "He was like, 'You want to go over 1,000 miles, at night, and, fast rope into an urban area to simulate rescuing an ambassador?'"

"Yes, general," Cuomo replied.

"You're serious?"

"Yes, sir."

"Well," Schmidle said, "this is definitely different."

In December, 2013, the thousand-mile raid took off from the Marine training center at 29 Palms, Calif. and flew four hours to Fort Hood, Texas. "We learned a ton," Cuomo said. In stark contrast to the earlier exercises, "we were able to communicate from aircraft to aircraft, to include sending pictures back and forth," exchanging intelligence updates, and rewriting the attack plan in flight. They even received imagery from a Harrier jet sent ahead to reconnoiter the target area. In the future, that role would be played by the F-35.

After the December raid — and another talk with Lt. Gen. Schmidle — came the March 2014 raid on San Clemente Island, using the mock F-35. The next exercise will occur in 29 Palms this June. It'll be similar to the San Clemente raid, he said, except "it's all live-fire at night." Marines will fast-rope out of hovering V-22s, destroy simulated anti-ship missile batteries in both open and urban terrain, get resupplied by a [GPS-guided high-altitude airdrop](#) — the scenario assumes too high an anti-aircraft threat to come in low once surprise is lost — then march 10 miles through "enemy" forces to seize an airfield.

Long-Range Raiders

The kind of mission Cuomo and his young officers are practicing — deep raids to destroy missile launchers and capture airfields — is central to the Marine Corps's evolving concept of future operations.

"We've been looking at a concept known as '[distributed STOVL operations](#),'" Lt. Gen. Schmidle told the Association of the US Navy. STOVL refers to "short take-off, vertical landing," a rare and costly capability for jet aircraft but [something the Marines insisted on for their version of the F-35](#). In addition to launching fighters from [aircraft carriers](#), big-deck [amphibious ships](#), and fixed airbases, the Marines want to exploit STOVL to disperse handfuls of fighters to ad hoc airstrips. A typical detachment, Schmidle said, would be 2-4 F-35Bs accompanied by two V-22s carrying ground crew, supplies, and fuel — in fact, the Marines are working on a "tanker" kit for the V-22 to enable it to refuel F-35Bs in flight — and would operate from an austere airfield for 24-48 hours before returning to the ship.

In a combat zone, of course, someone has to protect these forward airbases — and, in many cases, to capture them in the first place. That's what Cuomo and his Marines are working out how to do. Historically, Marines deploy in smaller forces than does the [Army](#), but the standard Marine Expeditionary Unit (MEU) still has a battalion of ground troops, commanded by a lieutenant colonel. By contrast, the new Marine Corps concept called [Expeditionary Force 21](#) talks about long-distance operations by individual companies of 100-200 Marines, commanded by captains. That's an extraordinary amount of responsibility for young officers — men just a few years older than Cuomo's newly commissioned students.

"When you launch that force 200 to 300 miles deep," he told me, "it doesn't have much support. That force needs to be incredibly capable."

"Some have gotten excited about the technology," Cuomo said, "which I understand, because it's great and it's going to enable us to do all sorts of things." But the most important thing, he told me, is the human beings using the technology. "The advanced technological assets, while great...are making the moral, mental, and physical demands on the Marine infantry greater than they've ever been."

Infantry Officer Course Marines use Samsung tablets to coordinate operations from the back of a V-22



So innovation and initiative by young Marines aren't just important to the experiments at the Infantry Officer Course. Increasingly, they're crucial on the battlefield as well.

Commentary: iPad-Generation Pilots Will Unlock F-35 Capabilities

30 Jul 2014 Robbin Laird & Ed Timperlake

Far from the PR fighting fields of Farnborough, the US Marine Corps is preparing for a surge in the combat capability of the Navy-Marine air/ground expeditionary force. The first squadron destined for initial operational capability (IOC) of the F-35B is the "Green Knights" of VMFA-121 at Marine Corps Air Station Yuma. The aviators and maintainers of this storied squadron are working to bring the first F-35B squadron into service next year, along with Marine Aviation Weapons and Tactics Squadron One (MAWTS-1).

Their approach for an earlier template of innovation can be seen in the dramatic changes associated with the Osprey, which has made Marines the only

tilt-rotor-enabled assault force in the world. With the combination of the Osprey and the F-35B, Marine infantry will be able to operate at distances of over a thousand miles. This is a unique 21st-century combat capability.

The key to the future, as demonstrated at Yuma, is to put the F-35B in the hands of the operators. Already the pilots of VMFA-121 are working closely with Air Force pilots as that service prepares for its IOC in 2016. The Navy is also involved but with less urgency.

As Maj. Gregory Summa, the executive officer of VMFA-121, said, "Working with the other service pilots provides an important window on where we want to go with the concepts of operations of the aircraft. We have different backgrounds — Harrier, F-18s, F-16s, F-22s and F-15s — but we understand that given the commonality of the aircraft,

these different backgrounds suggest common ways ahead. We are all able to contribute to the way ahead for a common aircraft."

Some different ways of operating are suggesting themselves. Historically, there is a one-to-one relationship between combat and mission support aircraft for certain types of insertion missions.

"With the F-35 and its combination of stealth and fused combat missions, we can reduce dramatically the need for mission support aircraft in initial operations," Summa said. "For example, a non-kinetic electronic warfare option is one button push away."

The co-location of VFMA-121 with MAWTS-1 is an important part of the aircraft's introduction. While VFMA-121 is preparing it for IOC, MAWTS-1 is responsible for the tactics and training for USMC aviation. F-35 MAWTS

instructors are flying with VFMA-121 to shape concepts of how to standardize fleet operations for the F-35B.

According to Maj. Gen. Robert Hedelund, a former MAWTS-1 commanding officer and now commanding general of 2nd Marine Air Wing (MAW), "VFMA-121 will figure out how to kill the enemy more effectively and MAWTS will standardize the approach."

Clearly, USMC experience will be informed by the pilots and operators of other services, including allied partners.

Again, an earlier focus on synergy between operators and evolving concepts of operations is underscored by recent successful Osprey combat experience. The Osprey is not a replacement for the CH-46, just as the F-35 is not a replacement for the Harrier or F-18; it is a new page of aviation combat.

It may have taken awhile for the Osprey to enter into service but it has revolutionized USMC operations. The tilt-rotor assault force changed the operational range of the entire Amphibious Ready Group-Marine Expeditionary Unit. An MV-22-enabled infantry force can cover more than 1,000 miles to engage in combat operations and, as seen in Odyssey Dawn in Libya, execute an unprecedented pilot rescue in record time.

Changes will become even more dramatic when the new-generation pilots become the operators of the fleet. In an interview when he was commanding general of 2nd MAW, the now deputy commander of aviation, Lt. Gen. Jon Davis, referred to them as the **iPad-generation** pilots.

"I think it's going to be the new generation, the newbies that are in the training command

right now that are getting ready to go fly the F-35, who are going to unleash the capabilities of this jet," Davis said. "They will say, 'Hey, this is what the system will give me. Don't cap me; don't box me in.'"

We have already seen this with the Osprey: Pilots who have only operated Ospreys working with infantry instructors don't think the same as an older generation.

Anyone who thinks this is a decade of treading in place for US military capabilities is missing the USMC's transformation. The Marines are part of a nascent F-35 global enterprise, and their approach to innovation will infuse the enterprise with considerable dynamism.

Robbin Laird and Ed Timperlake are co-authors along with Richard Weitz of Rebuilding American Military Power in the Pacific: A 21st Century Strategy.

<http://www.defensenews.com/article/20140730/DEFSECT05/307300019/1001/DEFSECT>

Juan Carlos/Canberra Class LHD on DEFENCETALK

'Engines101' 30 Jul 2014

Perhaps I can help here. I have a few years STOVL experience and worked on the F-35B programme as a ship integration engineer.

There is a common (and wholly understandable) viewpoint that the F-35B has 'problems', which include operating from ships. This viewpoint than informs assumptions about what it can and can't do. Here are a few facts that might help inform this thread.

1. The F-35B can vertically land with a full internal weapons load of around 3,600 pounds, plus enough fuel for a go around, full IMC circuit and land. That's a fairly impressive performance for a normal aircraft, let alone one that has to do a VL. But it's not an accident. It was the driving Key Performance Parameter (KPP) for the F-35B. The lift system is performing as per requirements - there is no engine 'performance drop'. The main problem the aircraft had was excessive weight, which caused a significant redesign that started in 2002/3.

2. It can carry out VLs with a full load over a range of temperatures and pressures defined in the customers' requirements. This was the 'US MIL Tropical Day'. However, back in 2002, the UK initiated studies into the possibility of getting back on board at even higher temperatures and lower pressures. This set of conditions was the 'UK Hot Day' (essentially top end of the Persian Gulf in summer months). One of the options for achieving this was the 'Short Rolling Vertical Landing' or SRVL. It's been investigated now for some time, and looks very achievable on a large deck. I think it would be tight on an LHD, but might be possible.

3. MTOW from a ski jump is not yet known, will depend on upcoming tests at at Pax. It will be very similar to MTOW using a normal rolling takeoff. 'StingrayOz' is very much on the button here.

4. The CONOPS for land bases would be to use the full capability of the aircraft to carry out RVLs in around 1,200 feet at higher landing weights (if required) and STOs to take off at MTOW. In both cases, using far less

runway that a conventional aircraft. This would also allow ops from runways at 'hot and high' conditions that rule out many conventional aircraft.

5. So, my view is that an F-35B could operate at designed MTOW off a Juan Carlos LHD up to US Mil Tropical day.

However, 'Sting' (and 'hauritz') are, in my view, off target about high intensity ops, but that's understandable given the amount of disinformation out there about deck heating. This may help.

The F-35B's exhaust environment has been the subject of years of testing. The team know far more about it than the UK ever did with the Harrier. Testing of flight deck and runway materials started in 2003.

The bottom line is that operations from LHD flight decks are fully achievable. The key problem is not deck strength, or melting, but mainly the ability of the non skid coatings to withstand the blast. The same problem affected Harrier operations. Modern coatings are being applied that have excellent resistance, but like any aspect of naval aviation, this will (and can) be managed.

So, my view is that, just like the RN and the USMC have proved for some 30 years, high intensity F-35B ops from an LHD deck are technically achievable. Of course, there has to be other stuff on and in the ship to support that, but the aircraft is not, in my view, the stopper.

As ever, it all depends on what you want the aircraft to do. Sure, the F-35B will not have the same performance in all respects that the F-35A has. But the F-35A can't operate from a ship. That's not a problem as long as you have all the land bases you need to protect a maritime operation. So here's one final set of (hopefully interesting) facts. The first aircraft shot down by a UK aircraft in WW2 was shot down by a naval aircraft. The last aircraft shot down in WW2 was by a naval aircraft. Since WW2, every single aircraft shot down by a UK aircraft has been shot down by a naval aircraft.

Putting aircraft on ships gets the aircraft closer to many of the fights. Choices about F-35B depend (in my view) on the fights you want to get involved in.

Hope this lot helps, and thanks

for allowing me to contribute to the thread.

<http://www.defencetalk.com/forums/navy-maritime/juan-carlos-canberra-class-lhd-12136-11/#post283243>

Folks, Perhaps I can help.

There's no doubt that if the ADF were to add a permanent fixed wing capability to the LHDs then I absolutely agree something that is currently planned for the ship would have to give. But the key word is 'currently'.

In war, things rarely (if ever) go as planned, and as ships have long service lives the only certainty one can offer is that they will end up doing things that they were neither designed or purchased (or intended) to do.

In 1981, I was personally told by a senior RN officer that HMS Invincible (around 20,000 tons) was an 'ASW Command Cruiser', and that 'playing around' with Sea Harriers to provide a 'secondary aviation capability' was 'diverting attention' from their 'proper role'. He meant that sincerely and professionally. Sixteen weeks later we were sailing for the Falklands, where Hermes took the ASW lead and we had to run the air war. Our 'limited' and 'probably ineffective' aircraft (RAF quotes there) were the single vital key

to our success. Very few saw that one coming.

STOVL offers the ability to put a meaningful amount of 'air power' on a smaller hull than any other technical solution out there. And with a bit of ingenuity (which the ADF has in spades) you can put a lot of STOVL 'air' on a small ship. We operated with 7 Sea Harriers, 11 Sea Kings and a Lynx right through the Falklands, beating all existing records for numbers of hours and sorties flown. Hard? Yes. But feasible.

One option would be to run a 'Tailored Air Group' concept, much as the RN did and the USN/USMC do, and adjust the aircraft embarked for the intended mission. Helicopter heavy for amphib ops (with full air cover provided by someone else), some F-35Bs if longer range strike of air defence is required.

All I can do is offer the technical fact and experience. It's an ADF call on how they exploit the ships. But if STOVL is off the table, they might as well take the ski jump off and get a helo spot back.

Hope this stuff is helping.

<http://www.defencetalk.com/forums/navy-maritime/juan-carlos-canberra-class-lhd-12136-12/#post283250>

A DISRUPTIVE CAPABILITY

Putting the LHD and the F-35B together, an engineer's view **WRITER: STEPHEN GEORGE**

There's a lot of attention being given to the possibility of putting the F-35B variant of the Lightning II on board the RAN's new Canberra class LHDs. There's also a lot of discussion, but also some disinclination.

Putting jet aircraft on ships is a fairly arcane art. There aren't many countries that do it, and there's not much international cooperation. So, when politicians pose questions like "Can we put these new stealth aircraft on our big new ships?" a lot of opinions are bound to emerge. However, not many of them are informed. So, let's look at the key challenges that will decide whether F-35Bs could work off the LHDs, and along the way set out some useful information.

The first challenge is space, most importantly on the flightdeck. There has to be space to land, space to take off and space to park. (Yes, size does matter.) A conventional 'cat and trap' naval aircraft requires ships of at least 75,000 tonnes and larger to operate effectively. But STOVL is to naval aviation what these days would be called a 'disruptive technology', and it delivers the ability to put highly capable fighter aircraft to sea in ships of less than 20,000 tonnes.

It's worth pointing out that this 'disruptive' event was not initially noticed by any of the world's navies.

After much travail, the UK and USMC led the way, and found (to the astonishment of many critics) that they could take relatively small ships out in the foulest seas, thousands of miles from home, and stay there for months. Not only that, the Falklands showed that, with advanced weapon technology and highly trained pilots, STOVL aircraft, so often derided for their alleged poor performance, could take on and defeat substantial land-based air forces. It's notable that the F-35B's critics often focus on its allegedly 'inferior' performance – but in modern air combat, it is its sensors and weapons that tip the balance. The Sea Harrier FA2, despite a very limited airframe, was a simply outstanding fighter aircraft throughout the '90s, due to its outstanding radar/missile combination.

Meanwhile, a long and highly effective technology development program led by the US resulted in advanced STOVL concepts designs appearing in the 1990s. As a result, by 1995 the Pentagon was able to set a realistic requirement for the superersonic, stealthy STOVL F-35B, which could operate from the 40,000-ton Wasp class LHDs. This led to a compact aircraft.

“In short, the F-35B would be a very good fit for the Canberra LHD decks.”

● F-35B operations from the USS Wasp during sea trials in 2013. LOCKHEED MARTIN

It also led to an extremely advanced flight control system that gives precise landings and short takeoffs. Fortunately, UK requirements gave it the ability to use a ski jump.

So, for a STOVL aircraft like F-35B, the 27,000-tonne Canberra class are not a 'small' ship – they are significantly bigger than the UK's highly effective invisible class STOVL carriers (and, by the way, much bigger than the RAN's last carrier, *HMAS Melbourne*). The LHD's flightdeck is very close in size to that of the Wasp class, but with the massive advantage of a ski jump. This would allow full use of the whole flightdeck length, as aircraft doing 'flat deck' STO launches have to lift off well before they reach the deck edge. The ski jump would also deliver significant improvements in launch weight (over a ton) and safety, especially for night ops. The elevators are big enough and strong enough to take the F-35B. In short, the F-35B would be a very good fit for the Canberra LHD decks.

Other dimensions would need to be checked, but remember, F-35Bs are designed for smaller ships. They don't need high deckheads (ceilings), and can be packed close together.

A tightly constrained 'maintenance box' was ruthlessly applied during development to make best use of valuable space, as was a requirement

for a very small logistics footprint. Of course, an aircraft like the F-35B is going to make demands on space elsewhere in the ship. Some of these, like fuel and other consumables will already have been covered. Weapon stowages would need to be checked, but the UK's experience is that with determination and ingenuity, squadrons make excellent use of the space available to get the job done. It's a normal part of naval aviation.

There are understandable concerns about the challenge posed by the F-35B's jet blast. But it needs to be understood that this issue has been considered, researched and tested right from the start of the F-35 program. The jet blast has been computer-modelled, tested in sub-scale rigs, tested on engine rigs and finally exhaustively tested during early flight tests. New and highly effective flightdeck coatings have been tested and trialled, and are being adopted by the USN and the Royal Navy. Consequently, the F-35B's impact on flightdecks is understood and manageable. It's possible that some minor ship modifications may be required, including protection for deck equipment, or possibly even deck reinforcement, but measures like these are normal for STOVL operations on ships.

Let's look at the challenge of the F-35's operational effectiveness from the ship. It's been argued that F-35Bs would 'displace' other aircraft on the LHD flightdeck and would lead to 'loss of capability'. This appears to ignore the significant capability the F-35B would bring to the fight.

Concerns have also been expressed over whether both fixed and rotary-wing aircraft could safely be operated from a single deck. These concerns reflect a lack of appreciation of what can be achieved from comparatively small flightdecks. The simple fact is that operating different types of aircraft simultaneously from small spaces is, like handling jet blast, a routine and well-understood aspect of naval aviation. It happens all the time, and with training, practice and a healthy dose of common sense, it can be carried out effectively and safely. This 'challenge' can be turned into a real opportunity. A space like the LHD's flightdeck could be used by 'tailored' air groups, composed



● Australia's LHDs have the deck space to operate F-35Bs, writes

of varying numbers of different aircraft (types so as to meet the (often unexpected) tasks that circumstances will present. This is normal practice for the USMC from their Wasp class ships, it was trialled by the USMC from UK carriers, and it would be wholly practicable to use Canberra class LHD flightdecks in the same way. This would give the ADF an extremely flexible and adaptable force asset.

There is a key point here, which is not well understood by those unfamiliar with naval aviation, and it's this: aircraft and ships can deliver operational effect very, very efficiently indeed. Packing aircraft, stores, fuel, weapons, support facilities and personnel close together on a ship results in high sortie rates and high operational tempo. In short, a lot of aviation 'bang' for the 'buck'. This fact has been demonstrated many times over many years, from the South Atlantic to the Bay of Sirt, from Korea to Suez, and it is a highly attractive feature for operational commanders (and politicians).

The amount of 'air' an LHD could generate from five to 10 F-35Bs, and the amount of time it could be maintained for, would startle anyone who hasn't done 'STOVL at sea'.

There's another key point. Aircraft carriers can move about – this allows them to optimise their distance from the target, depending on the threat. (Incidentally, it also makes them a lot harder to find and hit than airfields.) The recent Libya campaign showed that while land-based aircraft could deliver operational effect at long range, it also showed that carrier-based aircraft could deliver more sorties in a short time, and react more quickly

“Put simply, maritime aviation usually gets to the fight first.”

to emerging threats. Using USN and USMC carrier-based aircraft, with excellent assistance from the French, very effectively delivered the initial (and crucial) phase of the air campaign.

Put simply, maritime aviation usually gets to the fight first. Since the end of WW2, every single enemy aircraft shot down by a British aircraft has been shot down by a naval aircraft. It's not that naval aviators are better than their land-based counterparts – it's just that they usually get the first chance.

Here's the punch line: coupling high sortie rates with the ability to minimise distance to the target is the essence of naval aviation, and proximity equals capability.

Arguably, the key challenge in delivering that capability would not be the physical aspects of putting the F-35B on board the LHD. The real challenge would be regenerating the required operating expertise and special skill-set that's required to deliver that valuable and rare commodity called 'naval aviation'. Fortunately, Australia has a strong Fleet Air Arm heritage, and a number of ex-RAN aviators who were (not that long ago) involved in the UK's Sea Harrier operations. They were an absolutely outstanding group of aviators.

The Australian government could do worse than assembling some of that priceless maritime STOVL experience and putting it to work assessing the F-35B/LHD option. The US does this extremely well, and the 'greybeards' would, I am sure, be invaluable in looking at the F-35B/LHD combination as knowledgeable naval war fighters.

Regenerating a fixed-wing naval aviation capability would be the key to exploiting the F-35B at sea – but there is no doubt the RAN would be equal to the challenge. The question is, then, does the Australian government and the ADF have the courage, imagination and funds required to 'give it a fair go'?

● Stephen George is a former Air Engineering Officer in the Royal Navy, with postings including Air Technical Desk Officer in the UK Embassy in Washington DC and Air Engineer Joint Force Harrier. He subsequently worked for BAe Systems as engineering manager on the Joint Strike Fighter project. Since 2007 he has run his own consultancy business specialising in defence acquisition, project management and systems engineering. ■



Australia receives first Canberra-class LHD 09 Oct 2014 James Hardy

<http://www.janes.com/article/44335/australia-receives-first-canberra-class-lhd>

“The Australian government has accepted the first of its two Canberra-class landing helicopter docks (LHDs) from BAE Systems, the vessel's prime contractor said in a statement on 8 October. The ship will remain at BAE Systems' Williamstown shipyard in Melbourne before its commissioning at Sydney later in 2014, the statement added. It is due for delivery to the Royal Australian Navy (RAN) on 28 November.

Canberra , which is based on Navantia's Juan Carlos I aircraft carrier design, completed its final contractor sea trials in late August.

Work is progressing on second ship Adelaide , which arrived in Australia for outfitting in February after being transported from Navantia's Ferrol yard in Spain. Adelaide is scheduled to begin sea trials in the second quarter of 2015, with delivery expected in 2016....”

BAE Australia wins LHD support contract 28 Sep 2014 Jon Grevatt

<http://www.janes.com/article/43772/bae-australia-wins-lhd-support-contract>

“Australia's military procurement agency, the Defence Materiel Organisation (DMO), has awarded BAE Systems Australia a contract to provide support for the Royal Australian Navy's Canberra-class landing helicopter dock (LHD) vessels.

A statement by the Australian Department of Defence (DoD) on 26 September said the support contract is valued at AUD220 million (USD191 million) and will run for four years as the LHD programme transitions from the acquisition and outfitting phases to operational service with the RAN.

The DoD added that the majority of work under the "LHD transition in-service support contract" will be undertaken in Sydney where the two LHDs will be based.”

NUSHIP Canberra Live Aircraft Collective Training

Date: 26.08.2014 Duration: 2:11 RAN

"NUSHIP Canberra's Air Department conducted collective training with live aircraft on the multispot "dummy" deck which is used for Landing Helicopter Dock flight deck training at HMAS Albatross. Check this video out for more information about the training."

48Mb .MP4 video: http://cp114370.p1.videos.viostream.com/download/1563_169418_85385_mp4hd.mp4

NUSHIP Canberra AVN Mission rehearsal Training

Date: 28.07.2014 Duration: 2:46 RAN

"NUSHIP Canberra's Air Department conducted mission rehearsal training on the multispot "dummy" deck which is used for Landing Helicopter Dock flight deck training at HMAS Albatross. Check this video out for more information about the training."

63Mb .MP4 video: http://cp114370.p1.videos.viostream.com/download/1563_168614_41228_mp4hd.mp4

NUSHIP Canberra Duty Watch Certification

Date: 09.10.2014 Duration: 2:58 RAN

"Members of NUSHIP Canberra's first Duty Watch teams are preparing to take responsibility for the first Landing Helicopter Dock – the largest ship ever built for Navy. The Duty Watch teams will be responsible for the safety and security of the ship while in harbour. Find out what the teams are up to by watching this video."

67Mb .MP4 video: http://cp114370.p1.videos.viostream.com/download/1563_170631_47351_mp4hd.mp4

NUSHIP Canberra sails into Sydney

Date: 11.04.2014 Duration: 2:00 RAN

"NUSHIP Canberra made history last month when she sailed into Sydney Harbour for the first time. The first of two Landing Helicopter Dock ships being built for the Navy, Canberra's visit to Sydney was part of the contractor sea trials and testing program. This program proves systems and equipment prior to the ship being delivered to Defence. The ship conducted a planned commercial docking in Sydney for a hull clean and final paint. As Canberra docked down, her size and scale was readily apparent. The Sydney-based ship's company took the opportunity to conduct important familiarisation and induction training while the ship was in her future homeport. The ship's four Duty Watch teams carried out security and damage control training in preparation for taking responsibility for the ship. Canberra has now departed Sydney to continue contractor sea trials. These trials will include a set of propulsion, speed and endurance trials on the way back to Melbourne. Canberra is returning to Williamstown to prepare for the final phase of Contractor sea trials involving communications and combat systems."

44Mb .MP4 video: http://cp114370.p1.videos.viostream.com/download/1563_165071_12899_mp4hd.mp4

Australia Mulls F-35Bs For Its New Assault Ships 27 Oct 2014 Aviation Week

<http://awin.aviationweek.com/ArticlesStory.aspx?id=4a8b94d5-eb7f-4aac-8408-a1417bbfd80d>

“BAE Systems has handed over the first of Australia’s two new assault ships as the government considers whether to equip the vessels with a squadron of Lockheed Martin F-35B Lightnings.

The move would reintroduce fixed-wing combat aircraft to Australian naval service after a gap of more than 30 years. However, it lacks backing from the three armed services and looks difficult to justify, even as the government shows a willingness to boost the defense forces with more Boeing C-17 airlifters and Airbus KC-30 tankers.

The first of the new flat-topped assault ships will be commissioned into the Royal Australian Navy (RAN) this year as HMAS Canberra. The second ship, the future HMAS Adelaide, is due to run contractor sea trials in the second quarter of next year ahead of delivery in the third quarter, says prime contractor BAE Systems....

Prime Minister Tony Abbott has told the defense department to consider F-35Bs, says an adviser to the government on defense policy. Indeed, Abbott appears to have personally proposed the idea ahead of the publication of a defense white paper next year. Japan is facing a similar decision as it proceeds with plans for at least one air-capable assault ship (AW&ST Aug. 19, p. 32).

“Matters of this kind will be considered in the context of the 2015 Defense White Paper,” says the defense department, declining to elaborate on its considerations. Defense Minister David Johnston said in May that the order was a possibility. Australia is considering establishing two F-35B squadrons, says analyst Ben Schreer of the Australian Strategic Policy Institute, adding that probably **18-24 aircraft would be needed. Including modifications to the ships, the cost would exceed AUS\$5 billion (\$4.4 billion).**

Neither the RAN, Australian Army nor, least of all, Royal Australian Air Force (RAAF) is publicly supporting the idea. For the RAAF, the purchase could put an end to its long-term hopes of acquiring 28 F-35As to add to 72 already approved....”

Jump jets for the ADF? 17 Nov 2014 <http://apo.org.au/research/jump-jets-adf>

Richard Brabin-Smith, Benjamin Schreer | **Australian Strategic Policy Institute**

“This report argues that the costs of Australia acquiring F-35B Joint Strike Fighter short take-off, vertical landing aircraft outweigh the potential benefits.

Overview https://www.aspi.org.au/publications/strategic-insights-78-jump-jets-for-the-adf/SI78_jump_jets.pdf (200Kb)

Is there a case for Australia to acquire F-35B Joint Strike Fighter short take-off, vertical landing (STOVL) aircraft to operate from the two new Canberra-class landing helicopter docks (LHDs)? The government has directed that this question be addressed in the development of the 2015 Defence White Paper. This report is an independent assessment of the costs and potential benefits of such an acquisition. Reintroducing organic naval air power into the ADF would be a big strategic decision, and very complex and expensive, so it's important to have a clear view of the circumstances in which it might be beneficial enough to be worth pursuing. And it's important to be aware not only of the direct costs but also of the potential risks and opportunity costs. Overall, this report concludes that the benefits would be marginal at best, wouldn't be commensurate with the costs and other consequences for the ADF, and would potentially divert funding and attention from more valuable force.”

Jump jets for the ADF?

78

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Richard Brabin-Smith and Benjamin Schreer

Is there a case for Australia to acquire F-35B Joint Strike Fighter short take-off, vertical landing (STOVL) aircraft to operate from the two new Canberra-class landing helicopter docks (LHDs)? The government has directed that this question be addressed in the development of the 2015 Defence White Paper.

This report is an independent assessment of the costs and potential benefits of such an acquisition. Reintroducing organic naval air power into the ADF would be a big strategic decision, and very complex and expensive, so it's important to have a clear view of the circumstances in which it might be beneficial enough to be worth pursuing. And it's important to be aware not only of the direct costs but also of the potential risks and opportunity costs. Overall, this report concludes that the benefits would be marginal at best, wouldn't be commensurate with the costs and other consequences for the ADF, and would potentially divert funding and attention from more valuable force structure enhancements.



https://www.aspi.org.au/publications/strategic-insights-78-jump-jets-for-the-ADF/SI78_jump_jets.pdf

November 2014

STOVL jets and their potential

Carrier-based aviation could provide a future government with greater military flexibility in regional and global contingencies. A carrier enables the projection of air power independently of land bases, thereby enhancing political freedom to manoeuvre without relying on the agreement of host nations. Proximity to the area of operations can also allow a more rapid response to tactical developments than might be available from land-based aircraft. Moreover, depending on circumstances, a carrier's mobility could provide a level of protection from detection and attack not available to fixed assets on the land.

Because of the potential to launch STOVL jets from the Canberra-class LHD's 'ski jump' deck configuration, it's tempting to see the LHD as a potential 'mini' aircraft carrier. With 27,000 tonnes displacement and 230 metres of deck, it will be Australia's biggest ever warship. But it will be much smaller than most traditional carriers, such as the US Navy's nuclear-powered 100,000-tonne *Nimitz* class and the future *Ford* class, the UK's future 65,000-tonne *Queen Elizabeth* class, France's nuclear 42,000-tonne *Charles de Gaulle*, and China's 59,000-tonne *Liaoning*. Those ships have been optimised for sustained fleet protection and land attack. That also applies, to a more limited degree, to dedicated 'light carriers' such as Italy's 30,000-tonne *Cavour* and the now decommissioned 22,000-tonne British *Invincible* class (see the appendix to this report for details).

In contrast, just like the 26,000-tonne Spanish *Juan Carlos I* LHD from which they're derived, the Canberra-class LHDs are designed as multi-role amphibious assault ships. Their primary purpose is to embark, disembark and support ground forces for a variety of missions. That also applies for much larger amphibious ships of the US Marine Corps, such as the 41,000-tonne *Wasp* class and the 45,000-tonne *America* class. Even though those ships will embark F-35Bs, their main role is to project and sustain land power from the sea.¹ However, the Spanish Navy also plans to use its LHD as an 'aircraft carrier', given its ability to embark STOVL aircraft, e.g. for fleet protection and power projection.

In principle, Australia's LHDs could be configured for the same purpose. But it's important to recognise that we still wouldn't play in the big league of aircraft carriers. The finite capacity of a Canberra-class LHD imposes constraints. The LHD couldn't carry its full complement of helicopters and amphibious troops with their vehicles and equipment and simultaneously deploy a useful number of STOVL aircraft and any additional support aircraft that might be needed. The latter could include helicopters for airborne early warning (which the ADF currently doesn't have), antisubmarine warfare and search and rescue, although conceivably some of the helicopters could be operated from other ships in company. In some respects, this ability to choose can be seen as evidence of flexibility, not as a constraint, but that misses the point: on any one operation, the more that an LHD embarked STOVL aircraft for air defence or ground attack, the less would be the remaining capacity for amphibious operations.

Currently, the ADF intends that each LHD will embark, transport and deploy about 1,200 personnel (along with their equipment and aviation units) using a range of helicopters and landing craft. This configuration is optimised for ADF amphibious operations and lodgements in permissive and low-intensity environments. Missions could include stabilisation operations in the South Pacific, non-combatant evacuation operations, and humanitarian assistance and disaster relief. Helicopters armed with Hellfire air-to-surface missiles could be used if there were limited threats to the disembarking force.

At the other end of the scale is the option to embark a maximum number of F-35Bs for fleet protection and force projection. Presumably, this configuration would be for more intense conflicts, either independently or as part of coalition operations. The flight deck should be able to accommodate from six to eight STOVL aircraft. If the hangar were used to the full extent, the ship could probably carry between 12 and 16 jump jets.² But the LHD would also need to embark one or two airborne early warning helicopters (at least) to support STOVL operations, thus reducing the number of F-35Bs. Furthermore, because of the relatively small number of STOVLs, the LHD would face challenges in generating enough F-35B sorties continuously to protect itself and ships in company against a capable adversary. The constrained range and weapons payload of the F-35B could also limit its effectiveness in land-attack, compared to the A and C variants of the Joint Strike Fighter.

Last, the LHD could potentially embark a mix of STOVL jets and helicopters to provide air cover for a landing amphibious force, to attack ground-based threats (such as mortar positions) or as a show of force to intimidate hostile elements. The LHD would

probably need to embark a minimum of four F-35Bs to enable the simultaneous deployment of two aircraft. While this would reduce the space for helicopters and storage facilities for amphibious operations, the ADF should still be able to embark a sizeable amphibious force. However, if the threat levels faced by the amphibious force in such contingencies were low, it's doubtful whether F-35Bs would really be needed.

Direct and indirect costs

Carrier-based aviation would be a multibillion-dollar defence investment and would be likely to take more than a decade to develop because of the capability's complexity. There's also a need to consider risks associated with the F-35B program and opportunity costs in the future equipment program.

Modifying the ship won't be enough

As built, the LHDs have been optimised for amphibious operations using helicopters and watercraft. They don't have the air traffic control, specialised maintenance facilities or storage for fuel and weaponry needed for STOVL operations. The flight deck would also require heat-resistant coating to deal with the heat generated by the F-35B's exhaust.³ An informal estimate of the costs of modifying one LHD would be around \$500 million, although that figure would require confirmation.

Further, a decision to acquire F-35Bs could increase the pressure to get more ships and other supporting assets. A flexible 'part-time' jump jet capability where the LHDs are configured according to the specific mission sounds good in theory. However, it's hard to see how, with only two LHDs, the ADF could avoid compromising its ability to prepare adequately for both mission sets, let alone have at least one ship ready to deploy at any given time. If the goal were to use one LHD as a full-time power projection capability with the maximum number of STOVL aircraft while simultaneously retaining the amphibious component for the ADF, at least one more LHD (\$1.5 billion) and possibly another air warfare destroyer for protection (\$2 billion) would be needed. The ADF would also need to buy airborne early warning helicopters and more antisubmarine warfare helicopters to support the STOVL capability. All up, making the STOVL capability work would be likely to require considerably more money than that required to modify the LHDs and buy the jets.

The F-35B: risky, expensive and less capable

Because of its stealth characteristics, advanced sensors, and range and payload, the F-35B will be more capable than the Harrier STOVL aircraft currently used by the US and others. The US Marine Corps plans to use it for amphibious assault against highly capable adversaries. However, the aircraft remains controversial because of technical problems and major cost overruns. The F-35B is also the most expensive Joint Strike Fighter variant. Table 1 shows the Pentagon's estimated 'flyaway' costs per unit once the full production rate has been reached.

Table 1: US Department of Defense projected F-35 flyaway costs per unit (US\$ million, 2012)

	Joint Strike Fighter variant		
	F-35A	F-35B	F-35C
Airframe	66.0	76.8	78.2
Engine	11.7	28.7	11.5
Total	77.7	105.5	89.7

Source: Jeremiah Gertler, *F-35 Joint Strike Fighter (JSF) Program*, Congressional Research Service, Washington DC, 29 April 2014, p. 17.

The flyaway cost excludes some acquisition costs (for example, facilities, initial spares, weapons, simulators and so on) and life-cycle costs. It's also based on assumptions about future inflation rates, production learning curves and numbers of aircraft sold. Even this conservative 'best case' figure means that the government would have to spend roughly \$5 billion for two

squadrons (18–24 aircraft) of F-35Bs, plus about another \$7 billion for through-life costs (over, say, a 25–30-year period). More accurate assessments of through-life costs (which are almost always underestimated) would need to take account of the very high technological complexity of *any* of the F-35 variants.

These are significant sums, both in absolute terms and in foregone opportunities to acquire other defence capabilities instead. One of the questions the government needs to answer is whether the F-35B acquisition would be at the expense of any of the Air Force's F-35As, or other critical capabilities that would add more value for the ADF than the STOVL option. That might include more capable future frigates, enhanced special forces, a capability for defence against ballistic missiles, or the V-22 Osprey helicopters, which could also be operated from the LHDs.

The ADF would also need to ensure that the Navy's focus on STOVL training did not come at the expense of other activities, particularly in the area of joint force training with the LHDs for amphibious operations. The potential for STOVL training to disrupt the ADF's emerging amphibious capability would be significant, not least because of the complexities of carrier operations and the time and effort required to develop skills and doctrine.

Last, modifying the LHDs would mean taking them out of service for quite some time, although the effects of that could be mitigated by making the modifications at the same time as scheduled refits or maintenance.

It should also be noted that the F-35B STOVL has a shorter combat range and a lighter weapons payload than the land-based F-35A or the conventional take-off F-35C carrier version (Table 2).

Table 2: F-35 variants compared

Variant	Range (internal fuel)	Combat radius (internal fuel)	Weapons payload	Standard internal weapons load
F-35A conventional take-off and landing	>1,200 nm / 2,200 km	>590 nm / 1,093 km	8,160 kg	25 mm GAU-22/A cannon 2 x AIM-120C air-to-air missiles 2 x 2,000 pound GBU-31 JDAM guided bombs
F-35B short take-off / vertical landing (STOVL)	>900 nm / 1,667 km	>450 nm / 833 km	6,800 kg	2 x AIM-120C air-to-air missiles 2 x 1,000 pound GBU-32 JDAM guided bombs
F-35C conventional carrier take-off and landing	>1,200 nm / 2,200 km	>600 nm / 1,100 km	8,160 kg	2 x AIM-120C air-to-air missiles 2 x 2,000 pound GBU-31 JDAM guided bombs

Source: Lockheed Martin Australia, <http://www.lockheedmartin.com/au/us/products/f35.html>

In addition, all F-35 variants are able to carry weapons and external fuel under their wings, although this adds drag and reduces stealth. Nevertheless, the F-35B couldn't carry the modern Norwegian Joint Strike Missile—which could become the standard missile for the F-35A and F-35C variants—because of size and mass considerations.⁴

Where would it make sense?

What are the circumstances in which such a capability might be used? And could other capabilities achieve a similar or sufficient effect? The ADF's 'principal tasks', established over many years, provide a good analytical framework for assessing the potential utility of STOVL operations for Australia. Those tasks include operations in the defence of Australia, operations in the South Pacific, contingencies in Southeast Asia, and support of the US alliance in 'wider operations'.

As with all military operations, there would be occasions when the risk of serious loss would outweigh the benefit expected from the deployment. That is, vulnerabilities against different threat levels have to be taken into account. The LHDs would need to be protected from missile and torpedo attack. This means that, except in trivial cases, an LHD would need escorts such as air warfare destroyers and submarines to help protect it. Operations in high-threat environments would also require high levels of intelligence, surveillance and other support, including from land-based aircraft in at least some cases.

Jump jets for the defence of Australia?

It's axiomatic that most, if not all, operations in the direct defence of Australia would be conducted from Australia, especially from the air bases across the north of the country. This is especially true of the protection of the Australian mainland. To the extent that coastal shipping might need protection and, specifically, defence against air attack, that would also be provided from the land. But such occasions would be rare, not least because of the infrastructure in place on the land, such as the all-weather railway from the south to Darwin and the steadily improving network of roads. If a high level of protection of coastal shipping were needed, it would be achieved in the first instance from dedicated land-based fighter aircraft, supported by in-flight refuelling, over-the-horizon radar, airborne early warning and control aircraft and Growler electronic warfare aircraft. Missile-equipped destroyers (air warfare destroyers) could also be used for air defence. While carrier-embarked STOVL aircraft could also make a contribution to the control of Australia's air and maritime approaches, it's hard to see how that further margin of capability would add value commensurate with the costs.

Strike operations would be conducted in the defence of Australia. The options here are wide. They would include land-based aircraft such as the F/A-18 Super Hornet and the F-35A, supported by in-flight refuelling and Growler aircraft. Other options include land-strike missiles launched by surface ships and submarines, the use of armed drones (UAVs), and perhaps in the future hypersonic missiles (if they could be justified as a priority in Australia's strategic circumstances). In sum, within the range of our land-based strike systems, the additional benefit from STOVL fighters seems to be marginal at best. There would also be the need to provide defence of the LHD and accompanying ships, especially against submarine and air attack. Although there could be situations in which the closer range to a target from an LHD could be an advantage, in most circumstances strategic strike, if properly planned, wouldn't need such a rapid response.

Proponents of a jump-jet capability might also argue that there could be operations in the direct defence of Australia that would require the ADF to operate beyond the combat radius of land-based strike aircraft. LHD-embarked F-35Bs could therefore give a forward-deployed joint task force an added layer of air defence, with options for anti-ship missions, land-strike and reconnaissance. However, beyond the range of land-based air cover, the protection of the maritime task force would become much more difficult and would require the continuous employment of at least half of the embarked STOVL aircraft for air defence tasks. This would leave a much reduced number for strike operations. While it's important to avoid circular arguments, it's also reasonable to assume that if the adversary were such as to merit strike operations against targets distant from Australia using the STOVL option, it would be quite capable of posing significant risk to the maritime strike force being used to project power in this way.

STOVL for the South Pacific?

Australia has a key interest in the stability of the South Pacific and has often deployed the ADF to places such as Bougainville and the Solomon Islands to help defuse tension and to re-establish conditions in which disputes could be resolved peaceably. Similar operations are highly likely in the future and could well warrant the use of an LHD configured for amphibious operations.

However, on such operations Australia has so far used lethal force only sparingly, and experience shows that there's little if any need for high levels of combat air support. To the extent that aerial firepower might be needed, armed helicopters embarked on the LHDs should be sufficient. It requires a lot of imagination to argue that the security situation in the islands would require the use of sophisticated STOVL aircraft to get a satisfactory resolution. The South Pacific would have to be radically different from what it is today.

To at least a first approximation, such arguments apply to Papua New Guinea (PNG), too. Bougainville aside, the many challenges that PNG faces are more social and economic than military. The special case of the land border between PNG and Indonesia has been a cause for concern in the past, as West Papuan militants sought sanctuary on the PNG side of the border. But this issue and the associated tensions have been far better managed in recent years. Were Australia to contribute to the defence of PNG against

external armed attack (under the provisions of the 1992 Joint Declaration of Principles), Canberra would reasonably expect to be able to operate aircraft from land bases in that country (and in some cases to operate out of bases in northeastern Australia).

It's possible, however, to imagine circumstances in which STOVL aircraft operated from an LHD could make a useful tactical contribution; for example, by being positioned close to an area of operation, the jump jets might be able to respond more quickly than land-based aircraft. And there's scope to debate the respective vulnerabilities and risks: land bases require land forces to protect them from ground attack (including from special forces), the LHD needs protection against surface and submarine attack and both require air defence. Clearly, the details and conclusions depend on the scenario and the capabilities and intent of the adversary against which Australia would be helping PNG defend itself. But, given the string of assumptions that need to be made to support the case, it would be drawing a very long bow to argue that PNG contingencies provide a reason for Australia to acquire STOVL aircraft for its LHDs.

STOVL and Southeast Asia

The principle that Australia should seek to find its security 'in and with Asia, not against Asia' is also well established. What, then, might be the value of the STOVL option to Australia's ability to contribute to the security of that part of Asia closest to us? Identifying the circumstances in which Australia might want to conduct operations in the defence of Southeast Asia requires much speculation. Would it be a conflict or the threat of conflict between two or more ASEAN members? Could it be the prospect of operations by a major Asian power against one or more of the ASEAN countries? What would have to be at stake for Australia to make more than a modest contribution to the campaign? Would Australia itself be one of the countries under attack?

In any event, if the Australian Government decided to make a significant contribution, the ADF would reasonably expect to be able to operate land-based aircraft from the country whose own defensive efforts Australia would be supporting, or with whom we could come under common attack.⁵ Just as for operations in support of PNG, it's difficult to conclude that such contingencies could justify the STOVL option. That's also because the ability of the hypothetical major power to attack the deployed ADF elements, including the LHDs, would need to be taken into consideration (as would the potential threat to the Australian homeland). Indeed, while all deployed forces would need protection, the consequences for a deployed LHD would be serious because of the trade-off between configurations of aircraft for air defence and strike made necessary by the ship's finite capacity. Again, depending on the assumptions about the scenario, the need for protection against submarine attack could be acute.

In sum, it's not clear what added operational value an STOVL capability would bring to the ADF in Southeast Asian contingencies.

Supporting US alliance operations

Finally, consistent with Australia's US alliance, the LHD/STOVL capability could be used to support alliance operations in 'wider conflicts'. What are the scenarios in which Australia might contemplate the deployment of its 'mini-carrier' LHD and STOVL jets to support the US?

The worst case would probably be a US–China conflict. If that were to happen, any Australian Government would need to consider that China would most likely be in a position to pose a very high risk to forward-deployed ADF task groups, including the LHDs. The People's Liberation Army has embarked on a comprehensive modernisation program designed to prevent large surface ships, including US carriers, from operating near China. Investments in anti-ship ballistic and cruise missiles, submarines, and improved air defence systems provide the backbone of China's A2/AD (anti-access/area-denial) strategy. As a result, the US Navy is reconsidering the future of its carrier operations, including moving the ships further away from the reach of China's missiles.⁶ The proliferation of precision-strike systems also has implications for amphibious operations. At a minimum, large carriers and amphibious assault ships will be pushed further out to sea. Consequently, the US Marines are examining how to project and sustain power ashore over greater distances.⁷

A forward-deployed Australian LHD and its accompanying naval task group in support of high-intensity US operations in maritime East Asia would therefore face very serious risks. Moreover, it's unclear how even a full complement of 12 to 16 STOVL aircraft would be an important contribution to a US coalition operation.⁸ There'd be other, more effective ways for Australia to contribute to such a campaign, such as with submarines and land-based aircraft. As well, the operational demands of such contingencies would be very high, requiring intense (and costly) levels of training, including intensive joint training with the US. Before Australia tried to go down that path, it would need to be particularly confident that the US saw that this was the best way for the ADF to work with US forces. Operating LHDs with STOVL aircraft in North Asian contingencies would pose very high risks for the Australian forces, for little apparent military benefit for the US.

Outside the Asia-Pacific region, the ADF could be deployed alongside the US in the Middle East. A common argument for carrier-based aviation in that part of the world is that the use of foreign land-bases might not always be possible. However, a future scenario in which no Arab country (or Turkey or Israel) would offer the use of its air bases assumes a fundamentally transformed Middle East, united against US-led interventions. Indeed, the current conflicts in Iraq and Syria provide a more realistic model for future access to land bases. While Turkey has denied the US coalition the use of its air bases for strike operations, the United Arab Emirates, Jordan and Saudi Arabia offered to host allied fighter and support aircraft. It's prudent to assume that the Royal Australian Air Force would have access to land bases if Australia wanted to make a contribution to a future coalition air campaign in the region.

There's also the option of modifying the LHDs without acquiring the aircraft, in order to allow STOVL operations by US Marines during joint operations. The US Marine Corps often conducts bilateral carrier landings, usually using helicopters, to improve interoperability and cooperation with other nations. This could be a relatively low-cost investment and would provide the ADF with experience in STOVL operations without having to commit to a full-scale acquisition program. Nevertheless, the option would still run the risk of being tokenism. Questions of sovereignty would also have to be addressed.

Conclusions

This paper has been written without the benefit of access to privileged information about costs and capability, and has not explored every conceivable contingency in which STOVL aircraft might be used. Nevertheless, the overall conclusion is clear: the cost-benefit analysis is not in favour of developing LHD/STOVL aviation for the ADF. The scenarios in which an LHD/STOVL capability would be realistically required and make an important operational impact are vague, at best. Therefore, the 2015 Defence White Paper should not announce a decision or intention to acquire jump jets for the ADF. There's no urgency to reach a decision next year. Furthermore, unless the government provides a compelling strategic narrative and significantly more money, there would be a real danger that the White Paper would raise unrealistic expectations about a much more muscular Australian strategic posture (including additional military capability).

Nevertheless, if the government is still interested in exploring STOVL, it should get an independent assessment of the potential costs and risks. Areas to be covered should include modifications to the two LHDs; the status of the F-35B program and 'best', 'medium' and 'worst' case costings (including operating costs); the likely impact on other ADF projects, including the amphibious capability; and the further costs for an additional LHD and escort ships. Opportunity costs in the future equipment program need particular consideration: there are likely to be better ways to spend the money that the STOVL option would require.

Finally, if carrier-based aviation were deemed necessary to support a much more muscular Australian military posture for regional and global deployments, the government should instead consider acquiring dedicated aircraft carriers to form the core of a serious naval battle group. However, as ASPI has shown in previous publications, the costs for such a capability would be considerable.⁹ Even for major powers, a carrier capability is enormously complicated and expensive, and its operational utility could become increasingly contested with advances in warfighting technology.

Appendix: Aircraft carriers and large amphibious ships

Country	Class	Tonnage (full displacement)	Under construction	Planned	Role	Remarks
United States	10 Nimitz-class carriers (nuclear powered)	Approx. 97,000 tonnes	Gerald R Ford class (100,000 tonnes)	2 x Gerald R Ford class	Aircraft carriers	
	8 Wasp-class LHDs	44,000 tonnes	America-class (45,600 tonnes)	11 America-class	Amphibious assault	America class to replace Wasp class
India	INS <i>Viraat</i> (to be decommissioned in 2017)	28,700 tonnes	INS <i>Vikrant</i> (40,000 tonnes)	INS <i>Vishal</i> (65,000 tonnes)	Aircraft carrier	INS <i>Vishal</i> could be nuclear powered carrier with catapult launch
	INS <i>Vikramaditya</i>	45,400 tonnes				
China	<i>Liaoning</i> (Admiral Kuznetsov class)	59,000 tonnes	First Chinese-designed carrier	Possibly 3	Aircraft carrier	
France	<i>Charles de Gaulle</i> (nuclear powered)	42,000 tonnes	–	–	Aircraft carrier	Joint carrier operation with UK planned
Russia	Admiral Kuznetsov	55,200 tonnes	–	Possibly 1	Heavy aircraft-carrying cruiser	Plans for advanced carrier in the 2030s
Brazil	<i>Sao Paulo</i> (Clemenceau class)	32,800 tonnes	–	–	Aircraft carrier	Built in 1960, currently under maintenance
Thailand	HTMS <i>Chakri Naruebet</i>	11,500 tonnes	–	–		Disaster relief
United Kingdom	Queen Elizabeth class (HMS <i>Queen Elizabeth</i>)	70,000 tonnes	HMS <i>Prince of Wales</i>	–	Aircraft carrier	IOC for HMS <i>Queen Elizabeth</i> expected by 2020
Italy	<i>Giuseppe Garibaldi</i>	13,850 tonnes	–	–	Light aircraft carrier	
	<i>Cavour</i>	30,000 tonnes	–	–	Light aircraft carrier	Plans to acquire F-35Bs for the <i>Cavour</i>
Spain	<i>Juan Carlos I</i> LHD	26,000 tonnes	–	–	Multi-purpose amphibious assault	Plans to operate F-35Bs
Australia	Canberra-class LHD	27,500 tonnes	Canberra	Adelaide	Multi-purpose amphibious assault	
Japan	Izumo-class helicopter destroyer (DDH)	27,000 tonnes	One additional Izumo class	–	Primarily used for anti-submarine warfare	No indication of plans to operate STOVL aircraft

In addition, South Korea is considering equipping the second ship of the Dokdo-class landing platform helicopter ships with a 'ski-ramp' for possible STOVL operations. In the long term, the South Korean navy plans to build two 30,000-tonne light aircraft carriers between 2028 and 2036. Similarly to Australia, Turkey is building an LHD based on the *Juan Carlos* design in cooperation with Navantia.

“... [US] Joint Publication 1-02 (JP 1-02) titled **Department of Defense Dictionary of Military and Associated Terms** provides standard US military and associated terminology for the DoD as a whole, including the joint activity of the US Armed Forces in both joint and allied operations... it defines **IOC** as: “The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics that is manned or operated by an adequately trained, equipped, and supported military unit or force.”...”
<http://www.dtic.mil/get-tr-doc/pdf?AD=ADA488114>



- 1 Of course, the US Marine Corps can rely for critical support on the US Navy's much larger aircraft carriers.
- 2 The Spanish Navy claims that its *Juan Carlos* LHD could carry up to 10 or 12 F-35B or AV-8B STOVL aircraft plus a similar number of helicopters in its aircraft carrier configuration. This report's more conservative estimate of the Canberra class's ability to embark STOVL aircraft and helicopters is based on the Royal Australian Navy's description of the ship's helicopter configurations.
- 3 The US Navy has yet to find a 'cost-effective solution' for a heat-resistant deck coating. See, for example, Carlo Munoz, 'SNA 2014: Heat from F-35, MV-22 continue to plague big deck amphibis', *USNI News*, 15 January 2014, <http://news.usni.org/2014/01/15/sna-2014-heat-f-35-mv-22-continue-plague-big-deck-amphibis>.
- 4 Colin Clark, 'Norway's Joint Strike Missile tempts Aussies; Raytheon likes it too', *BreakingDefense.com*, 16 July 2014, <http://breakingdefense.com/2014/07/norway-joint-strike-missile/>.
- 5 The success of such collaboration would be greatly helped by having already established the habit of close cooperation with countries such as Indonesia, Singapore and Malaysia.
- 6 Ronald O'Rourke, *China naval modernization: implications for U.S. Navy capabilities—background and issues for Congress*, Congressional Research Service, 8 September 2014, p. 52.
- 7 Kris Osborn, 'New threats change amphibious assault strategy', *DoD Buzz*, 28 August 2014, www.dodbuzz.com/2014/08/28/new-threats-change-amphibious-assault-strategy/.
- 8 In evidence to the House of Commons Select Committee on Defence in November 2004, Admiral Sir Alan West said that the capacity of the Queen Elizabeth-class carriers to embark up to 36 Joint Strike Fighters was based in part on having the 'same sort of clout' as one of the US carriers. UK Parliament Committee on Defence, 'Examination of witnesses (questions 540–559)', 24 November 2004, www.publications.parliament.uk/pa/cm200405/cmselect/cmdfence/45/4112404.htm.
- 9 Mark Thomson, Andrew Davies, 'Strategic choices: defending Australia in the 21st century', *ASPI Strategic Insights* 45, December 2008, pp. 22–23.

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[Oz F-35Bs on LHDs ASPI reply]

'Engines101' 23 Nov 2014

The discussions here seem to be tending towards the lines expressed in the recent ASPI paper, which I'd summarise as:

LHD/F-35B can't be a 'true carrier'

Time spent on F-35B off LHD would detract from the LHD's main role

It won't be effective anyway

If you want fixed wing aircraft at sea the only answer is a USN sized carrier

The ADF can do without it

I'll try to address those. First point is true, if you think the only effective carrier is a great big one. But it's not true. The RN and the USMC have shown time and again the difference a small ship delivering STOVL air direct to the fight. The future for sea based fixed wing, unless you are USN or China (and possibly India) is going to be F-35B on ships of various sizes, all smaller than CVNs. In my view (and I know others will disagree) the ADF has a chance to gain this capability.

Yes, time spent on F-35B ops would 'detract' from the 'main role'. But things change. Roles change. STOVL is not anywhere near as hard to set up at sea as cat and trap. But it's a balance, and I agree that the sums and the assessments have

to be done on how the LHD time would be sliced up. But saying 'we can't do it because we musn't change our plans' is about the weakest argument against the idea.

Effectiveness – I honestly don't think some here on this thread understand just how effective a smallish force of F-35Bs, in there right place, could be. Or how limited land based air at long ranges actually is. Let's put it like this – if the LHD force is, say, 300 miles from land based air, just how many aircraft do you think a land based F-35A force could put over the fleet on a 24 hour basis? Possibly 2, even if they had the tanker capacity, which they don't. Combat duration over the fleet measured in tens of minutes. Time to react to a threat? Those 48 hour ATO planning cycles mean the fleet will have to make do with what's been planned, not what they might need. (And I speak as a survivor of the cold war when the RN was promised that a whole (large) squadron of RAF Phantoms would provide fleet air defence. It ran out around 90 miles off the UK coast). Now think of 6 F-35Bs on the LHD deck, at an 'alert 3' posture for air defence or strike missions. Oh, and look up some of the sums for just how huge the costs are for maintaining constant combat air presence at these sort of ranges.

Again, for clarity – the answer is no longer the huge ship, unless you are a superpower. STOVL and ships like the LHD

offer a smaller player the chance to put real combat power (not to mention a fairly awesome ISTAR asset) where it's needed, not where it has to be based.

Does the ADF need it? Don't know, has to be their call. But they need to reflect on the vital roles sea based fixed wing air has played in campaign after campaign over the past 35 years. They need to look at just how frequently Host Nation Support (HNS) has been withdrawn for land based aircraft (the answer, by the way, is very). They need to have a realistic threat scenario which includes a proper assessment of air threats to a surface task force.

And finally, if the argument against F-35B on board is 'we would never plan to put an ADF task force where it can't have 24 hour cover from land based air', then get ready for some short and limited duration deployments.

The one line I very much agree with is that the ADF has time to look at this properly. The Australian buy of 70 odd F-35As is large and should meet RAAF requirements for some time. Let's make sure that a properly constituted panel of experts takes an objective look at this. The UK has (sadly) shown what happens when Defence Reviews are rushed and then hijacked by single service politics. And sea based fixed wing is, make no mistake, always a hugely (inter service) political issue.

Best Regards, Engines101

<http://www.defencetalk.com/forums/navy-maritime/juan-carlos-canberra-class-lhd-12136-29/#post288860>

LHD and F-35B: the debate opens up

26 Nov 2014 Steve George <http://www.aspi.org.au/lhd-and-f-35b-the-debate-opens-up/>

Debate over the possibility of operating F-35B aircraft from the Canberra LHDs has opened up—a good thing. This post offers technical and tactical thoughts to stimulate the debate and challenge recent assertions.

The feasibility of acquiring an F-35B/LHD capability is a key issue. Some assert that it'd be highly complex, take the ships out of service for long periods, cost \$500 million, and require decades to achieve. Those assertions massively overstate the problems and ignore a plethora of inconvenient facts.

The Canberras retain the essential capability of the 'Juan Carlos I' design, including features that support the F-35B. They have air traffic control facilities for helicopter operations, which would support STOVL, although an additional lighting system may be required for bad weather operations. The F-35B wouldn't require large 'specialised' maintenance facilities to be built into the ship, although adaptation of existing spaces might be required. The Canberras have enough fuel to support F-35Bs, and large weapons magazines. Claims to the contrary are incorrect.

Flight-deck heating issues are consistently overstated. Heat-resistant coatings might be required, but are easily applied. Other measures such as a 'creeping' vertical landing would further alleviate what's already a minor issue.

The bottom line? Operating the F-35B from LHDs is technically feasible and well within the capability of the ADF. It wouldn't be free, but nor would it break the bank.

Turning to strategic aspects, the laws of operational physics mean that the closer an aircraft is to target, the greater its effect. In many scenarios an LHD could get F-35s far closer to a theatre of operations than is possible by using far distant land bases. In many scenarios, it'd be the only option.

Some argue that land bases and overflight permissions will always be available. A recent ASPI paper states: 'the ADF would reasonably expect to be able to operate land-based aircraft from the country whose on defensive efforts Australia would be supporting, or with whom we could come under common attack' and 'it's prudent to assume that the [RAAF] would have access to land bases ... to make a contribution to a future coalition air campaign'. Such statements must be challenged: unpredictable regional politics can, have and will trump 'reasonable expectations' and 'prudent assumptions'. In fact, denial of host nation support happens frequently.

Malta denied use of its airfields in 2011 for the Libya campaign, and France, Spain and Italy all denied use of air-space for US air strikes on Libya in 1986. In both those cases, sea-based aircraft provided critical support to the campaigns. Recently, Turkey has refused use of its bases for strike aircraft—which the ASPI paper acknowledges but argues unconvincingly has been overcome by basing aircraft hundreds of miles further away in the UAE and Saudi Arabia. It surprisingly fails to mention that ship-based aircraft are executing a significant part of the air campaign. Again.

Withdrawal of host nation support leads to long-range operations and those have inherent limitations. Massive and expensive resources, particularly tankers and fuel, are required to generate relatively modest levels of 'air' over the distant target area. They also display the risky phenomenon of 'scheduled war', with air operations planned in detail over 48 hours in advance. The IS campaign shows that hands a useful advantage to enemy forces who can and do quickly change the situation on the ground.

An LHD/F-35B capability becomes even more important where the fight could threaten ADF deployed surface task groups. Lack of an organic fixed-wing air-defence capability and reliance on ship-based missiles and distant land-based air cover would be highly risky, given developing levels of maritime strike available to potential regional adversaries.

Maritime nations have repeatedly used sea-based aircraft to support land-based aircraft or to provide air power where land-based aircraft couldn't. Some nations have achieved this more than others—every aircraft shot down by the UK since 1945 has fallen to embarked aircraft. Given the maritime geography of SE Asia and the South Pacific, the ADF can't afford to ignore those lessons. A mixed fleet of 100 A and B F-35 variants, with F-35Bs able to operate from both land and sea, would give the ADF a much-enhanced capability to bring decisive air power to bear quickly as, where and when required. An LHD/F-35B capability would also fall neatly within the aims of Plan Jericho, providing the ADF with an opportunity to integrate and exploit the advanced information-gathering and distribution systems of the F-35 and the RAN surface fleet and RAAF Wedgetails and Poseidons.

There's a long way to go with the LHD/F-35B debate, and it's important that decisions are based on experience, knowledge and fact, not assertions and dogma. To this end, ASPI's suggestion that 'the government should get an independent assessment of the potential costs and risks' is both a sensible and a timely one.

HMAS Canberra enters commission into Australian Navy at Sydney ceremony

28 Nov 2014

The largest ship ever built for the Australian Navy has been welcomed into the fleet, with the HMAS Canberra formally commissioned for service.

The commissioning service was held in Sydney with Governor-General Sir Peter Cosgrove and Prime Minister Tony Abbott among the dignitaries to welcome HMAS Canberra into the Australian Navy.

Commanding Officer Jonathan Sadleir officially commissioned HMAS Canberra on behalf of the Australian Navy.

The Governor-General said the event marked a major milestone in the history of Australia's defence forces.

"Commissioning is one of the most important ceremonies in the life of a war ship," Sir Peter said.

"Symbolically it marks when a war ship becomes a part of our Navy and that it's entitled to fly the historic white ensign.

"From the date of commissioning, a war ship is recognised under domestic and international law as a sovereign representative of its nation.

"From today, wherever she may travel in the world, Canberra is all-Australian. The ship and her crew are a part of our nation.

"To the crew, when you set sail, you will do so with the admiration and respect of our nation.

"This is now your opportunity to proudly write a new chapter consistent with the finest traditions of the Royal Australian Navy and the wider Australian Defence Force."



PHOTO: Governor-General Sir Peter Cosgrove at the commissioning ceremony for HMAS Canberra.
(ABC: Anne Barker)

The new ship is the third Navy vessel to be named HMAS Canberra and Rear Admiral Stuart Mayer said all crew and officers were aware of its legacy.

"I have no doubt whatsoever that this Canberra will continue the fine tradition established by her predecessors and add further lustre to an already prestigious name for Queen and country," Rear Admiral Stuart Mayer said.

HMAS Canberra to also get humanitarian missions: Abbott

Also known as a Landing Helicopter Dock or LHD, the ship will be able to land 2,000 armed personnel in helicopters and water craft, complete with vehicles, supplies and ammunition.

It is designed to handle combat situations and humanitarian emergencies, and has a flight deck eight storeys above the water.

Mr Abbott said HMAS Canberra was an important part of Australia's defence strategy for the region, and would also be used in humanitarian emergencies.

"This is a proud day for our Navy and a proud day for our country and I am so thrilled to be on this mighty ship," Mr Abbott said.

"While Australia always seeks to make friends rather than foes, you never know what's over the horizon.

"The world remains a difficult and dangerous place. Our armed forces deserve the best possible equipment and our friends and neighbours should know they have the strongest possible ally.

"HMAS Canberra is our largest ever war ship and one of the most capable and sophisticated amphibious assault ships in the world.

"It will also be deployed for humanitarian assistance if disaster strikes in the region."

The construction of the Canberra-class LHD has spanned the globe.

Its 230-metre hull was built in Spain in 2008 before being taken to Williamstown, in Victoria, for the fit-out. Sections of the ship have been assembled in other parts of Australia and shipped to Williamstown for installation.



PHOTO: Prime Minister Tony Abbott arrives for the commissioning ceremony for HMAS Canberra.
(ABC: Anne Barker)

Second Canberra-class ship due in 2016

HMAS Canberra is one of two Canberra-class LHDs with a sister ship in Adelaide still under construction. The HMAS Adelaide, is expected to be ready for commissioning in 2016.

The Canberra Class LHDs have been designed to be able to manoeuvre in shallow waters.

They have a large ramp/door at the stern that lowers to allow access for the four LCM-1E amphibious landing vehicles the ship will normally carry.

A 202-metre-long landing deck can support up to four CH-47 Chinook helicopters taking off or landing at the same time.

The Canberra's combined electrical output is the equivalent of 60 Formula One racing cars.

The ship's Amphibious Operations Officer, Major Matthew Singers, said it represented "one of the largest capabilities that's in the Southern Hemisphere".

"It can provide humanitarian aid and disaster relief, and it's been likened to being the Swiss army knife of the ADF's force projection and combat power."

Despite its size, the ship has a crew of just 400, compared to more than 1,000 on some of its predecessors.

Together, the two ships cost more than \$2 billion.

HMAS Canberra will stay in its home port in Sydney until it receives its first assignment.

HMAS Canberra Key Statistics

- Crew: 49 officers, 294 sailors, 50 soldiers
- Homeport: Sydney
- Launched: February 17, 2011
- Commissioned: November 28, 2014
- Load: 27,500 tonnes
- Length: 230m
- Draught: 7.08m
- Maximum Speed: 20+ knots
- Maximum Range: 6,000 nautical miles
- Commanding Officer: Captain Jonathan D Sadler

Australia's LHD 'as aircraft carrier' headache 07 Oct 2014 Tom Muir

It has been widely reported that in the lead up to the **2015 Defence White Paper**, **Prime Minister Tony Abbott** ordered Defence to assess the benefits of **F-35B jump jets** and converting the **Canberra class Landing Helicopter Docks (LHD)** to accommodate them.

Previously, the **RAAF** was committed to buying only the F-35A version of the Joint Strike Fighter.

In June, **Stephen L Jones** opined that if Australia was serious about buying the jump jet version of the JSF, it would be wise to look at why the UK is the only country to change its mind on which version of the aircraft to buy.

Writing in the academic blog, *The Conversation*,

"While the UK had originally signed on the JSF project to buy F-35B jump-jet fighters to replace their **Harriers**, the **2010 Review** announced the decision to buy the **F-35C naval carrier variant** instead. The reason given for the change in policy was that the F-35C carrier variant has a 'longer range and greater payload' which was the critical requirement for precision strike operations in the future. The carrier-variant was also cheaper, reducing through-life costs by 'around 25 per cent'. The savings would result from a cheaper acquisition cost, as well as the efficiencies from maintaining only one type of aircraft, instead of two versions.

"In 2012 Britain's *The Telegraph* newspaper reported it had seen a highly classified **Operational Analysis Supporting Paper** which indicated that "planners have grave doubts about the capabilities of the jump jets. According to the newspaper, the conventional variant was 'more effective than the jump jet in almost all cases'.

❑ US\$77.7 million – F-35A CTOL variant

❑ US\$105.5 million – F-35B STOVL variant

❑ US\$89.7 million – F-35C carrier version

COMMENT: 'Warren'

"The article critically fails to mention that the UK has now reverted back to its original plan to buy the the V/STOL F-35B... not the F-35C."



Australia commissions helicopter carrier Canberra 02 Dec 2014 Andrew McLaughlin

<http://www.flightglobal.com/news/articles/australia-commissions-helicopter-carrier-canberra-406655/>

“The Royal Australian Navy commissioned its first of two Canberra-class landing helicopter dock (LHD) vessels at a ceremony in Sydney on 28 November. HMAS Canberra and her sister ship – to be christened HMAS Adelaide late next year – will be the largest vessels ever operated by the navy. They are based on the Strategic Projection Ship design from Navantia, an example of which is in service with the Spanish navy as the King Juan Carlos I.

Each LHD has a displacement of 27,500t at full load, and can accommodate 18 NH Industries MRH90 Taipan, Sikorsky MH-60R Seahawk or Airbus Helicopters Tiger armed reconnaissance helicopters, up to 110 armoured vehicles, four amphibious landing craft inside a well dock with sea door and a battalion of up to 1,200 troops. The 230m (757ft)-long design has a 1,390m² (15,000ft²) hangar/light vehicle deck and a 1,860m² heavy vehicle deck. The ship also has sufficient generating capacity to be able to export electricity into the power grid of a small city that may have been affected by a natural disaster.

The flightdeck has six landing spots for medium-sized helicopters, or four for the larger Boeing CH-47F Chinook – seven of which will be delivered to the Australian army from next year. Aircraft elevators are located forward and aft, while there is also a forward armaments elevator.

The Spanish design retains its ski-jump ramp, ostensibly because there was no benefit in redesigning the ships without one. However, its retention not only offers cross-decking opportunities for allied fixed-wing types such as the Boeing AV-8B Harrier II or Lockheed Martin F-35B, but also flexibility for the Australian Defence Force to operate such aircraft in the future. The possible acquisition of the F-35B is currently being studied as part of a new defence White Paper due for release in mid-2015.

HMAS Canberra is due to commence first-of-class sea trials before the end of December, during which time the first aircraft will be embarked aboard the vessel to explore and expand flight envelopes from and around the ship, initially using only two of its deck landing spots.”

Forget the carrier option

Wot?! Nic Stuart 03 Dec 2014

Yes, it's a good thing that the debate about the possibility of buying the F-35B has 'opened up'. But that's simply because it's good to talk. Politics will prevent it from maturing beyond a completely academic argument. Of course it's a good idea. Of course it would be nice to have a vessel capable of providing integral air support to an amphibious group. But it's just not going to happen. And why? Welcome to the world of defence funding.

There are two problems with the idea of converting one of these ships to operate as a mini-aircraft-carrier. The first, probably insuperable problem is that it would cost a great deal to strengthen the flight deck and convert one of the vessels to carry the STOVL version. But even if that can be achieved and the money found somewhere, you still have the second predicament: opportunity cost.

Using one of our two LHDs to provide intimate air-cover for a task force sounds great, but it'd drastically cut the number of troops carried—and that's the whole idea of the vessels. It would also halve operational flexibility (by restricting landings to simply one beachhead). The idea of converting one of our purpose-built Landing Helicopter Docks into a pathetically small and inefficient aircraft carrier, rather than using it to do the job it was bought for, just doesn't make sense.

There's another alternative, of course. If we wanted to operate a small air detachment, we could buy a third LHD. That one could be specifically designed to operate the F-35B and would provide all the good things that come with such vessels. But pause to think for a moment and

you'll realise why that won't happen either.

For a start, you'd need a new version of the aircraft and another, different, type of ship. Neither of those bits of equipment would quite be orphans, but they wouldn't be part of the existing family either. Effectively we'd be asking the taxpayer to pay for the acquisition of a new capacity. The last time we had a real carrier was almost 50 years ago. It would have to line up in the list of budget priorities and fight against all the other spending demands.

I can hear the questions now: So we're not at war, you can't tell me what this capacity is for, or who we'd be operating against—you just think it might come in handy? Nice try, but we'll have a hospital/tax cut instead, thanks.

Put yourself in a politician's shoes. What are you going to buy—a third LHD in case we need to provide air cover tomorrow or a hospital to serve one of today's quick-growing marginal electorates? I know where I'd spend my money.

John Howard's government was urged by some to consider the possibility of a third LHD when it made the original decision. It chose instead to retain an option to build a fourth AWD. But the economic environment has changed. The government's commitment to return to spending 2% of GDP (at some unspecified date in the future) does indicate a willingness to spend on the military. However that doesn't mean it'll choose to prioritise a new capability such as this in the future—particularly when it's suffering such political grief for cutting allowances today.

In the Middle East, our Super Hornet pilots regularly operate on missions of more than 10 hours, topping up their aircraft once or even twice from the terrific KC-30A multi-role tankers of 35 Squadron. Operating out of Al Minhad

wouldn't be anyone's first choice. Perhaps you might like to ask the government why we can't fly our aircraft from Iraq. Actually, perhaps not. That opens up a whole can of worms that nobody's keen to address. The point is, it's a long flight, but the pilots cope.

There's a case for the F-35B but it has nothing to do with ships. What's missing from this discussion is the increasing lethality and destructiveness of long-range missiles.

The problem with the conventional version of the aircraft is that it requires a runway to take off from. That restricts its operations to locations with airstrips. But today's long-range missiles are deadly accurate. They might miss the JSFs, but they wouldn't need to be tipped with nuclear devices to destroy the tarmac (or at least damage it enough to severely inhibit operations).

The very trends in increasing missile accuracy that militate against the acquisition of any sort of carrier are also, over time, likely to have an inhibiting effect on where aircraft can be deployed. Missile range is increasing as costs decrease. It's possible to make an argument for purchasing the F-35B along those lines by stressing their utility in forward operational areas.

Still, I can't help feeling that cost considerations will also consign that option to the same dustbin as the aircraft-carrier.

There was, I believe, a good argument to be made for incorporating the STOVL version as a part of our original purchase of aircraft. That chance has gone. Finding the extra money needed to buy, operate and maintain the F-35B will now be impossible.

Nic Stuart is a columnist with The Canberra Times.

<http://www.aspistrategist.org.au/forget-the-carrier-option/>

Forget the carrier option: an engineer's response

17 Dec 2014 Steve George

Nic Stuart's piece, **'Forget the carrier option'**, makes a large and important judgment: that politics and defence funding won't allow the option of deploying F-35Bs on Australia's LHDs. But in making that case Nic repeats erroneous assumptions that are hindering a true exchange of views. It's vital that defence reviews are supported with facts—and some of them bear repetition.

First up, the technical facts. F-35B operations from LHDs are feasible. The F-35B is specifically designed not to drive major ship modifications. The LHD wouldn't need 'conversion' to take F-35Bs, although it would require minor modifications, similar to those being applied to the USN 'Wasp' class. The flight deck is capable of taking an F-35B. The F-35B won't require massive changes to the ships' air-traffic control facilities, assuming that they are already up to

operating rotary-wing aircraft day or night in bad weather. It won't need huge changes to ship structure or facilities.

Those modifications wouldn't 'cost a great deal', as Nic stated. And to repeat, giving the LHD an ability to operate F-35B doesn't mean turning it into a 'mini aircraft carrier'.

Next, remarkable assumptions are being made about what embarked F-35Bs would do. Nic's piece says that their role would be to provide 'intimate air-cover'—a new and intriguing term. With a range of over 300 nautical miles, the most 'intimate' aspect of an F-35B air defence would probably be the effect of an AIM-120 warhead on an incoming threat. But that misses the key point: putting F-35Bs on an LHD would allow more effective use of all the aircraft's capabilities, including precision-strike and ISTAR support, by putting the aircraft closer to the fight. As another article puts it, 'proximity equals capability'. But be in no doubt, air cover

will be a requirement for a task group operating anywhere near an enemy air threat. It won't, as the article somewhat dismissively puts it, be a **'nice to have'**.

Nic assumes that the RAN would have to buy a third LHD (or a different ship optimised for F-35B) to make the exercise 'worthwhile'. With this leap of logic, he argues that an F-35B option is unaffordable. But this is not a given. The two LHDs are highly capable and flexible assets—their Air Groups will be adjusted to meet the demands of future situations. Yes, embarking F-35Bs will displace some of the planned Air Group. But Tailored Air Groups (TAGs) are a common-place and well-understood way of using small decks to best effect. And be in no doubt, the ADF will have to adjust the LHD Air Groups in the future.

It's almost certain that whatever operational assumptions the LHDs were bought against will change, and change fast. And the way the LHDs will be equipped and operated

will need to change. Will amphibious operations be ADF only? Would both LHDs be available? Would they be part of an international task group with USMC participation? Would they be required to go where there might be an enemy air threat? We don't know. But the ADF has to make the best use of the two ships they've got. Sticking to the line that 'we can't do it because that would mean changing our defence planning assumptions' is guaranteed to make it worse.

Nic's article also baldly states that F-35Bs on an LHD would be 'pathetically inefficient'. That's a bold claim, and should be examined against the actual experience of the RN and the USMC's STOVL units over the last 30 years or so. (Actually, it's eerily familiar to the arguments against the Sea Harrier/'Invincible' class combination in the late 1970s. Those went away after what happened in the South Atlantic in 1982.) But it's quite true that the issue of 'efficiency' should be considered,

particularly for long-range air operations.

Nic asserts that 'our pilots can cope' with long flight times. Yes, of course they can, but that's not the issue. Burning 'more than 10 hours' of flight time to deliver around 25 minutes of 'air power' might not be especially 'efficient'. Critics of the F-35B/LHD option should do the maths on how many land-based aircraft (and tanker slots) are needed to provide continuous, reactive, air support at long range. Do some fuel-usage calculations. Now put 5 or 6 F-35Bs with the task group, on three-minute alert posture, 50 miles from the target and do the maths again. Now decide which option is 'inefficient'. It's a simple effect of geography. Proponents of the F-35B/LHD option aren't saying it's a replacement for land-based air power. It's for when land-based aircraft, for reasons of pure physics, can't do the job.

Finally, the article says: 'There was...a good argument to be made for incorporating the STOVL version

as a part of our original purchase of aircraft'. Agreed. It then says that 'That chance has gone'. Not agreed. There's nothing stopping the ADF making a final buy of 28 aircraft the F-35B variant. Or even switching some of the existing planned buy from the A variant to Bs. It's a matter of political will.

The divergent views around this debate show just how important it is that the F-35B issue is thoroughly (and independently) investigated so that decisions are supported by facts. The UK's failure to 'get the facts right' in their 2010 SDSR led to an F-35/carrier related mess of epic proportions. Australia now has the chance to do the job properly.

Steve George was an air engineer officer in the Royal Navy for 28 years, and served in HMS Invincible during the 1982 Falklands operation. During his career, he was closely involved with the Sea Harrier, and also with joint RN/RAF Harrier operations. Retiring from the RN as a Commander, he joined the JSF programme to work on F-35B ship suitability. He is now an engineering consultant.

<http://www.aspistrategist.org.au/forget-the-carrier-option-an-engineers-response/>



ASPI argues that the benefits of deploying F-35Bs from Australian LHDs are outweighed by capability gaps in other areas. Source: US Navy

Acquiring Lockheed Martin Lightning II F-35B short take-off vertical landing (STOVL) fighters to operate from the Royal Australian Navy's (RAN's) two 27,800-tonne Canberra class landing helicopter dock (LHD) amphibious ships would not be justified, a leading think-tank has concluded.

This issue could be addressed in a Defence White Paper expected around mid-2015. However, the Australian Strategic Policy Institute (ASPI) said the benefits of such a capability would be marginal at best and would not be justified by the costs.

The study pointed out that the LHDs - the first of which will be commissioned early in 2015 and the second in 2016 - could not carry a full complement of helicopters and amphibious troops with their vehicles and equipment and simultaneously deploy a useful number of STOVL aircraft and additional support aircraft.

ASPI says Australian F-35B purchase wouldn't make sense

Julian Kerr, Sydney and James Hardy, London

- IHS Jane's Defence Weekly 16 November 2014

<http://www.janes.com/article/45813/aspi-says-australian-f-35b-purchase-wouldn-t-make-sense>

Even in a STOVL-only configuration an LHD would face challenges in generating enough F-35B sorties continuously to protect itself and ships in company against a capable adversary, the study said.

"On the other hand, if the threat levels faced by an embarked amphibious force were low, it's doubtful a handful of F-35Bs would really be needed," it added. "While the LHDs could be modified to allow STOVL operations by US Marines during joint operations, the option still runs the risk of being tokenism."

COMMENT

One of the report's authors, Benjamin Schreer, notes that the acquisition of F-35Bs would allow Australian forces to operate in more "high intensity" environments away from friendly airbases, and as such would likely see Australia adopt a even closer strategic relationship with the United States. Scheers suggests Northeast Asia or the Middle East are the most likely theatres in which this might happen.

"The key question is whether the capability justifies the direct and indirect cost" Schreer said, adding that a "conservative" ASPI estimate forecast that two squadrons of F-35Bs would cost AUD12 billion, a figure that would complicate other ADF capability enhancements such as new frigates, more submarines, or follow-up plans to expand the size of the F-35A conventional take-off and landing variant fleet from its planned strength of 72 aircraft.

However, should carrier-based aviation be deemed necessary "to support a more muscular Australian military posture in the future," in Schreer's words, then the report argues that the government should consider acquiring a dedicated aircraft carrier.

Making the STOVL F-35B Work for the ADF

Steve George, Feb 2015
Defence Technology Review

STEVE GEORGE TAKES AN IN-DEPTH LOOK AT THE TECHNICAL INTEGRATION ISSUES OF OPERATING THE F-35B JOINT STRIKE FIGHTER FROM AUSTRALIA'S CANBERRA-CLASS LHD.

To date, most of the on line discussions about the value and practicality of this option have lacked complete information and technical depth; in many cases, the 'information' has been wholly inaccurate. This short brief is intended to help DTR readers gain a better appreciation of the issues.

F-35B and the Capability Question

Much has been made of the 'limited' capability of the F-35B JSF compared to the land-based F-35A conventional take-off and landing variant. So let's put it in perspective.

The F-35 JSF family of aircraft represent a major step forward in tactical aircraft combat capability, and they achieve this primarily through a massive advance in the gathering and exploitation of information, collected by their own sensors or data linked from other

platforms. The F-35 sensor suite includes a highly advanced AESA radar (AN/APG-81), a fully integrated electro optical targeting and sensing system (EOTS; such systems are pod mounted on legacy aircraft such as the F-16 and F/A-18), a large electronic warfare (EW) suite of passive radio frequency sensors, and an integrated dual band infrared (IR) distributed aperture system (DAS; AN/AAQ-37) that combines missile warning with IR imaging functions. The aircraft are also equipped with a highly advanced data link system. All of these are highly advanced in technology and performance, and will give the F-35 JSF family tremendously improved situational awareness (SA) in operations.

The F-35 JSF family also exploit low observable (LO) technology to an extent not previously achieved on tactical aircraft. The LO techniques and solutions on the F-35 reflect years of development and hard won experience on previous US platforms, and will give the F-35 a decisive edge in combat.

So, it's important to realise that as far as SA and LO are concerned, the F-35B has exactly the same

capabilities as the F-35A and F-35C. Same radar, same EOTS, same EW suite, same DAS, same LO technology. The key message is that the F-35B is an exceptionally capable aircraft. However, it's absolutely true that the addition of STOVL capability has affected capability in three areas: range, 'g' and weapon bay size. So let's look at these areas.

The F-35B's combat range key performance parameter (KPP) requirement is 450nm against the F-35A's 590nm. This reflects the reality of losing internal space to the lift fan system, and was understood when the KPPs were first agreed around 2000. However, the point of the STOVL aircraft is that it is intended to be deployed on ships, closer to its targets. This logic would apply to any Australian Defence Force (ADF) use of the aircraft from the Canberra-class LHD. The F-35B also has the same highly flexible 'probe' refuelling system as the F-35C, enabling it to be refuelled by a wide range of potential national and coalition tanker aircraft.

Interestingly, 'g' requirements were not included as F-35 KPPs, and so have been traded against

KPPs and other higher priority requirements. 'G' values are dependent on aircraft weight, configuration, altitude, speed and a number of other factors, so any comparison between the two variants is likely to be simplistic. However, it does appear that the F-35B has a typical sustained turn rate of around 4.5g, with the F-35A figure being around 5.5g. This is probably due to the F-35B's airframe being optimised for the lowest possible landing weight, and the additional drag of the lift fan system fairing.

There will be impassioned arguments around this difference, but there is no doubt that the importance of raw 'g' in air combat effectiveness has dropped markedly over recent decades in favour of improved SA. The LO capable F-35B, possessing exceptional SA and armed with the AIM-120C Advanced Medium Range Air-to-Air Missile and new generation short-range air-to-air missiles, plus a sustained turn rate much better than legacy STOVL aircraft, will be a highly capable air combat adversary.

Finally, weapons bay capacity. Again, the original KPPs reflected

the reality of STOVL challenges and called for the F-35B to carry a 1,000lb joint Direct Attack Munition (JDAM) internally, as opposed to the 2,000lb JDAM requirement for F-35A and C variants.

Early F-35B designs attempted to achieve a 'common' 2,000lb capable weapons bay, but reality caught up with Lockheed Martin around 2004, and the F-35B reverted to a smaller 'KPP compliant' bay. However, the F-35B can still carry 2,000lb JDAMs externally if required, and in any case, the need for these very large weapons is infrequent: recent operations show that 500lb class air-to-ground munitions are the most frequently used by a large margin. Again, this drop in heavy ordnance capability would not likely be a deal breaker for the (ADF).

In any event, the F-35B offers a tremendous step forward in STOVL capability compared with that offered by the Harrier family of aircraft, which have, for over 30 years, delivered highly effective combat capability all over the globe.

So, it's true that, in some respects, the F-35B has more limited capability than the F-35A. But these do not appear to be 'decisive'

or 'critical' shortfalls. But – and the value of this 'but' cannot be overestimated – in many scenarios, it delivers the important capability to operate from a ship much closer to the required area of operations. Our defence leaders have to decide whether that is a capability trade off worth making.

So let's look at the other main area of contention – the practicality of putting the F-35B on the 'Canberra' class LHDs.

Integrating Aircraft and Ships

It's best to start by understanding that putting military aircraft on ships has never been easy. Warships, even the massive US Navy (USN) nuclear-powered aircraft carriers, are not and never will be just 'floating airfields' – the raw constraints of physical space have driven naval aviators to develop new ways of launching, recovering, arming, maintaining and repairing aircraft since the earliest days.

But they have consistently succeeded. Effective, safe and sustainable embarked air power has been demonstrated from a wide variety of ship/aircraft combinations over the past 100 years. Maritime

fixed-wing aviation is an achievable art – and STOVL makes it even more achievable.

Successful maritime aviation depends on a little known discipline called 'ship/aircraft integration'. This is a systems engineering challenge, requiring thorough understanding and control of the various interfaces between the ship and the aircraft. So, how closely are the F-35B and the LHD interfaces currently aligned? Remember, it's been regularly asserted that the LHD is 'not designed to operate the F-35B' or that the F-35B 'will not be compatible' with the LHD. To assess the practicability question, we need to understand the various types of ship/aircraft interface. They can be grouped as follows:

- The operating interface – launching and recovering, including movement around the flight deck, with ship motion;
- The environmental interface – includes aircraft weight, size, jet blast and noise;
- The information interface – becoming a major aspect, includes the required mission support systems, communication and

identification, and not least the means of exploiting the intelligence, surveillance and reconnaissance outputs from the F-35B. Also includes the required guidance systems for launch and recovery;

- The support interface – how the ship provides the required support capabilities to the aircraft, including fuel, weapons and maintenance. A key driver for manpower requirements as well as hangar and flight deck layouts.

The important issue of personnel requirements for F-35B operations will also be examined. Let's take each of these issues in turn, and see how much is known from publicly available information.

The Operating Interface

At the outset, it's vital to appreciate two very salient facts.

- The first is that the F-35B has been specifically designed to operate from ships like the LHD. It has had to meet requirements for operating from USN Wasp-class amphibious assault ships, as well as some UK specifications for ski jump launches. Wasp-class

flight decks and spaces are not dissimilar to those on the LHDs, although they do not have the benefit of a ski-jump.

- The second is that the LHD class on which the Canberra-class has been based has also been designed with F-35B in mind. The original Spanish Juan Carlos I design was required from the outset to embark the F-35B, and detailed technical information was made available from the US to Spain to assist in this process. All these requirements were retained in the two Canberra-class LHDs.

So, looking at F-35B launch and recovery, the LHD flight deck would allow short take-off (STO) launches at required mission weights without the ski-jump. With the ski jump – already factory-fitted – safer and more effective (higher weight) launches will be possible. We are looking at something in the order of 1,500kg of extra payload with no penalty except a safer take-off. Remember that the aircraft is specifically required to be able to launch from ski-jumps.

For landings, the F-35B's flight control system has been carefully

designed to allow safe and accurate recovery to small deck areas with low pilot workload in all conditions. The nose wheel steering and engine controls also support aircraft movement on small or congested flight decks.

Summary: the operating interface presents low risk. The ski-jump on the Canberra-class offers significant operational advantages over USN amphibious assault ship designs and would mitigate the F-35B's differential in performance compared with the F-35A.

The Environmental Interface

The F-35B design was sized by the requirement to use the Wasp-class flight deck, elevators and hangars. These are small spaces. It drove the wingspan and length of the aircraft, landing gear geometry and other aspects. As we already know, the RAN's LHD source design accepts the F-35B's weight and size. The elevators, for instance, are sized to 27 tonnes – very near the aircraft's maximum possible weight. So the aircraft will fit on board and can be moved between decks.

But it is F-35B jet blast that has

become a contentious issue, so let's address that. Since the advent of maritime jet aircraft, handling jet blast in the confined space of a ship has been a major issue. USN carriers carry large and complex jet blast deflectors for launching, and deck heating on launch was a major issue for UK carriers throughout the 1960s and 1970s with the F-4 Phantom. The first generation of seagoing STOVL aircraft – the Harrier family – presented far less aggressive jet exhausts, but even they presented challenges of flight deck heating and erosion of the deck coatings.

The much higher landing weight and thrust power of the STOVL F-35B therefore presented a real challenge in achieving the required ability to operate from a wide variety of surfaces and environments, including ship decks. As a result, the F-35 JSF programme included a massive effort to model, replicate and understand the aircraft's jet efflux blast, temperature and noise, and its effect on various surfaces.

This involved full and part scale rig testing, as well as testing with the actual aircraft. The information

from these has informed existing efforts to develop better flight deck coatings and noise protection measures. It should also be understood that the way F-35B's powered lift system works means that the main engine exhaust is operating at approximately half full power in 'powered lift' mode. This reduces the scale of the potential problem.

While the detailed results of this work are not and cannot be publicly released, a few important basic statements can be made.

Firstly, the F-35B will not melt the LHD's flight deck. It is possible that repeated landings on one spot could degrade existing flight deck coatings. However, this issue can be managed by a combination of managing landings to reduce thermal stress on a single area, or by adoption of improved coatings now arriving on the scene. The US Marine Corps is already looking at a 'creeping' landing technique, which could be used on board, as well as the new Thermion nonskid deck coating system which has characteristics aimed primarily at dealing with the prolonged direct exhaust blasts of the F-35B and V-22 Osprey tilt-rotor.

Comprised of bonded ceramic and aluminium, Thermion was trialled by the RN as long ago as 2006, and trialled successfully on USS Wasp, first in October 2011 and then again in August 2013. Thermion is a candidate for being the new standard deck coating on both USN and RN ships due to its high heat resistance properties, improved skid protection and cheaper coat over a 10 year life cycle.

Secondly, the F-35B's blast can be managed. It's quite possible that some items of deck equipment currently located around the LHD flight deck may need relocation or shielding, but this is a normal part of bringing a new aircraft to a flight deck; initial Sea Harrier testing on the Royal Navy's Invincible-class ships led to a number of detailed changes. Sensationalist reports that modifications to the USN Wasp-class ships show 'severe problems' or 'failures' of the F-35B are simply wrong. Remember, putting aircraft on ships isn't easy.

One area that will require some attention is noise. There is little that can be done to reduce the noise of a jet engine, and the safety regulations for

exposure to noise are becoming ever more demanding. The key area of concern for F-35 noise is actually on the F-35C variant, for deck launching, and a series of programmes are under way to develop improved aural protection systems for USN personnel. These are already entering service, and the new equipment will be read across to the F-35B.

Summary: the environmental interfaces with an F-35B/LHD combination present challenges, but they are a routine, known and manageable aspect of naval fixed-wing aviation.

The Information Interface

This area has received less attention than the rest, and that is a pity, as it is quite possibly the most important and most challenging aspect of any F-35B/LHD marriage.

The F-35B has exactly the same exceptionally advanced packages of active and passive sensors, communications links, onboard computing and weapons systems as the F-35A and C models. It represents a massive leap forward

in generating and using tactical information to achieve its mission, particularly in its ability to integrate with modern military data networks. This means that F-35B mission planning and post-mission analysis will require information technology (IT) systems far beyond anything currently fielded by the ADF. To its credit, the ADF has realised this, and Plan Jericho, which aims to accelerate the integration of warfighting data networks, is a farsighted and well-aimed initiative led by Chief of Air Force Air Marshal Geoff Brown.

This poses a challenge for any deployed F-35B formation, and integrating the required mission planning and mission support suites – which will operate at a very high level of security – with any forward base will be a challenge. Fortunately, modern warships already possess capable communications and computing backbones, but the challenges of integrating the F-35B's IT suite should not be underestimated. This would also need to include the Autonomic Logistics Information System (AUS) which is required to manage the F-35B's support systems.

Summary: the information interface is probably the most challenging area of F-35B/LHD integration, and the most important for effective use of the capability at sea.

The Support Interface

When military aircraft go to sea, the support arrangements they use are very different to those routinely deployed on land bases. The constraints of space for both equipment and personnel, and the totally different ways in which aircraft are prepared, armed and repaired on board a ship must be reflected in the design of both ship and aircraft.

Fortunately, the F-35B's requirements for support systems were explicitly tailored to reflect the very restricted spaces available in the Wasp-class. Interestingly, the tightest constraint on what was called the logistics footprint was applied by the UK. This drove a number of hard decisions on the design and operation of key aircraft and ground support systems. This included key dimensions such as height requirements for maintenance and refuelling system design.

LHD design changes to accommodate the F-35B would be restricted to any specialist support spaces, and probably to weapons storage and preparation spaces. There are lessons to be learned here from the UK, who took on the challenge of putting the maintenance intensive Sea Harrier on board the very small Invincible-class ships. Some shuffling of spaces was required, but no major changes to structure or layout. As ever when aircraft go to sea, there will be challenges. But a healthy measure of ingenuity and adaptability from service personnel is as important as the design solutions offered by industry.

It's also important to note that the F-35B's avionics suite and many other critical components are common with the F-35A – this should help ensure that spares and repair infrastructure beyond the ship operates at a highly efficient level.

Summary: assertions that the F-35B could not be supported on the LHD should be treated with extreme caution. Operating the F-35B should certainly be supportable on the LHD without major ship changes.

The Personnel Equation

Another issue raised by those who seek to dismiss the possibility of F-35B/LHD operations is that of personnel numbers, and the problems of accommodating them on board. Firstly, there is never a direct correlation between the aircraft design and the numbers of personnel used to support it. Other factors, such as required flying rates affect the sums, but less appreciated factors such as the systems used for maintenance and personnel trade structures can significantly affect deployed numbers. Moreover, when looking at embarked operations, the iron law of numbers of beds available often limits the decisions on numbers. Generally, aircraft units designed to operate at sea use less personnel than equivalent units based on land. It has to be stressed that this does not mean that land-based units are inefficient – it's more that staffs planning embarked aviation have an in-built culture of restricting numbers at the outset. And there should be some margin – the LHDs are large ships, and should have a number of spare bed spaces available for embarkation of visiting units and support personnel.

It would be very surprising if they were already completely full. In any case, a constant experience of warships is that the number of personnel on board increases with the years in service. Again, the UK's experience may be relevant. The Invincible-class saw a rapid increase in total numbers of personnel embarked from under 800 to well over 1,200. It wasn't easy, but they coped well.

What should be obvious is the importance of developing the personnel aspects of the challenge – successful embarked aviation depends on committed, trained and experienced personnel who can handle the challenges of delivering combat air power from confined, moving spaces a long way from home.

Summary: F-35B support personnel numbers should not be a deciding factor in whether to embark the aircraft on the LHD.

Conclusion

This brief has attempted to set out some of the technical facts surrounding the issues of F-35B integration on the Canberra-class

LHDs. Hopefully, it will serve to inform an important debate, as the ADF and Government put the finishing touches to the 2015 Defence White Paper.

A final thought. The subject of maritime aviation generates emotive discussions, often around the ownership and control of assets, as well as theories of 'air power' and its application from various bases and whether Australia should or should not be in the aircraft carrier game. It would be unfortunate if the F-35B/LHD debate focussed on these aspects and ignored the opportunity the ADF has to develop a highly flexible and effective capability to complement land-based aviation.

It is not often appreciated that maritime aviation has been used operationally in almost every year since World War Two. Every single aircraft shot down by UK armed forces since that conflict fell to an aircraft operating from a ship. Today, US naval aircraft are delivering a significant proportion of the sorties against IS forces in Iraq and Syria.

This is a time for cool heads, facts and experience. The White Paper's deliberations on this issue would benefit massively

from an expert panel of STOVL maritime aviators. Fortunately, Australia has plenty of these rare assets available. They should be called up now. DTR

Steve George served as an Air Engineer Officer (AEO) in the Royal Navy for 28 years, achieving the rank of Commander. His service career included work with both rotary and fixed-wing aircraft, as well as specialist appointments in weapons procurement and international collaboration with the US. He served on HMS Invincible during the Falklands War of 1982, and subsequently held a range of appointments associated with Harrier operations at sea.

He left the Royal Navy in 2002 and joined BAE Systems as a specialist ship/aircraft integration engineer on the F-35 JSF programme, based first at Lockheed Martin in Fort Worth, Texas, and then in the UK. He left BAE Systems in 2007 to start his own aerospace consulting company, Wisma Consulting Ltd

[http://defencetechnologyreview.
realviewdigital.com/?iguid=e3f4646a-
c89f-4286-90e2-33bbfb34990b#folio=26](http://defencetechnologyreview.realviewdigital.com/?iguid=e3f4646a-c89f-4286-90e2-33bbfb34990b#folio=26)

The LHDs and the rotor-wing option—a pilot's response

11 Mar 2015 David Baddams

Where H is for helicopter, emphasising the H in LHD is imminent. HMAS Canberra is now due to conduct initial underway deck, embarkation and aviation support trials with ADF ground-support helicopters. In a recent Strategist post Albert Palazzo and Antony Trentini advocated the use of SH-60 Romeo helicopters from the LHDs for anti-submarine warfare, in a new tasking to complement the oft-stated amphibious and humanitarian operations. Their welcome piece expands thinking of the LHDs in a strategic light, but includes yet another 'swing' at possible F-35B operations from the LHDs. I hope this follow-up helps add some light to this new strand in ASPI's LHD discussions.

The LHDs are not LHDs. They're 'strategic projection

ships', a clunky term admittedly that doesn't much help describe their full capabilities. In plain English, they're better described as multi-role flat-tops. LHD is an obsolescent and single-role label that's used for easy signage, but does not indicate the possible air-power capabilities Australia has to hand with these ships. Rotary ASW is certainly one of those capabilities, and the ADF already states that the Canberras will be able to support Romeos as well as the ground-support MRH-90, Chinook and Tiger aircraft. But as expert contributors to The Strategist have pointed out, they're designed to accept fixed-wing aircraft—they're not solely a 'rotary-wing' platform.

Now to the big picture. For decades the ADF did precisely what Dr Palazzo and Mr Trentini suggest. The carrier HMAS Melbourne was primarily an ASW ship, using four generations of specialist aircraft over 25 years. Her Cold War patrols around the Pacific were strategically

significant both for Australia and the alliance. However, they would not have happened without organic fast air. Not even America's specialist Essex-class ASW carriers patrolled without air defence: by definition ASW happens nowhere near a friendly fighter base. Whereas the threats then were long-range Soviet and other hostile multi-engine aircraft, an LHD-Romeo combination with escorts in the South China or Philippine seas or Indian Ocean would also need to consider the rapidly emerging threat of carrier aircraft and long-range missiles aimed at both ship and helicopter. Far from benign, the waters of an LHD ASW patrol amid aggressor submarine and potent air threat would be incredibly dangerous. Big ship, multi-helo ASW in distant waters is not for the faint of heart.

The HMS Illustrious (pictured above) entered Sydney in 1986. The Sea King helicopters on its flight deck were outstanding ASW assets—with even better

crews—and ‘Lusty’ and her sisters never departed without a full load of live ASW ammunition. The ship also carried some of the air group’s Sea Harriers. Two of the Harrier pilots at that time were Australians, as was the ship’s Principal Warfare Officer. Those fast jets were critical to the ASW mission: had the Soviets, their allies or sympathetic trouble makers struck—for real—at either the defenceless Sea Kings aloft or the ship underway, then the jets would have shot them. The point? Any LHD ASW task group would require air defence, and no amount of hope and erroneously-received wisdom about Host Nation Support or in-flight refuelling will put ground-based F-35s near the ship or Romeos around the clock. Only embarked F-35s could do that. And no, ship-launched SAMs are not adequate to oppose those threats.

The same air defence issues will apply to the forward use of RAAF Wedgetail, Poseidon and Triton assets from the mid 2020s.

Any LHD ASW patrol would also have to fit into the broad mission profile of this fleet. That is, the LHD-Romeo idea must fit into a whole-of-ADF capability and doctrine. In an ASPI speech delivered last November, ADF chief Mark Binskin made it clear that the 1980s doctrine of Defence of Australia was destined for scrap, and that growing and long-life strategic concerns were now well and truly beyond the Imaginot Line of Australia’s top end—beyond the air-sea gap. RAAF chief Geoff Brown’s Plan Jericho, where maximum possible effect is to be extracted from networked support aircraft, fast jets and the LHDs’ own C4 capability, is a timely and critically important element of this future forward defence. LHD ASW could not be generated and evolve outside that paradigm any more than embarked F-35Bs could.

Dr Palazzo and Mr Trentini have made an effective forward scout’s foray into LHD strategic potential. Using the LHDs for

ASW is a valid idea for ADF examination, as most of the time the ships will not be loaded to the gunwales with soldiers and vehicles for amphibious training or cargo for disaster relief. While some hope that this year’s White Paper pushes the F-35B concept towards comprehensive analysis in the lead-up to a decision on Project AIR 6000 Phase 2C, a strong case could be made in the future for analysis of all LHD air capabilities and how they could fit into strategic planning for forward defence. That certainly includes embarked ASW. Alas, without organic and persistent fast air it wouldn’t be much of a real-world option.

David Baddams was a fighter pilot in Australia and the UK from 1978 to 1999. He now works in general aviation.

<http://www.aspistrategist.org.au/the-lhds-and-the-rotor-wing-option-a-pilots-response/> &

<http://www.aspistrategist.org.au/the-lhds-and-air-power-the-rotor-wing-option/>

“...Joint Strike Fighter (JSF) [F-35B/C] pp14-16 https://www.scribd.com/document_downloads/257364459?extension=pdf

Our tried and true F/A-18s, AV-8Bs and EA-6B Prowlers have performed magnificently in combat in Iraq and Afghanistan, providing our Marine riflemen the fires they needed, in every clime and place from sea bases large and small, and expeditionary bases ashore. With the help of Congress, we have kept these aircraft as modern as possible and extracted every ounce of readiness we can from them; however, the high operational tempo has pushed these aircraft to more rapidly approach the end of their service lives. Due to the uncertainty prevalent in today's global security environment, the Nation requires we maintain a capability to respond quickly in contested regions regardless of weather conditions. The F-35 Joint Strike Fighter, as part of the MAGTF, meets the Nation's needs.

The Marine Corps remains committed to the recapitalization of our aging TACAIR fleet through the procurement of the F-35. The JSF brings a new capability to the battalion sized forces that sail with our Marine Expeditionary Units. Today, there are a multitude of high risk regions where a crisis response operation would require large Joint strike packages to soften or blind the threat. These packages would have to include cruise missiles, fighter aircraft, electronic warfare platforms, aircraft which specialize in suppression and destruction of enemy air defenses, and strike aircraft - just for U.S. forces to gain access. Such strike packages require coordination across services and combatant commands and take weeks and months to assemble. **This same kind of access can be attained with a single detachment of 4 to 8 F-35s - the same sized detachment which will reside with a Marine Expeditionary Unit. For major contingencies, a surge of F-35Bs to our amphibious carrier decks and forward austere bases enables even greater options and striking power. The F-35 provides a transformational capability to the Marine Corps and the Joint Force. It gives our Nation a day one, full spectrum capability against the most critical and prohibitive threats.**

The Marine Corps prioritizes putting our TACAIR as close to our infantry as we can by basing them from Amphibious Carriers or austere Forward Operating Bases (FOBs) and Forward Arming and Refueling Points (FARPs) ashore. This places the F-35's transformational capabilities in the hands of the infantry Marine. The Marine rifleman is now supported immediately with close air support, electronic warfare capabilities, and intelligence, surveillance, and reconnaissance support in threat and weather conditions which **previously would have denied aviation support.** The F-35's ability to develop, process, and display information to the pilot and disseminate it at tactical, operational, and strategic levels is what makes the platform truly unique, "a server in the sky" for the MAGTF. The sensors and communications equipment of our F-35s allow pilots and forward air controllers to see through the clouds to exchange high fidelity pictures in environments we would consider a no go today. Enhancing the C2, strike and intel capabilities of the MAGTF commander, the F-35 transforms the MAGTF into an element capable of penetrating any AOR in the world to set the conditions necessary to enable follow-on forces.

The Marine Corps has maintained the lead in this transformational platform. The F-35B and C models will replace the over 23 year old F/A-18 Hornet, 18 year old AV-8B Harrier and the 27 year old EA-6B Prowler; the same aircraft that have been passed from fathers to sons and daughters now serving. We have stood up our first two squadrons of F-35Bs and will stand up a third in 2016. PB16 supports the Marine Corps' timeline to achieve IOC of its first F-35B squadron later this year and complete full transition by 2031. With the optempo expected to remain high, we will transition to F-35s as rapidly as possible. Continued Congressional support for this transition is key to increasing our degraded aviation readiness & minimizing our exposure to ever increasing operations and support costs for aged aircraft.”

Navy League 2015: F-35 studies next-generation EW capability

14 April 2015 Marina Malenic <http://www.janes.com/article/50659/navy-league-2015-f-35-studies-next-generation-ew-capability>

“Key Points

- The F-35 programme is considering integration of a next-generation EW capability that could allow pilots to control enemy weapon systems
- The evolution in EW capability is likened to the technological advancement from gravity bombs to precision munitions

The Lockheed Martin F-35 Lightning II Joint Strike Fighter programme is considering integration of a new pod-mounted electronic warfare (EW) capability being developed independently, the deputy programme executive officer told IHS Jane's during the Navy League Sea-Air-Space conference on 14 April. "Fundamentally, it's no different than the application of electronic warfare," Rear Admiral Randy Mahr said of the new kit, which he previously referred to as an "offensive cyber" capability. "You pick a target and you apply a signal to that target."

Rear Adm Mahr declined to name the company developing the capability, noting that such industry internal research and development (IRAD) initiatives are treated as proprietary technology. He said the company is targeting the F-35 programme for sale of the capability because "they're looking at us and the evolution of the platform. We have the processing capability, and we have the knowledge of the battle space."

The admiral described the capability as a more nuanced application of EW than that of legacy systems. "Until now, we've been trying to disrupt radar," he explained. "The next step is to try to gain control of the weapon system." Rear Adm Mahr likened the advancement of EW in the new system to the difference between gravity bombs and precision munitions. "So far in the 70s, 80s, and 90s, electronic warfare has been the massive application of a lot of energy; we've been able to direct that energy," he said. "Now we're looking to make that energy smaller and to do something with it. This is to get in to their control systems."

Meanwhile, the F-35 programme is also examining ways to open its architecture to the integration of new technology, Adm Mahr said. "We'd like to be able to open our systems so that we can bring more things in, like this cyber capability," he said. However, opening architectures after an aircraft has been completed is a challenging task, he acknowledged.

Still, there is precedent to opening architectures after the fact. The Boeing AV-8B Harrier and the Boeing F/A-18 Super Hornet are just two of the Pentagon's aircraft that have been subject to such changes that allowed for technology insertion. Asked when the F-35 might have a completely open architecture, Rear Adm Mahr said: "It's probably a decade away." One of the keys to opening the architecture will be integrating international weapons. Those efforts will help the programme "learn how to integrate things efficiently without have to rebuild the whole system", he said."

Australia and Norway cooperate on Joint Strike Missile 27 Feb 2015

Philip Smart <http://www.australiandefence.com.au/news/australia-and-norway-cooperate-on-joint-strike-missile>

“Australian will cooperate with the Norwegian Ministry of Defence to develop Kongsberg’s Joint Strike Missile as a potential future weapon for Australia’s F-35A Joint Strike Fighters. The Kongsberg Defence Aerospace Joint Strike Missile (JSM) system is a fifth-generation, long range precision guided stand-off missile designed for both Anti Surface Warfare (ASuW) and Naval Fire Support (NFS) missions over land, sea and the littoral.

At four metres long & weighing around 400kg, it can be carried externally or internally by the F-35A, but is too large for the F-35B’s smaller internal weapons bay. A stealthy shape and use of terrain profile matching navigation are designed to minimise detection and help the missile fly dynamic, unpredictable profiles to target.

Norway intends to buy up to 52 F-35A aircraft and will field the Joint Strike Missile early in the next decade for its own fleet, but is also attempting to interest other F-35A customers. Although Australia won’t formally consider buying the JSM until later this decade, early participation has ensured the system will be understood and compatible should an order be placed.

But Australian industry has been part of the program since development began in 2008. QinetiQ Australia has been providing mission planning support to Kongsberg for the Joint Strike Missile since 2008. QinetiQ software developers have created a tool for JSM that allows Joint Strike Fighter pilots to visualise the best route to fly to maintain connectivity with the JSM after launch, in case of a post-launch target change, mission abort, safe detonation and/or damage assessments.

BAE Systems Australia has been working with Kongsberg on the electronics for a second, independent sensor within the missile to identify hostile radar targets. “BAE Systems Australia will deliver a pre-production passive RF sensor in April 2015 for the JSM program,” said BAE Systems Director, Land & Integrated Systems, Graeme Bent. “This will involve fit checks, system integration & flight testing for a development-standard missile in order to demonstrate it provides enhanced operational capability.””

SUBJ: DESIGNATION OF NAVYS FLAGSHIP | UNCLASSIFIED ROUTINE 130739Z MAR 15

1. THE PURPOSE OF THIS MESSAGE IS TO FORMALISE THE DESIGNATION OF HMAS CANBERRA AS THE FLAGSHIP OF THE ROYAL AUSTRALIAN NAVY

2. THE COMMISSIONING OF CANBERRA AND THE PROGRESSION TO TASK GROUP CENTRED OPERATIONS PROVIDES AN OPPORTUNITY TO INTRODUCE A FLAGSHIP INTO THE ROYAL AUSTRALIAN NAVY. THE NAVY FLAGSHIP IS A SYMBOLIC REPRESENTATION OF THE LEAD SHIP OF THE RAN WITH A RESULTANT INCREASE IN ITS ABILITY TO SHAPE AND INFLUENCE THROUGH PRESENCE AND THE CONDUCT OF SPECIFIC FUNCTIONS, INCLUDING REPRESENTATIONAL AND CEREMONIAL. AS THE FLAGSHIP IT WILL PROVIDE THE PRIMARY PLATFORM FROM WHICH TO SUPPORT NAVY, ADF AND GOVERNMENT 'SOFT POWER' ROLES. WHILE ANY SHIP CAN BE CALLED UPON TO DO ANY OF THE ROLES OUTLINED IN THIS SIGNAL, CANBERRA WILL BE EXPECTED TO DO MORE AND TO A HIGHER STANDARD BY VIRTUE OF HER FLAGSHIP ROLE

3. THE ROLE IS NOT INTENDED TO ESTABLISH ANY UNNECESSARY COMMAND AUTHORITY. THE MANAGEMENT, ROLES, CEREMONY AND AUTHORITIES OF THE CHIEF OF NAVY FLAG, COMAUSFLT FLAG AND COMWAR BROAD PENNANT ARE UNCHANGED BY THIS ROLE

4. HMAS CANBERRA WILL RETAIN THE ROLE UNLESS A DEEP MAINTENANCE ACTIVITY PRECLUDES THE SHIP PERFORMING THIS FUNCTION. IN THIS INSTANCE THE FLEET COMMANDER WILL PREPARE A BRIEF FOR CHIEF OF NAVY SEEKING A TEMPORARY TRANSFER OF THE RESPONSIBILITY TO ANOTHER SHIP

5. THE TITLE OF FLAGSHIP IS ONE THAT IS LOADED WITH HISTORICAL PRESTIGE, IT GIVES ME GREAT PLEASURE TO DESIGNATE CANBERRA AS THE NAVY FLAGSHIP

MRH-90 Approach May 2015

<http://www.adf-messageboard.com.au/invboard/uploads/post-7-1432769545.jpg>

**LHD Juan Carlos I,
in-cockpit Osprey CQ**

<https://www.youtube.com/watch?v=YcPHjVCgPC0>





<http://www.sldinfo.com/the-australian-path-to-defense-innovation-the-perspective-of-the-incoming-chief-of-the-royal-australian-air-force/>

THE AUSTRALIAN PATH TO DEFENSE INNOVATION: THE PERSPECTIVE OF THE INCOMING CHIEF OF THE ROYAL AUSTRALIAN AIR FORCE

2015-05-20 By Robbin Laird

Recently, I had the chance to talk with the current Deputy Chief of the Royal Australian Air Force, Air Vice-Marshal Gavin (Leo) Davies, who will take over as Chief of the Air Force this summer.

His tenure comes at a crucial time in the evolution of the RAAF and of the Australian Defence Force as a whole.

And the Australian approach is part of the evolving context within which key coalition partners of the United States are undertaking fundamental changes to shape their forces for 21st century operations.

Whether it be the UK innovating under the impact of the acquisition of their new carrier, or the Dutch and Norwegians leveraging the F-35 to shape ways ahead (the Dutch speak of Air Force 3.0) or the Gulf Air Forces shaping a very competent air arm engaged in Middle Eastern Operations, allies are reshaping ways to operate on their own or with their coalition partners.

No ally is clearer about shaping a template for change or shaping a way ahead than the Australians, and within Australia the RAAF.

The current Chief of the RAAF, Air Marshal Geoff Brown, launched what he calls Plan Jericho as the template for change.

A former Air Vice-Marshal in the Royal Australian Air Force, John Blackburn, has been deeply involved in supporting the Plan Jericho launch, and provided an overview on the approach in a recent presentation to the European Air Group at High Wycombe and at a joint Aussie-Danish Airpower Symposium in Copenhagen on April 17, 2015.

As Blackburn explained at the Copenhagen Airpower Symposium on April 17, 2015, the idea



Air Commodore Gary Martin, the Australian Air Attache in the United States, with Air Vice Marshal Davies after the interview. Credit: SLD

behind the effort is pretty straightforward, namely, to leverage the coming of the F-35 as a trigger for transformation for the modernizing RAAF fleet.

Rather than just waiting for the coming of a fifth generation aircraft, the Aussies are looking to reshape the force to become a more integrated, lethal force enabled by vastly improved, shared, situational awareness and targeted decision making able to operate effectively in the challenging environments in which they operate. It is about a step change in the ability to operate as an integrated team across the Australian Defence Force and in Coalition operations.

In part, the challenge is to get past the replacement platform mentality.

The core air platforms have been or are being replaced but the task is not simply to learn the new platform and prepare for the next one in a narrowly defined functional area – fighter is a fighter, tanker is a tanker, a lifter is a lifter, an air battle manager is an air battle manager and so on down the 20th century species list – but to shape cross platform capabilities and to reshape how battle management, operations and warfare is conducted.

This is challenging for a small air force, which is already taxed in learning how to operate new platforms, and get them into operations.

The notion of preparing for the introduction of the F-35 and cross platform innovation will be evolved by testing new approaches to using other new platforms and leveraging them as well in new ways PRIOR to the F-35 becoming the dominant fighter in the RAAF.

For Air Marshal Brown, the task for Plan Jericho is about combat innovation and not just about a new airplane, but what that plane and the innovation in the RAAF associated with the plane might mean for the Australian Navy and Army as well.

The question he posed to launch Plan Jericho is simply: What is a 5th Gen / 5th Gen enabled Force?

According to [Blackburn](#):

For the Chief this is clearly a Force with: vastly improved shared situational awareness, the ability to operate as an integrated team and the term is a lever for joint integration in 21st century combat conditions and adapted to a 21st century strategic environment."

RAAF F-35Bs on LHDs?

The formal definition of Plan Jericho has been laid out in an official publication earlier this year and the way to understand it is as follows:

"Plan Jericho is Air Force's plan to transform into a fully integrated force that is capable of fighting and winning in the information age.

Jericho Vision: To develop a future force that is agile and adaptive, fully immersed in the information age, and truly joint.

This is not the final plan, but rather the first step to meet our challenge of transformation for the future.

The discussion with Air Vice-Marshall Davies started precisely on the point of how he viewed Plan Jericho and its importance in helping shape a way ahead.

According to Davies: "The Plan Jericho approach dovetails very well with the overall relook which Australian defense is taking with regard to first principles.

There is a first principles review going on at the same time we have launched the Plan Jericho effort.

We think our approach is not simply about the Air Force but the overall process of transformation for Australian defense."

He emphasized that "if we simply continue without transformation we will not be able to deal with threat environment which Australia and its allies face.

Significant innovation, shaping distributed operational capabilities, and greater coalition effectiveness are all part of the way ahead.

It is about building a more credible deterrent force, one whose effectiveness can not be in doubt in the eyes of the adversaries of the democracies."



(L-R) Deputy Chief of Navy, Rear Admiral Michael van Balen, AO, RAN, Chief of Army, Lieutenant General David Morrison, AO and Deputy Chief of Air Force, Air Vice Marshal Gavin 'Leo' Davies, AO, CSC pay their respects after laying wreathes at the Anzac Day 2015 National Ceremony held in Canberra.

He explained further how he looked at the challenge.

"I call it the Janes factor.

I want a potential adversary to look at the Royal Australian Air Force, the Australian Defense Force more broadly, and then at a coalition force, of which Australia is a part, and flick through Janes fighting ships, fighting aircraft, fighting systems, and conclude that I do not want to butt heads with that group, actually.

That's going to hurt me more than I can stand.

I suspect if we continue to evolve as we are, and have done over the last 20 years, without taking on a fifth generation warfare approach, then when they read that Jane's volume on Australia, they'll say probably they won't be able to hurt me that badly.

This is clearly NOT the conclusion we wish our adversaries to reach."

Air Vice-Marshall Davies highlighted that a key trajectory for force transformation was to be able to combine kinetic with non-kinetic capabilities to deliver the kind of combat effects, which are needed for a wide variety of combat tasks and situations.

He comes from an F-111 background, and the ability to project lethality at a distance was built into the F-111 approach.

But this approach is not the most relevant to the way ahead, for it is about combined capabilities delivering a multiplicity of effects appropriate to the task which is required.

"What we've had trouble appreciating, and this is somewhat tough for an F111 man, is that that concept is no longer valid.

We need to take the fighting force, not just the kinetic effect, to battle, and so our requirement for air lift, our requirement for anywhere refueling, became part of a fighter support package, but really the fighter support package now includes electronic warfare, it includes ISR, and it includes the ability to update the battle second by second, minute by minute, whereas what we have been reliant upon ISR updates of day by day up until this point.

If we don't have all the elements as we go forward into a particular series of events, I don't believe we will prevail.

We will not be able to have the response that we need and for a force as small as the ADF is, that's simply not going to be effective"

The force integration piece is the goal for Plan Jericho.

He mentioned that the Royal Australian Navy leadership was shaping a convergent approach to innovation and looking at naval and air integration as a key element of moving forward as well for their platforms.

"We already see manifestations of this in Operation Okra, where we have navy controllers on the Wedgetail and we will have Air Force controllers onboard Navy ships as well.

This is about breaking the cultural barriers."

A key element associated with the Plan Jericho approach is enhancing risk tolerance. Risk aversion will not see the kind of innovation necessary to shape an integrated force which can leverage the new platforms, with the F-35 being a centerpiece for the innovation process.

"With the new technologies, the younger generation intuitively probes ways to do things differently.

We need to not get in the way but to facilitate change as senior leaders. And we can seek out opportunities to enhance innovation.

For example, we have bought the C-27J in order to access many of the shorter airstrips in our area of operation.

What about access with the F-35B & also LHDs?

We can access four times the number of air fields in the Australian region with C27 than we can C130J.



Norwegian Deputy Minister of Defence, Oystein Bo (right to left) Deputy Chief of Air Force, Air-Vice Marshal Gavin (Leo) Davies, Kongsberg Executive Vice President, Pal Bratlie, BAE Director Land and Integrated Systems, Graeme Bert and General Manage Aerospace QinetiQ, Dick Noordewier at the Kongsberg stand after The Hon Kevin Andrews MP, Minister for Defence has announced Australia's participation in a cooperative Joint Strike Missile (JSM) development program with Norway for the F-35A Joint Strike Fighter. *** Local Caption *** The Hon Kevin Andrews MP, Minister for Defence has announced Australia's participation in a cooperative Joint Strike Missile (JSM) development program with Norway for the F-35A Joint Strike Fighter.

I think that is the next step."

We concluded the discussion by addressing a core question: when his time as Chief of the RAAF is over what will he hope to look back on as achievements during his time in office?

"There are two key tasks which I hope we will succeed in achieving.

The first is pushing beyond the platform approach. 

A C-17 is not just about going from point A to point B. How do we reshape its role as we craft a fifth generation warfare approach?

More generally, how do we tie our inventory together in a more effective war fighting approach enabling us to prevail in the 21st century strategic environment?

The second is overcoming a risk averse culture. 

We need to open opportunities for the young officers, airmen and airwomen to drive innovation and to open the aperture for integrative change."

We are going to send young crews to work with a mix of experienced C-130 crew members because we want to have fresh looks at how this fleet might operate in an island environment as vast as Australia and deliver the kind of military tasks that these crews will face and the Government expects."

A core effort for the RAAF and the ADF is working a diversity of coalition efforts, and the coming of the global F-35 fleet enhances our ability to shape new working relationships in the near term.

"We have seen an expanding willingness among partners to share experiences and to shape convergent ways ahead in the past few years.

And we hope to continue this trend going forward.

For example, as South Korea adds the F-35 and works logistics or its integration with its Navy or Army, how might we learn from what they do?

And as we expand ways to enhance interoperability with the integration efforts we can expand the apertures of how we integrate various pieces of equipment going forward based on expanding working relationships with Asian and other allies.

Air Vice-Marshal Gavin (Leo) Davies, AO, CSC

Air Vice-Marshal Davies joined the Royal Australian Air Force as a cadet Navigator in 1979 and graduated to fly P-3B and P-3C Orion aircraft with No 11 Squadron at Edinburgh in South Australia. In 1987 Air Vice-Marshal Davies completed pilot training and after completing F-111 conversion course was posted in 1988 to No 1 Squadron at RAAF Base Amberley.

In 1990, Air Vice-Marshal Davies was posted to Cannon Air Force Base, New Mexico, to fly F-111D aircraft on exchange with the United States Air Force. On return to Australia in 1993 Air Vice-Marshal Davies was posted to No 1 Squadron as the Operations Flight Commander followed by one year as Operations Officer at Headquarters No 82 Wing during 1996.

After a posting in 1997 and 1998 as the Executive Officer at No 1 Squadron, Air Vice-Marshal Davies completed RAAF Command and Staff Course. In 2000, he commenced two years in Capability Systems within Defence Headquarters.

In 2002, Air Vice-Marshal Davies' long association with No 1 Squadron was again rekindled when he returned as Commanding Officer and achieved 2000 hours flying the F-111. He was the Staff Officer to the Chief of Air Force during 2004 before taking up the post of Officer Commanding No 82 Wing at RAAF Base Amberley.

Air Vice-Marshal Davies worked as Director Combat Capability within Air Force Headquarters in 2006 and 2007, during which he was deployed to the Middle East to work within the Combined Air Operations Centre. From 2008 he was the Director General Capability Planning within Air Force Headquarters until 2010, when he was posted to Washington as the Air Attaché. Air Vice-Marshal Davies returned from Washington in January 2012 to take up his current position as Deputy Chief of Air Force.

In March 2015, his future promotion to Air Marshal and appointment as Chief of Air Force was announced with effect 4 July 2015.





Israeli Air Force

The First “Adir” to be Revealed Today 22.06.2016

Zohar Boneh | Translation: Ohad Zeltzer Zubida

<http://www.iaf.org.il/4447-46784-en/IAF.aspx>

The F-35's, known in Hebrew as the “Adir”, rollout ceremony will be held today at 10:00 AM Dallas time at the “Lockheed Martin” factory. IAF Chief of Air Staff: “I don’t think it is an exaggeration to say that the presence of the F-35 in the Middle East will change the dynamic of the region for the better”

The first Israeli “Adir” (F-35I) jet, which is expected to land in Israel in this coming December, will be revealed today in a rollout ceremony in the “Lockheed Martin” factory in Fort Worth, Texas. The ceremony will be held in the presence of the Israeli Minister of Defense, Avigdor Lieberman, IAF Chief of Air Staff, Brig. Gen. Tal Kelman, and other senior representatives of Israel and the USA. “Today is a special day for the Israeli Air Force”, said the Chief of Air Staff. “It symbolizes a leap in the strategic abilities of the state of Israel, and it symbolizes the partnership and unbreakable commitment between the United States and Israel, a commitment which is a strategic asset for the state of Israel”.

The “Adir” is a multirole stealth fifth-generation fighter jet that is expected to completely change the face of the IAF and introduce new abilities into the force. “A few months ago I had the privilege of flying the F-35 simulator here in Fort Worth”, Brig. Gen. Kelman shared. “As a pilot that has flown a great variety of aircraft for over 30 years, I must share the feeling: It was like holding the future in my hands. The unique combination between split edge technology, lethality and amazing man - machine interface will lead the world to the fifth generation”.

“The F-35 which will be received by the IAF with open arms this coming December, will substantially enhance our operational capabilities. The new aircraft will bring with it new strength. There is no doubt that the F-35 will become an integral part of our defense system and allow us to better ensure the safety of our civilians - against our hostile neighbors, and against the complex threats which may escalate at a moment's notice”. The Chief of Air Staff added. “I don't think that it is an exaggeration to say that the presence of the F-35 in the Middle East will change the dynamic of the region for the better”.

F-35Bs for IAF also?

IAF Chief of Air Staff: “We want to reach 75 jets”

The Minister of Defense, Avigdor Lieberman, who will lead the Israeli delegation to the rollout ceremony, said that Israel's intention is to equip itself with at least 17 additional F-35 jets that will join the 33 jets whose purchase has already been agreed upon. In the last few months, the Chief of the General Staff, Lt. Gen. Gadi Eizenkot approved the IAF's recommendation to raise the number of Israeli F-35 jets to 50. “Every opinion I have heard says that this is the best jet in existence today, and we will do what it takes to buy the additional jets”, said Lieberman. “Advancing toward a new deal depends of course on the American aid deal which is being discussed currently, but my stance is clearly in favor of purchasing the jets”.

The Head of the IAF Chief of Air Staff, Brig. Gen. Tal Kelman, who will also participate in the rollout ceremony today, sees the first 50 jets as an intermediate station. “We want to reach 75 jets”, said Brig. Gen. Kelman. “The Israeli F-35 is the first fifth generation fighter to arrive in the Middle East, and it will allow us to open a significant gap in our abilities when facing all of the elements in the area”.

According to the Chief of Air Staff, the IAF is already examining the F-35B model equipped with the ability to take off from very short runways and land vertically. “We want the first 50 jets to be A models, but beyond this, we are examining the options. The F-35B may be limited relatively to the A model regarding the amount of munitions it can carry, but has other advantages that may aid us in different scenarios”.

“It has become tangible”

The preparations leading up to the arrival of the “Adir” in Israel have been in progress for a few years and today they are in their peak. “Suddenly we have begun feeling that it is approaching. There is a plane. It has become tangible”, shared Lt. Col. Yotam, the Commander of the “Golden Eagle” Squadron, which will receive the “Adir”. “Apart from that, it is good to see that there is no delay, something very common in large, multi-participant projects such as this”.

The “Golden Eagle” Squadron's technicians are currently in the “Lockheed Martin” factories in order to learn about the jet's maintenance, and about a month from now, the first mission of pilots will travel to the USA for conversion training, and will return a short time before the jets land in Nevatim AFB. “The preparation for the arrival of the jet hasn't ended yet, and we don't have much time, but besides aircrew members, a force designated to prepare and make sure that the jet we see today receives the best maintenance possible will stay here”, said Lt. Col. Yotam.

A moment before the journey to Israel

Now, the aircraft is expected to undergo a series of comprehensive tests in the USA in order to make sure that it is fit for flight, and will even take off for a test flight, operated by an American pilot in order to check its abilities when facing the pressure put on it. About two weeks later, the second “Adir” is expected to come off the assembly line, and according to schedule, the series of tests are expected to be completed by the end of November, just in time for the jets to embark on their journey to Israel.

Norway, Australia Team To Upgrade Missile for F-35

Lara Seligman 21 Sep 2015

<http://www.defensenews.com/story/defense/air-space/strike/2015/09/21/norway-australia-team-to-develop-missile-for-f-35/72590888/>

“FORT WORTH, Texas — Norway and Australia have minted a deal to develop a new seeker capability for the Joint Strike Missile, a core weapon planned for integration onto Norway's F-35. Under the Sept. 15 agreement, Australia will finance the development of a new RF-seeking capability, which will enable the missile to locate targets based on electronic signature. BAE Australia will develop and integrate the capability, according to a Sept. 21 statement from Norway's Ministry of Defense.

If Australia later decides to procure the JSM, developed by Norwegian company Kongsberg Defence Systems, Norway and Australia will share the cost of integrating the JSM on the F-35. The new seeker will provide JSM dual-seeker capability, which enables the missile to operate in all weather conditions, Executive Vice President of Kongsberg Group and President of KDS Harald Ånnestad told Defense News on Monday. Kongsberg expects the announcement to fuel increased interest in the JSM from other international partners, he said. This marks the first time another nation has discussed the possibility of covering some of the costs related to the JSM, the Sept. 21 statement reads.

JSM is a long-range, precision-guided missile that will be carried internally in the F-35. The current seeker being developed for the missile is based on a technology known as "imaging infra red" that enables the missile to detect and identify targets based on heat signature, according to the statement. JSM will be integrated on Norway's F-35 in the first phase of follow-on development in the 2022-2024 time frame.

"This agreement is a prime example of instances where two nations, each bringing their own specialties and skills to the table, are able to build a better system by working together compared to what they could have done on their own," Norwegian Minister of Defence Ine Eriksen Søreide said, according to the statement. "This, in a nutshell, is what the F-35 partnership is all about and it is an important example of the kind of positive ripple effects the program helps generate beyond the aircraft themselves."

Navy Develops Semi-Autonomous Air-Launched Missile for F/A-18

15 May 2015 Kris Osborn

The Navy is working on a deal with Lockheed Martin to integrate its new, semi-autonomously guided Long Range Anti-Ship Missile onto an F/A-18 Super Hornet aircraft, giving the fighter an increased ability to identify and strike targets at longer ranges from the air, service and Lockheed officials explained.

In development since with the Navy and the Pentagon's research arm, the Defense Advanced Research Projects Agency, or DARPA, the so-called LRASM weapon is being developed as a long-range air, surface and submarine-launched missile able to track and destroy targets semi-autonomously.

Not much detail about its seeker technology, range or guidance systems is publically available – as much of the program is secret. However, Lockheed officials have said the weapon has an unclassified range of 200 nautical miles, a distance which is likely to be well short of its actual range.

Also, LRASM does use a semi-autonomous guidance technology designed to allow the weapon to avoid obstacles in the air while in flight,

Lockheed officials explained.

The Navy plans to have LRASM operational on F/A-18s by 2019; the Navy, Air Force DARPA and Lockheed have conducted at least three demonstrations of the LRASM thus far.

In the most recent flight test in February of this year, the LRASM was fired successfully from an Air Force B-1B bomber at Pt. Mugu, a sea range in California. LRASM will be operational on an Air Force B-1B by 2018, officials said.

At an initial air-launched test flight took place in August of 2013, the LRASM successfully launched from a B-1B bomber and navigated itself to the target, said Lockheed officials.

The Navy also plans to compete a surface-ship launched variant of its air launched Long Range Anti-Ship Missile, or LRASM which is now in development, service officials said.

With this in mind, Lockheed has been investing about \$30 million in research funds to develop and test a LRASM that can fire from a surface-ships' vertical launch system, Lockheed officials said.

In fact, the Navy and Lockheed conducted a vertical-launch system, or VLS, test firing of LRASM from a desert location last year at White Sands Missile Range, N.M.

"We wanted to make sure it can exit the canister when the booster lights up and the missile stays intact. We're furthering the maturity of our surface launched integration and planning on doing a few flight tests in the near future," Hady Mourad, Program Director with Lockheed Martin Missiles, told Military.com in an interview.

The weapon is being configured to fire out of surface ship and submarine firing tubes and vertical launch systems.

"The weapon will launch out of whatever Tomahawk gets launched out of," Mourad added. "What we bring with LRASM is not part of the inventory."

The weapon has some similar characteristics to an existing air-launched weapon called the Joint Air-to-Surface-Standoff Missile, or JASSM. This similarity will likely help make production of LRASM easier because some of the dimensions are comparable to JASSM.

Eventually, the LRASM will likely fire from surface ships such as destroyers, submarines and aircraft such as F-15s, F-35 joint strike fighters and other platforms, Mourad explained.



JULY 2, 2014 A well-balanced Air Force



Interview with Air Marshal Brown, Chief of Royal Australian Air Force by Sergei DeSilva-Ranasinghe

THE Royal Australian Air Force (RAAF) maintains one of the leading Air Forces in the Asia Pacific region and is in the process implementing its most significant modernisation programme in decades. In an exclusive interview, the RAAF Chief, Air Marshal Geoff Brown, talked with Sergei DeSilva-Ranasinghe on a range of topics that emphasised the RAAF's development and current challenges, updates on modernisation and acquisition programmes, the Air Force's role in support of Army and Navy amphibious doctrine and its future objectives.

Q: how the RAAF evolved over the last decade?

Air Marshal Brown: Over the last decade, we have deployed every one of our capabilities at

some time. We started with the major combat phase in Iraqi Freedom with the FA-18s, AP-3Cs, and C-130s, and a big push into the Combined Air Operations Centre to control them. We also had sustained operations with the C-130s and AP-3Cs for a 10-year period, as well as some unique ones like the deployment of the radar into Kandahar, controlling the airspace, and establishing a UAS capability with the Heron.

Of the 1,500-odd Australians in theatre around 500 plus have been Air Force people, whether they've been embedded, or with our own units. It has been a large and sustained deployment exercise and, I suppose, if you look at the lessons that came out of it, it is pretty much 'come-as-you-are' with the capabilities that you've got. I don't think any of us think much of the concept of strategic warning time these days. From 2003, we've pushed to have our aircraft fully fitted out with a full suite of defence expendables and Radar Warning Receivers (RWRs), which previously we might have been fitted for, but not with.



These days, all our platforms need to be flexible, capable of being employed in a number of roles. If you look at the experiences of the last 10 years, taking the AP-3C in the Middle East as an example, on one mission, it could go from supporting Marines in Afghanistan, to coming back and doing a maritime mission on the way home. It's been a particularly flexible platform. The other big one for us has been the establishment of the UAS capability, with Heron, and again, I think on average, we were doing around 6,000 hours a year and can cover ground forces operations 24/7 with the Heron. Moving into that UAV capability has been a big move for us.

Q: What are the main challenges for the RAAF today?

Air Marshal Brown: Certainly, finance is always a challenge. We've probably saved about AUD\$700 million in our overall sustainment programmes in the last four years, and we've done that through a combination of what we've termed Air Force improvements. We've looked at fixing the techniques across Air Force and the way we do business to actually improve it, so that we can sustain the same capability at a lower cost. We've done a fair bit of work in that area, and I'd argue that it's been very successful. If I were to take the C-130J engines as an example, we've now got the highest on-wing time of any C-130J operator anywhere in the world and that has a lot to do with the improvements that we've made over the last couple of years. The big challenges as we go ahead are more to do with people, and having the right skill set as we move forward. We've had a major restructure of our combat support group to actually free up some people, so that we can invest in areas like intelligence and force protection.

Q: From a capability perspective can you provide an overview of what the RAAF's status today? In terms of modernisation, how well does the Air Force cover each type of capability and what have been its recent acquisitions?

Air Marshal Brown: A couple of years ago, I used to use a couple of slides showing all the aircraft and systems that we're operating now, and what we'll operate by 2020. The only three platforms that were to remain were the C-17, the C-130J and the Hawk. Everything else changes over that period.

We've introduced seven major platforms and systems, just in the last two years, and I'd argue that they've all been very successfully introduced. We transitioned the F-111 into the Super-Hornet, AUD\$300 million under budget. We've added an additional two C-17s to our fleet, taking that up to six, and Wedgetail has really hit its straps in the past 12 months, as far as the capabilities are concerned. Then there is Vigilare our major air-defence system, which involves 240-odd inputs from 45 different systems, including space-based systems, and that gives us a quite unique coverage of the area. We've had the Multi-Role Tanker Transports delivered, and that capability looks pretty good despite some issues.

The government committed to the 12 EA-18G Growlers, as well as to keeping the JSF on the same timeline. So I'm not complaining about where we sit. Our air lift capability also looks pretty good, with six C-17s, 12 C-130Js, as well as the five KC-30A Multi-Role Tanker Transports (MRTTs), along with 10 C27-Js coming online from 2016. There are not many Air Forces anywhere in the world that can boast that sort of airlift capability.

Looking at ISR; the E-7A is probably the most modern and sophisticated Airborne Early Warning and Control platform in the world and the AP-3C is about to be replaced by the P-8A and the Triton high altitude UAV. For anti-submarine aircraft numbers, the current Defence Capability Plan says eight. We've done a fair amount of study on that and we think that number is a little shy of what's required, so there's a lot of work going into getting that balance between a UAV capability and a manned platform.

If we look at strike and air-control, there are 24 Super Hornets and 12 Growlers on the way, Joint Air-to-Surface Standoff Missiles (JASSM) are integrated onto the classic Hornets, and Joint Stand-Off Weapons (JSOW) on the Supers. I'm not uncomfortable with where we sit there, either, or with the order for the Joint Strike Fighter. If you look at it as four core roles, we're sitting pretty well. I think we operate the most powerful Air Force east of India and south of China, in all capabilities.

<http://navalinstitute.com.au/a-well-balanced-air-force/>

Q: The F-35 project has raised much media attention and scrutiny as it runs over time and budget. When will Australia receive its F-35s and what advantage, in your opinion, will it provide to the RAAF over its regional competitors?

Air Marshal Brown: We'll start getting significant numbers of aeroplanes around 2018. It's a programme like all programmes in that it's gone through its ups and downs. To be honest, it's not a capability that keeps me awake at night. If you look at where we were in 2003, we budgeted a certain amount of money and we're still within that budget in 2013. I think that, 10 years down the track, that's not a bad result, though we probably don't have the same level of contingency that we did when we put it together in 2003.

As capability is concerned, it's Fifth Generation. I've fought against F-22s and I can tell you there's no point in being a Fourth Generation fighter if you're up against a Fifth Generation fighter; there's just that much difference between the two. It's like comparing a monoplane to a biplane.

People look at what you really need in a fighter. I would argue that situation awareness has always been the key thing in fighters; if you can target somebody else and they can't target you, you've got enormous advantages. If they can't see you on radar, or on an IR system, or if their system is not integrated to the same degree as the F-35, then they are at a complete disadvantage. I'm often amazed, actually, by some of the almost mythical capabilities that people ascribe to a lot of these other aeroplanes, even ones that are under development – ones that are fundamentally 10 to 15 years behind where the JSF is at the moment.

Q: What types of challenges has the RAAF encountered in the modernisation of ISR and close support capabilities?

Air Marshal Brown: One of the big things with the whole ISR role is that it's not just the platform. The platform is the simplest part of the equation; it's all the Imagery Analysts and intelligence behind it, and the process of exploitation and dissemination (PED – processing, exploitation and dissemination of information), which is the challenging part. We've learned a lot of lessons over the past 10 years and expanded the Force, to the point where I'm running a programme now to actually increase the number of Airborne Intelligence Analysts across our whole intelligence workforce through to 2020.

Q: In terms also of the future acquisitions, one thing of particular interest is the expansion of the RAAF's UAV force. What drone models are being considered, and what capabilities will they offer?

Air Marshal Brown: Firstly, you've got the Triton, the maritime version developed from the Global Hawk UAV. I think it's potentially a great capability for Australia, but it only just had its first flight last year, so there's a fair amount of development work that's got to be done. We need data on its capabilities and the sort of target set that we want to operate. But, certainly, if we can look at patrolling the north-west of Australia, it can cover a lot of territory in a 24 hour period. It can get down to places like Heard Island and around the Pacific more quickly than what we can with a AP-3C, and it can actually stay there longer. I see a lot of use in that sort of capability, but it is complimentary with a manned platform because high altitude UAVs like Triton can't take any action. They can't deploy an air-sea rescue kit, they can't do anti-submarine warfare and they can't strike against a surface target. So, it's all very well to see and survey, but you still need the capabilities to be able to do something about what you've seen while surveilling.

There is also the smaller Heron UAV, which I think has been an incredibly useful capability in Afghanistan. We are looking at ways in which we can continue that support to the Army, and it is certainly under consideration at the moment. And a follow-on capability from Heron, like a Predator/Reaper type capability, is also under discussion at the moment. I think the implementation of armed UAVs by the RAAF will occur quite rapidly, probably in less than a decade.

Q: In recent times, Air Force integration with the amphibious concepts has been talked about between Army and Navy: Doctrinally, to what extent will the RAAF have a role in this?

Air Marshal Brown: For the RAAF's role in the amphibious force, air control is probably the main priority and strike is the second. Our involvement doesn't get a lot of mention because the real issue that you have to solve is the seams between Army and Navy. For us, one of the air-control tasks is protecting a high value asset: the amphibious ship or naval task force. We will be involved in Airborne Early Warning and Control (AEW&C), and the tankers, fighters and maritime patrol aircraft to try to keep the taskforce screened, so it can go from A to B. And, certainly, at its destination you're looking at co-ordinating close air support or strike and maintaining air control. So, there's no great change for Air Force regarding our roles and how we fit in, it's just that the vital point that you're protecting is in the sea. Of course that comes with its own challenges regarding force projection and the reliance on tankers, and achieving a persistent presence at a distance for all our assets that are part air control for an amphibious force.

Q: In terms of future priorities, the ADF is moving into a different era. What would you say your key objectives are during your term, and where do you want to steer the Air Force?

Air Marshal Brown: We've had an extended period of what I'd term 'low end' operations and, while they are important and there are a lot of lessons that we can learn from them, you've got to have a full-spectrum capability Air Force. That's where we need the Air Force to be, in that full spectrum of capabilities. We do carry the majority of the ADF's capabilities of strategic weight, so they need to be well-trained and capable. If I were to look at what a legacy is, I would say it is a well-balanced Air Force that can meet the needs of government across the spectrum of operations.

Thank you Air Marshal.

Sergei DeSilva-Ranasinghe is a security analyst, defence writer, consultant and a visiting fellow at the National Security Institute, University of Canberra.
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***Air Marshal Geoff Brown, AO**

Air Marshal Geoff Brown joined the RAAF in February 1980 after completing an Engineering degree. He graduated from No 111 Pilot's Course in 1981 and was initially posted to 12SQN Amberley to fly Chinooks. After three years at 12 Squadron he was posted to 2 Flying Training School Pearce and spent 18 months as a Flying Instructor before being posted to Central Flying School East Sale in 1986. While at Central Flying School he was a member of the Roulettes from 1987-89. He led the last Macchi team before they transitioned to the PC-9/A.

In 1990, Air Marshal Brown was posted to Williamtown for a Hornet conversion and then completed a short tour at 77 Squadron. On promotion to Squadron Leader in 1991, he was posted to 75 Squadron Tindal as a Flight Commander.

In 1993, Air Marshal Brown was then posted to 77 Squadron as Executive Officer. He completed RAAF Staff College in 1995 and was subsequently posted to Headquarters Air Command as Staff Officer Operational Evaluation.

From 1997 to 2000, Air Marshal Brown commanded No 3 Squadron. He then completed F-111 conversion and assumed the position of Officer Commanding No 82 Wing in December 2000.

In 2003 he commanded all F/A-18 and C-130 operations in Operation Iraqi Freedom and was appointed a Member of the Order of Australia and a Legion of Merit for his service in the operation. He was Officer Commanding Airborne Early Warning and Control Systems Program Office from June 2003 until December 2004 and spent 2005 at the Centre for Defence and Strategic Studies. He then commanded Air Combat Group throughout 2006. From January 2007 until June 2008 he was Director General Capability Planning in Air Force Headquarters.

Air Marshal Brown was the Deputy Chief of Air Force from 30 June 2008 to 3 July 2011. He was appointed Chief of Air Force from 4 July 2011.

Air Marshal Brown has over 5000 hours in military aircraft. He lives in Canberra with his wife Amanda and his two sons, Ryan and Jake. His sporting interests are gliding and motorsports.

Is 'A' really better than 'B'?

Jenna Higgins 06 Dec 2016

<http://centralblue.williamsfoundation.org.au/is-a-really-better-than-b-jenna-higgins/>

'Flexibility is the key to air power' is one of the favourite clichés of the professional airman. In this post, Flight Lieutenant Jenna Higgins asks if, in light of the USMC's recent successful proof of concept demonstration of the F-35B VSTOL, the ADF should demonstrate flexibility in reviewing the decision of whether to acquire the F-35B to operate off its newly commissioned *Canberra* Class LHDs.

Australia has committed to buying 72 F-35A *Lightning II* Joint Strike Fighters. These platforms fulfil the essential role of providing a potent strike and air combat capability required to deter attempts to coerce or attack Australia and our national interests. As a strike platform, they are also expected to 'seize the initiative, and defeat potential threats as far from Australia as possible'; a direct quote from page 94 of the 2016 *Defence White Paper*. The F-35A is to achieve this role with a combat radius of 550nm – not exactly a sizeable buffer. Further, this range barely covers the Indo-Pacific region; the emergent centre of global economic and strategic power.

Fortunately, the Australian Defence Force (ADF) has embarked on a journey to introduce an amphibious warfare capability as part of the ADF repertoire, which may enable the ADF to extend the reach of its soon to be acquired air combat capabilities. The two *Canberra* Class LHD vessels, both now commissioned, are based on Spain's *Juan Carlos I*, which was designed with the AV-8B Harrier STOVL (Short Takeoff/Vertical Landing) 'jump jets' in mind. The *Canberra* Class LHDs enable the ADF to, amongst other things, more readily address emergent threats in the broader Indo-Pacific region. With that said, it



Australia's first Lockheed Martin, F-35A *Lightning II* Joint Strike Fighter on its inaugural flight, 29 September 2014.
[Image Credit: Lockheed Martin]

is well understood amongst the Defence community that the induction of these platforms is just beginning of the quest for an amphibious warfare capability.

A heated discussion has previously occurred regarding the merits of the F-35B VSTOL variant and its subsequent integration to assist ADF's future amphibious capability. However, on the back of a recent US Marine corps (USMC) exercise, it may be worth reigniting this conversation and asking: Did we get it wrong?

The USMC are currently preparing for its first overseas operational deployment of the F-35 in January 2017. Given that they will be operating in our area of strategic interest, they are perhaps the best example for Australia to model an amphibious concept of operations (CONOP). But up to this point, the manner in which the USMC would operate with their new platforms in the region has been largely theoretical. However, over the period 18-20 November the USMC successfully conducted a 'Lightning Carrier Proof of Concept Demo'.

This exercise demonstrated the beginnings of an efficacious shift in CONOP which recognises the potential of enhanced connectivity and a more robust fixed-wing capability. While the USMC uses different platforms, with a combination of the F-35B and MV-22 Osprey, it is the F-35B and Carrier CONOP that holds the most telling lessons for Australia. Using this new CONOP, the USMC are able to penetrate enemy defences, deliver a force to an undefended area, and attack outwards as opposed to 'attacking the enemy at its teeth'. Precisely what the 2016 Defence White Paper outlines as Australia's defence strategy – protecting our shores while taking the defence away from our borders. Using the advanced connectivity of the F-35, the Carrier is no longer removed from the mission whilst the aircraft are on task. In the final phase of the exercise, the USMC demonstrated the ability for the F-35 to integrate with the Aegis combat system aboard a US Navy Cruiser in order to provide targeting data to an anti-air ballistic missile-defence weapon system on board the ship.

So what does this mean for Australia? While the purchase of the F-35B variant has previously been discussed and subsequently dismissed on the grounds of cost and complexity, it is a discussion that should not be shelved completely. Yes, expense needs to be considered; however, the concept is not a flawed one. Capability costs money. And when the money is being directed towards an unknown entity or a theoretical concept it can be a tough ask. But we now have a clear intent for amphibious operations, a clear intent for the Indo-Pacific region, and a real-time framework (based in our operating area) provided by the USMC to track. Yes, modifications for the LHD would be required, and re-think of how we conduct amphibious, but perhaps the future purchase of the F-35B wouldn't be so silly?

Flight Lieutenant Jenna Higgins is a currently serving Royal Australian Air Force Air Combat Officer. The opinions expressed are her's alone and do not reflect those of the Royal Australian Air Force, the Australian Defence Force, or the Australian Government.

Putting F-35B on the Canberra Class LHDs: The Debate Continues –

Steve George 09 Jan 2017 <http://centralblue.williamsfoundation.org.au/putting-f-35b-on-the-canberra-class-lhds-the-debate-continues-steve-george/>

This year's opening article revisits the F-35B debate sparked by Jenna Higgins' post from December 2016. Steve George's response addresses the key issues.

Back in November 2014, I wrote a piece for the Australian Strategic Policy Institute on potential F-35B operations from the new RAN LHDs (LHD and F-35B: The Debate Opens Up). It received a mention in a recent piece here on *The Central Blue* by Flight Lieutenant Jenna Higgins (Is 'A' really better than 'B'?), which set off a spirited discussion. As a result, I've been asked by *The Central Blue* team to provide a stand-alone piece to update my original article and touch on some of the main issues raised. My aim, however, hasn't changed – to stimulate informed and objective debate on how the Australian Defence Force (ADF) could best deploy its F-35 force capability.

FLTLT Higgins referred to 'a heated debate' on the F-35B/LHD question. It's worth noting that discussions about naval (or maritime) air power often seem to get 'heated', particularly when the word 'carrier' appears, or when it appears to compete with land based air power. Sadly, it's my experience that much of the heat doesn't shed any light, and the recent discussion thread on *The Central Blue* had some examples of the genre, which I'll address. I'll also update my assessment of the technical issues surrounding F-35B/LHD integration.

Strike Capability

I believe that the core issues can be simply framed. How much air strike effect does the ADF want to be able to apply at long ranges from Australia? Can it (and should it) rely on Host Nation Support (HNS)? Would F-35Bs on LHDs provide a useful capability, and would it be cost effective?

Any debate on the use of air power should recognise the iron laws of distance, time and speed that affect all air operations. Increasing the distance from base to objective reduces the amount of *air power* (time over the target) and the weight of ordnance that a force of aircraft can deliver in a given time frame. This isn't a criticism of land-based air power, it's a simple statement of physical fact. The further you have to fly, the longer the time spent in transit. Time spent in transit (both ways) is time you can't spend delivering combat effect. If you want the same combat effect, you need more aircraft.

This leads to my key conclusion. Proximity equals capability. Or, closer is better. This is why the US and the French have committed carriers to the current campaign in Syria and Iraq, located in the Eastern Mediterranean around 50 to 100 miles off the coast of Syria. It's also why the Russians took the risk of basing their strike force on land in Syria. While I'm not arguing that Russian air strike tactics are a model for anyone in the West, their choice of a nearby land base has allowed them to deliver concentrated and devastatingly effective aerial bombardments.

Meanwhile, the ADF's HNS for Operation OKRA (Iraq and Syria) is located in the UAE, well over 1000 miles away. Surely, no one could argue that this is the optimal location for medium range aircraft such as the F/A-18.

Proponents of land-based air power solutions will point to AAR technology and the ability of their aircrew to conduct very long-range missions as the solution. It is, if your solution is simply to be seen to contribute. But if you want to materially influence events on the ground in a reasonable time frame, you need maximum time on task and weight of effort. If you have to fly over 1000 miles to get to the target, that's millions of gallons of fuel burned and hours of flying time spent not delivering weapons. (The ADF's own figures from their website <http://www.defence.gov.au/Operations/Okra/atg.asp> show average F/A-18 sortie durations of around 7.6 hours). They simply can't deliver much 'air power' time over the target at that range, as nearly all of their flying hours are being spent getting there and getting back. Nor can they deliver much weight of bombs. Their own figures show that less than one weapon has been dropped per (long) sortie.

This isn't an isolated example, and history demonstrates that HNS is very often not available where you really want it. However, proponents of land based air power solutions sometimes simply deny that the problem exists. Back in 2014, the ASPI argued that:

...the ADF would reasonably expect to be able to operate land-based aircraft from the country whose own defensive efforts Australia would be supporting, or with whom we could come under common attack...

it's prudent to assume that the [RAAF] would have access to land bases ... to make a contribution to a future coalition air campaign...

Two years on, we might conclude that while the ADF certainly has access to land bases, they certainly aren't in the right place.

Other arguments are deployed in an attempt to make the HNS issue go away. One recent post asked 'how often (would) the Australian government ... want to bomb countries that the neighbours of that country do not wish to be bombed'? With respect, that's a good example of 'situating the appreciation' – asking the question you want to answer. The question could be framed as: 'why might countries deny us HNS?' and there's a long list of answers to that one. The first is the obvious one – they don't want us to bomb their next-door neighbour. (Or their co-religionist.) But history provides us with lots of examples why a country might want a neighbouring country to be bombed, but might still refuse HNS.

They might not want to be seen to be involved. They might not want it bombed by you, because they disagree with you over something else. They might have an election coming, and they might have an issue with a certain segment of their population that shares certain cultural values with the country you want to bomb. They might offer HNS, but with strings, such as only for only for AAR sorties, not actual strike missions. Countries that you don't even want HNS from may deny you overflight.

In my view, any debate over the utility of carrier-based aviation should look at the evidence offered by history. The ability to forgo HNS issues and locate a meaningful force of aircraft at a time and place of a country's own choosing is precious and useful. Maritime nations that possess such capabilities use them, all the time, all over the world. (Every enemy aircraft shot down in air combat by the UK since the end of WW2 has fallen to a carrier-based aircraft.) I suggest that Australia, by reason of basic geography, is a 'maritime nation'. Of course, others may differ.

The Cost

So, what about the cost aspect? Nobody suggests that putting F-35Bs on to LHDs would be a cost-free exercise. Various improbable figures have been put forward, many resting on an assertion that this would be a risky technical enterprise, with many unanswered questions. The USMC's recent successful trial of their 'Lightning Carrier' concept on board USS *America*, as noted by FLTLT Higgins, must surely lay many of these concerns to rest. The Canberra-class LHD was designed to accommodate 12 F-35Bs. That ski jump is a valuable (and currently unused) asset. Perhaps the costs of putting the F-35B to sea should be re-examined.

Some argue that any additional expenditure within the current national defence budget must by definition displace an existing capability. Not necessarily. If you have a fixed budget and want to do so something additional, you can increase the budget, or you can stop doing something that you're already doing. Or, you can do something you're already doing in a different way. Strategy, priorities and politics drive the choices. Of course, once a service (for example the RAAF) has its desired equipment programme (a substantial F-35A buy), it's easy to argue that anything else is unaffordable.

But if we are to talk costs it might be interesting to get better visibility of the actual costs of the ADF's current long-distance air support operations. Spending around 10 hours in the air for each weapon dropped (from ADF figures) to 'take out' a pick up truck fitted with a cannon cannot, in my view, be an economically sustainable form of war. AAR tankers deliver huge amounts of fuel – but they also consume large amounts themselves, and frequently have to dump unused fuel to land back at base. Apart from the colossal fuel bill, these flying hours are generating huge aircraft support costs in manpower, parts and repairs. They will also be consuming the (fixed) service lives of the aircraft. Have these sums been done?

A counter-argument recently advanced is that the 'substantial' additional cost to the RAAF of getting pilots trained to fly at sea (described as a 'non-combat' skill) could only be met by losing or degrading an existing RAAF aircrew 'combat skill'. In the first place, carrier deck training isn't a 'non-combat skill'. Ships and their air groups go into combat. Such training delivers a combat capability – delivery of high tempo operations from a mobile sovereign base. Describing it as a 'non-combat' skill illustrates a profound misunderstanding of how maritime air power is generated.

But automatically assuming that learning to operate from a ship would result in a 'loss in combat-related training across the RAAF's air combat capability' or a 'decrease in proficiency' is, in my view, another example of 'situating the appreciation'. I'm sure that RAAF pilot training constantly gets adjusted to meet changing requirements and to field new equipment. If the Government decided to go for F-35B, the training would be part of the cost. How big might that cost be?

It would be substantial if the objective were a full 'cat and trap' or 'STOBAR' capability, where getting aircraft back on board takes high-end pilot skill levels, and executing a high tempo flying programme from a small deck area requires a well trained and thoroughly worked up ship. However, F-35B has been specifically designed to provide low workload launch and recovery to small flight decks. F-35B operations will require a much (much) smaller training 'delta' for aircrew than either 'cat and trap' or legacy STOVL aircraft. The LHDs will already have to work up a core capability to operate their current complement of aircraft – F-35B ops would be another small 'delta'.

Survivability of the ADF Fleet

There is also the issue of defending a deployed ADF fleet. With China and India fielding capable ship-based combat aircraft, the issue of how to defend the fleet against air attack must be considered. F-35B would offer a hugely capable air defence capability in addition to its strike role, but the idea has attracted some passionate opposition.

One (somewhat novel) argument put forward against the F-35 in this role is that that putting a potent air defence capability on the LHDs would invite an air attack on the LHD that otherwise wouldn't happen. It's further argued that it would be less risky to rely on missile defences to provide 'air denial' immediately around the fleet, relying on the new Air Warfare Destroyer (AWD). (Strangely, an AWD would apparently not attract attack in the same way that an F-35B equipped LHD would.) Actually, this is a hugely risky strategy. It's been tried and it usually fails.

In my view, this is wholly flawed thinking. What if the foe wants to shadow your fleet at or beyond your missile range? Or wants to attack a fleet asset other than the LHD? Or wants to attack the LHD because it's already your capital ship, and the biggest (easiest) target? Or wants to attack you because you have no defences? I'm no expert on air power terminology, but aiming for basic *air denial* over the airspace immediately above your own fleet looks to be rather a long way down the capability scale – it's only just above 'air incapability'. I think you'd probably want at least *air parity* over the whole fleet, but I'm happy to be corrected. (I note that air power proponents have no difficulty in making the case for land-based air defence aircraft to provide *air supremacy* for land-based operations.)

I'd be interested to know how the ADF plans to use land based F-35As to provide air defence for the surface fleet. Those iron laws of distance and time haven't changed since the UK's Royal Navy was supposed to be defended by RAF Phantoms in the 1970s. It didn't work then and it's unlikely to work now, unless the RAN is planning on staying very close to the mainland.

Technical Issues

Two years on from my previous assessment, it's clear to any impartial observer that the US has put a massive effort into getting the F-35B cleared and capable from decks and ships that are comparable in size and capability to the RAN's LHDs. Along the way, many myths and misconceptions have been laid to rest.

The flight decks don't melt. The gear around the flight deck doesn't fall apart under jet blast. People don't get blown away by the jet blast. The aircraft can happily perform ski jump launches. It can be supported at sea, and can safely take off and land from small decks. The aircraft software works, although there's still much to do. In a nutshell, there are now very few issues with the F-35B that aren't shared by the F-35A and which aren't being solved.

The capability of the aircraft is clearly a huge step on from first-generation STOVL aircraft such as Harrier. In combat evaluation, the aircraft is showing what its massive situational awareness, and data collection and handling capability can bring to the fight. Imagine what

such a platform could do when linked up with modern ship mounted radars and sensors to build a truly integrated intelligence, air defence and strike system.

Conclusion

Countries' defence plans are always changing in response to circumstances and external developments. In my view, the ADF's intended area of operations, which is largely maritime in nature, will become a far less certain place in the years to come. Again, just my view, but previous assumptions on the availability of HNS will have to be reviewed along with existing plans for deployments of a purely land-based F-35A force.

The F-35 will deliver a 'game changing' capability for the ADF. Surely, as F-35B equipped US LHAs and LHDs (and possibly the UK's Queen Elizabeth-class carriers) become increasingly common visitors to the China/Pacific region, the ADF will have to look again at how it might develop an ability to more freely deploy its main striking force at long range. Or how it might protect its surface forces against developing air threats.

When those reviews take place, it is to be hoped that objective and honest analysis prevails over single service interests. There's too much at stake.

Steve George was an air engineer officer in the Royal Navy for 28 years, and served in HMS Invincible during the 1982 Falklands operation. During his career, he was closely involved with the Sea Harrier, and also with joint RN/RAF Harrier operations. Retiring from the RN as a commander, he joined the JSF programme to work on F-35B ship suitability. He is now an engineering consultant.

“...A counter-argument recently advanced is that the ‘substantial’ additional cost to the RAAF of getting pilots trained to fly at sea (described as a ‘non-combat’ skill) could only be met by losing or degrading an existing RAAF aircrew ‘combat skill’. In the first place, carrier deck training isn’t a ‘non-combat skill’. Ships and their air groups go into combat. Such training delivers a combat capability – delivery of high tempo operations from a mobile sovereign base. Describing it as a ‘non-combat’ skill illustrates a profound misunderstanding of how maritime air power is generated.

But automatically assuming that learning to operate from a ship would result in a ‘loss in combat-related training across the RAAF’s air combat capability’ or a ‘decrease in proficiency is, in my view, another example of ‘situating the appreciation’ [asking the question you want to answer]....”

Adelaide's fighting edge tested

15 March 2017 LEUT Will Singer

<http://news.navy.gov.au/en/Mar2017/Fleet/3587#.WMrSw0m1uZ9>



HMAS Adelaide leads a close formation of warships from the Royal Australian Navy, Royal New Zealand Navy and the Spanish Armada during a photographic exercise, part of Exercise OCEAN EXPLORER 17, off the western coast of Australia.



Royal Australian Navy's amphibious ship HMAS *Adelaide* lead from the front during the recent Exercise OCEAN EXPLORER.

Exercising task group operations off the Western Australian coast, the landing helicopter dock was the centrepiece to war-fighting scenarios.

En-route to the 'war-zone', the crews of Australian, New Zealand and Spanish Navies experienced realistic attacks by 'enemy' cruise missiles from aircraft and ground-based locations during the high-end warfare serials.

During the first air-strike, HMA Ships *Darwin* and *Melbourne* joined the Spanish Armada's ESPS *Cristobal Colon*, in protecting *Adelaide* by neutralising the incoming cruise missiles and an aircraft.

The smell of cordite lingered in the air of *Adelaide's* gun-deck while the ship's gun crews engaged incoming jet fighter aircraft with 12.7mm calibre anti-aircraft fire defending the ship from further damage.

Commanding Officer Captain Jonathan Earley reflected on the mission and the ship's critical role in the fight.

"The class of ship is one of the most sophisticated air-land-sea amphibious systems in the world," Captain Earley said.

"The benefit is that it can host battle staff onboard in order to exercise command and control over task groups.

Captain Earley said the aim of the exercise was to certify a 'Sea Control Task Group' in preparation for more complex exercises and operations they will be conducting later in the year.

"More importantly it signifies a key step in realising Navy's vision in our ability to both generate and sustain maritime task groups," he said.

Military activities were conducted at sea and in coastal areas north of Perth in the vicinity of Lancelin, Geraldton and as far south as Geographe Bay.

The exercise included the first visit to Western Australia by *Adelaide*.

Navy's largest ships unable to join Cyclone Debbie emergency response amid engine troubles **NEWS**

defence reporter [Andrew Greene](#) 28 Mar 2017

<http://www.abc.net.au/news/2017-03-28/largest-ships-unable-to-join-cyclone-debbie-emergency-response/8391574>

Engineers are frantically working to solve engine problems on the Royal Australian Navy's two largest ships, with fears the Landing Helicopter Docks (LHDs) could be out of action for several weeks.

The Canberra Class Amphibious Assault Ships HMAS Canberra and HMAS Adelaide are currently docked at Sydney's Garden Island Naval Base where maintenance crews are trying to identify and resolve issues with the LHDs' azimuth propulsion system.

Defence sources have confirmed to the ABC they currently expect the problem will take between seven and 10 days to address, but if further complications are found, the 27,000-tonne ships could remain sidelined for even longer.

The Defence Force insists the inspections have "had no impact on Navy meeting its operational tasks".

In a statement to the ABC on Monday night the Defence Department confirmed a propulsion issue had been identified on board HMAS Canberra during recent trials with military helicopters.

"As a prudent measure, the same inspections were conducted on HMAS Adelaide and identified emergent issues," it said in a statement.

"It is too early to determine the extent of this emergent work and Defence is working to identify the causes and develop a repair strategy."

Unavailable ships a 'significant failure': Feeney

Federal Opposition MP David Feeney, who sits on Parliament's Joint Standing Committee for Defence, Foreign Affairs and Trade, said it was a worrying development.

"The news that both of our major amphibious ships are unavailable for service in this [Queensland cyclone period](#) is very, very troubling and represents a significant failure," Mr Feeney said.

"The good news is that the capability gap can be filled by HMAS Choules, a vessel procured by the former Labor government in 2010, but nonetheless these amphibious ships are designed for precisely this work that they're now not able to do."

Mr Feeney demanded the Government provide a full explanation of the problems.

"The Government does need to explain to us precisely what is the engineering problem that they're confronting, how did it happen, and I think, very importantly, will these ships be available for service in Operation Talisman Sabre [in July]."

On Monday, the Chief of Defence, Air Chief Marshal Mark Binskin, said the military was well positioned to provide immediate assistance to local communities within Cyclone Debbie's storm zone, if requested.

"We are ready and able to respond to this emergency in support of civilian emergency authorities and the residents of north-eastern Queensland once the full impact of [Cyclone] Debbie is known," he said.

As a precaution, HMAS Choules — the nominated HADR (Humanitarian Assistance and Disaster Relief) ship — left Sydney on Monday morning to head to Queensland "to be ready to support recovery efforts if required".

Navy on the Record Response to Andrew Greene reporting

Published on 28 March 2017 Department of Defence (author)

<http://news.navy.gov.au/en/Mar2017/Fleet/3625#.WNwG1km1uZ9>

Recent reporting by the ABC that "*Navy's largest ships unable to join Cyclone Debbie emergency response amid engine troubles*" is misleading.

To assert, as the ABC did in its reporting that issues with HMA Ships *Canberra* and *Adelaide* has impacted on Defence providing support to anticipated disaster relief support in North Queensland is wrong.

Under the Australian Defence Force's regular planning cycle, HMAS *Choules* assumed duties as the on line (ready) ship to support any Humanitarian Assistance and Disaster Relief (HADR) requirements in mid-March.

HMAS *Choules* is currently sailing for Brisbane to forward deploy and embark emergency stores to support the recovery efforts in the North Queensland region should it be required.

It ignores and appears not to understand the fact that the Amphibious Assault Ships HMA Ships *Canberra* and *Adelaide* are still in their operational test and evaluation period, and this is the period where issues such as the ones currently being addressed are found. It is precisely why there is a delayed evaluation and introduction into service program to ensure all aspects of the operation of these ships is considered before they reach the Full Operational Capability (FOC).

Both ships have conducted considerable trials and support to operations since being received by Defence with HMAS *Adelaide* having just returned from Exercise Ocean Explorer off the coast of Western Australia, and HMAS *Canberra* recently completed First of Class flight trials with a range of military helicopters from Army and Navy.

During these activities, a propulsion issue was identified aboard HMAS *Canberra* and she is currently alongside in Sydney being inspected.

As a prudent measure, the same inspections were conducted on HMAS *Adelaide* and identified emergent issues.

Having identified these emergent issues the Australian Defence Force has put in place a very deliberate plan to investigate the issue and resolve it.

It is too early to determine the extent of this emergent work and Defence is working to identify the causes and develop a repair strategy.

These inspections have had no impact on Defence meeting its operational tasks.

TW Barrett, AO, CSC Vice Admiral, RAN Chief of Navy

Dunford Mulls F-35B IOC Decision; 4 Bs Take Out 9 Attackers 27 Jul 2015

Colin Clark <http://breakingdefense.com/2015/07/dunford-mulls-f-35b-ioc-decision-4-bs-take-out-9-attackers/>

“WASHINGTON: During the Marine’s recent operational readiness test of the F-35B, four of the Marine aircraft went up against nine enemy aircraft. “It went very poorly for the bad guys,” Lt. Gen. Jon Davis, deputy commandant for aviation, told me this afternoon. Davis provided few details, saying they were classified, He did say that the F-35s faced a threat that “we have never put an F-16 or a Harrier against.” The F-35Bs, he said, did a “great job.” I asked Davis about the recent news that the F-35A did not fare that well in dogfight conditions against an F-16. “I love the F-16. It was a great airplane. Still is pretty good, but i would not want to be in a fight against an F-35.”

In a clear message to A-10 advocates, Davis said the F-35B performed extremely well at Close Air Support missions using Joint Direct Attack Munitions (JDAMs) and laser-guided GBU-12s. The aircraft does need a cannon, he conceded, for some missions. The gun is currently undergoing its first tests mounted on an aircraft but it won’t be deployed on the plane until 2017 when the Block 3F software is installed. But Davis was unequivocal in his enthusiasm for the aircraft. “No airplane in the world will be able to touch this jet at Close Air Support,” he told reporters.

Davis said he had made his recommendation about the F-35B’s Initial Operating Capability to Marine Commandant Gen. Joseph Dunford: “He’s got all the paperwork now and he’s going through it.” Breaking D readers will remember that Dunford has been nominated to become the next Chairman of the Joint Chiefs of Staff and has been a bit busy recently dealing with nomination hearings and such.

Davis said early models of the F-35B are currently maintaining a 60 percent to 65 percent mission readiness rate, something he expects to rise substantially as more newer planes come to the line. He noted a training squadron with newer planes was “getting 70 to 75 percent rates the other day.” The overall goal is 80 percent later in the program.

The Marines plan to buy 353 F-35Bs and Davis said he has heard absolutely nothing to convince him that number should be cut. It seems pretty certain he has recommended to Dunford that IOC be approved, but, as he put it, that’s the commandant’s decision.”

LT GEN JON DAVIS,

Commander for Aviation, Headquarters, USMC

A MEDIA briefing at Lockheed Martin's trade stand at RIAT on July 8 provided an insight into how the US Marine Corps' F-35B operations are progressing in the US. Speaker for the occasion was Lt Gen Jon Davis, Commander for Aviation, Headquarters, USMC, a former Harrier pilot who completed an exchange tour with the RAF when he was a Lieutenant. He explained the current situation and plans for the USMC:

"For the Corps we are one year in from declaring our first operational F-35B squadron. VMFA-121 at MCAS Yuma, Arizona, is doing very well and just last week we stood up our second squadron, VMFA-311. It is changing from a Harrier squadron to an F-35 unit. We also have our training squadron, VMFAT-501 at MCAS Beaufort, North Carolina. There are currently three squadrons 'inside' the USMC and building on from VMFA-121 we'll have VMFA-314, which will be our first tail-hook squadron with the F-35C model. We plan to have four F-35C squadrons and 16 STVOL squadrons equipped with F-35Bs, giving us a total of 420 aircraft split between 353 B-models and 67 C-models."

Expanding more on the training of new F-35 pilots for the USMC

Lt Gen Davis continued:

"VMFA-501 is growing in size as a training squadron with new pilots from the Harrier, Hornet and Prowler communities, and we've also taken in our first ab initio pilots direct from the Goshawk. The success of the training programme is demonstrated in the way these new guys, with no previous operational experience, have taken to the F-35 like 'ducks to water'. It's exciting, personally, for me to watch."

As the USMC's lead squadron, VMFA-121 performed an operational readiness inspection last year to demonstrate to the Corps' senior command that they can perform their mission requirements and, if necessary, be deployed to a combat zone at short notice.

Lt Col Davis explained: "We put the squadron through a short notice op' readiness inspection where they had to fly all the mission profiles we defined – close air support [CAS], armed reconnaissance, interdiction, a big strike mission, anti-air warfare and assault support escort – this is where they have to provide cover for Ospreys and helicopters into an objective area."

"All the squadron members



Above: Lt Gen Jon Davis, Commander for Aviation, Headquarters, US Marine Corps, during the RIAT briefing on July 8. Both images Key - Glenn Sands

have a big exam at the start, what we call NATOPS [Naval Air Training and Operating Procedures Standardisation] which is basically a tactics exam, we also tested the maintainers.

"We started with a variety of scenarios and in every one, the squadron exceeded our expectations. The CAS missions went really well, but the mission that stood out for me was the visual armed reconnaissance, where we simulated a high-end SAM threat in the target area. It was up to the pilots to find the threat using the jet's sensors, locate the ground targets and hit them as well."

"With an older legacy jet, you'd have had to take out the SAM

"...“With an older legacy jet, you’d have had to take out the SAM site first and work from there – not in this case.

These four F-35 pilots did it all simultaneously. In the debrief afterwards they told us ‘we’ found all the targets in 22 minutes and had destroyed them all within 30 minutes – with just our four aircraft.” ...”

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In January 2017, VMFA-121 will move to MCAS Iwakuni in Japan and the intention is to have all 16 squadron F-35Bs in place by July. These will be the first operational fifth-generation jets in the Pacific region. Lt Col Davis best summed up the current mood of the Corps regarding the F-35:

"There's a lot of positive things happening with the programme and for us [USMC], because we're taking the lead in some areas, it's an extremely exciting time." Glenn Sands

US Defense Secretary Announces Navy Can Blow Up Anything It Wants, Any Time It Wants

By Ryan Faith February 4, 2016

<https://news.vice.com/article/us-defense-secretary-announces-navy-can-blow-up-anything-it-wants-any-time-it-wants>

US Defense Secretary Ash Carter is continuing his campaign to redirect the entirety of the US military-industrial complex before Obama leaves office.

According to people familiar with a Wednesday speech by Carter to sailors in San Diego, the secretary used the occasion to announce that the US tested the Navy's SM-6 as an anti-ship missile just last month.

That may mean little to people outside of a small circle of defense planners, but in brief, Navy has been using the SM or "standard missile" series for an age and a day. The SM-6 is also known under the snappy and exciting name "RIM-174 Standard Extended Range Active Missile." And this latest incarnation as ship killer means the SM is now able to do pretty much everything a missile can, and hit everything the US may want to hit. That is especially important to one nation across the ocean from where Carter was speaking: China.

The SM family started out as a ship-mounted missile intended to shoot down hostile aircraft and helicopters. In the intervening years, various incarnations of the missile have been used in a variety of roles: homing in on hostile radars, shooting down ballistic missiles, and in 2008, even taking down orbiting satellites.

The Navy is continuing to push the envelope with the newest edition of the missile, the SM-6. In recent years, the SM-6 has been used against land targets. But a role as an anti-ship missile rounds out the portfolio of things that it can conceivably blow up.

This plugs into a few other recent Navy missile developments, which together paint an intriguing picture. If you're China, a really important picture.

First off, the Navy has already been basing some SM missiles and Aegis radar on land. These so-called "Aegis Ashore" bases have been a key component in the US's effort to deploy ballistic missile defense to Europe. But if you can put that stuff on land in Europe, you can put it on islands in the Pacific, close to China.

At a Wednesday briefing on Capitol Hill, Dr. Andrew Krepinevich, former director of the Center for Strategic and Budgetary Analysis, spoke about that very thing: How to stifle Chinese plans to kick US ass in any big war, which is a matter of defending the so-called "First Island Chain" — a string of islands that collectively form a wall, boxing in Chinese air and naval power and preventing them from getting out into the Pacific and doing real damage. In his talk, Krepinevich mentioned how attractive it might be to put SM-6 missiles on all those tiny little islands sitting off the Chinese coast to swat down Chinese aircraft.

Krepinevich also mentioned that it would be really helpful to put long-range rockets and ballistic missiles on all those little islands, so they could take out key Chinese targets far inland from the first island chain. That could be an enormous complication for Chinese military planners.

“...First off, the Navy has already been basing some SM missiles and Aegis radar on land. These so-called "Aegis Ashore" bases have been a key component in the US's effort to deploy ballistic missile defense to Europe. But if you can put that stuff on land in Europe, you can put it on islands in the Pacific, close to China....”

And that's not all. The US has already run tests with the SM missile and the F-35 fighter-bomber, in which an SM missile has been fired from a ship but with no target identified. An F-35 in flight took control of the missile in midair, and then as the missile proceeded downrange, handed control of that missile to another F-35. Thus you could imagine a small, hardened launcher on an island popping up a missile and flinging it way into China, where it gets vectored on to target by a stealthy F-35.

The ability of the SM-6 to perform many roles — shooting down airborne targets, hitting ships, attacking deep inland, hitting ballistic missiles and even satellites — means that it could be the perfect way to turn that first island chain into a major headache for Chinese military planners.

And if we look past the SM-6, it turns out that the Navy is up to a whole lot of other stuff with its missile portfolio.

In his budget speech Tuesday, Carter confirmed that its well-known long-range Tomahawk cruise missile has been tested as an anti-ship missile. Launched from ships or submarines, it has been a standard tool for attacking targets far inland for years. By adding an anti-ship missile capability to the Tomahawk, the ability of Navy surface ships or submarines to engage targets can be expanded dramatically.

Then consider the stealthy Long Range Anti-Ship Missile (LRASM) which is still under development and is currently scheduled for deployment before the end of the decade. The LRASM can be launched from air or sea and hit targets up to 500 miles out.

If you take all three of those missiles, you've pretty much got a collection of weapons that can be tasked to do just about anything a missile can be expected to do. They can hit targets in space, coming from space, in the air, on land or on the water. They can be launched from the air, from sea, from land, or from underwater. At this point, the only real question is whether or not there's a need to double up on capabilities or tweak missiles for very specific niche applications. (There's not a huge amount of demand for a submarine-launched anti-aircraft missile, for example.)

What are the main takeaways? The big one is that it seems that the US Navy is paying some very serious attention indeed to Chinese ambitions in the Pacific. It's developing or dramatically expanding the capabilities of three entire missile families to be launched from about anywhere to hit anything. This suggests that Carter's emphasis on expanding the ability of the US to engage high-level threats is a hell of a lot more than lip service.

Zooming out past the US military posture and looking regionally at the Pacific, Japanese shifts to protect their southern islands and Philippine outreach to Japan and the US for military support both suggest that various parts of the First Island Chain are looking very seriously about how to fight back against China in the event of a war.

To be sure, there's some other stuff that's almost certainly coming down the pike in Carter's upcoming speeches. From a political point of view, if he's dropping bombshells like this just two days in to his sales pitch, he definitely wants to not only redirect the US military away from counterinsurgency and towards fighting a high-tech foe, but he wants everyone in the US and overseas to know about it.

“...The US has already run tests with the SM missile and the F-35 fighter-bomber, in which an SM missile has been fired from a ship but with no target identified. An F-35 in flight took control of the missile in midair, and then as the missile proceeded downrange, handed control of that missile to another F-35. Thus you could imagine a small, hardened launcher on an island popping up a missile and flinging it way into China, where it gets vectored on to target by a stealthy F-35....”

Navy Expanding NIFC-CA To Include Anti-Surface Weapons, F-35 Sensors

<https://news.usni.org/2016/06/22/nifcca-expands-sm6-f35> Megan Eckstein 22 June 2016

Navy engineers are working to bring new aircraft sensors and new weapons into the Naval Integrated Fire Control-Counter Air (NIFC-CA) architecture, with near-term goals of bringing in the F-35's radio frequency (RF) sensor and the anti-surface variant of the Standard Missile-6.

In a January test, the Navy proved that the new SM-6 Block I anti-surface missile worked, but it also proved that NIFC-CA – which, as its name implies, was engineered to go after fast-moving air threats – could be adjusted to counter surface threats too.

Whereas a normal NIFC-CA anti-air engagement might use an E-2D Advanced Hawkeye as the sensor that finds a target and then use the Cooperative Engagement Capability (CEC) as the link to bring targeting data to the ship that ultimately fires a weapon, the anti-surface technology demonstration required some modifications. A different sensor was needed to identify surface targets, and that sensor could not use CEC, meaning the whole engagement relied instead on Link-16, Anant Patel, major program manager for future combat systems in the Program Executive Office for Integrated Warfare Systems, told USNI News in an interview this month.

Patel did not name the sensor used in the demonstration, but the Navy's P-8A Poseidon, which is equipped with Link-16, or eventually the unmanned MQ-4C Triton would be ideally suited for the job. Patel said NIFC-CA is sensor-agnostic, as long as the sensor meets quality of service standards. But finding weapons that can hit large but slow-moving targets has its challenges.

"When things go slower, it's easier" to track them, he said. "But it has its own complexity also. Some of our weapons are not designed to look for slow targets, so we have to do some analysis and make sure we capture that. Also, if you look at SM-6, it's more an anti-air weapon, so the capability's designed to counter fast-moving targets, and then to go against this slow-moving target we had to make sure we can meet that requirement."

Some minor modifications were made to the Aegis Combat System Baseline 9 to accept the data from the new sensor, but Patel said the culmination of this work – a test in January at the Pacific Missile Range Facility in Hawaii – was a successful hit against a surface target, the decommissioned frigate *Reuben James* (FFG-57). This success is an early step in fielding a bigger All Domain Offensive Surface Warfare Capability.

Patel said NAVSEA & NAVAIR have been in talks for about 2 months on how to work together.

Another challenge in bringing new weapons into NIFC-CA is that now Naval Sea Systems Command (NAVSEA) and PEO IWS will have to coordinate with Naval Air Systems Command (NAVAIR) and its PEO for Unmanned Aviation and Strike Weapons – NAVSEA owns NIFC-CA and SM-6 but NAVAIR owns the rest of the anti-surface weapons in the inventory.

"From our perspective, they just have the aircraft but we have the entire combat systems, Aegis and SSDS (Ship Self-Defense System), so how do we integrate all that into overall Navy?" he said. "And then you look at what threat sets you're going after, they have different requirements and we have separate requirements, so basically understanding each other, what are the requirements, what the capabilities are, where are we today, what are our plans for the future, and then how do we consolidate?"

Essentially, NAVAIR has its own kill chain for employing anti-surface weapons and NAVSEA has its own kill chain for employing anti-air weapons, and the two are trying to merge into a single kill web that shares common sensors, links and weapons.

Patel said that by this fall the two organizations should have a path forward for how to collaborate in engineering, testing and fielding this kill web idea. As new weapons are developed in the future, it should be easier to design them with this collaborative kill web in mind.

Patel said the Navy is also expanding NIFC-CA by introducing more sensors, specifically the F-35. NIFC-CA today primarily relies on the E-2D, which are limited in number. The F-35 will be fielded in great numbers by countries around the world, so the Navy is eager to prove out the NIFC-CA/F-35 combo.

The Navy will conduct a live-fire test in September at White Sands Missile Range in New Mexico, where an F-35 will detect an over-the-horizon threat with its RF sensor and send data back to the USS *Desert Ship* (LLS-1) land-based ship simulator, which will then launch an SM-6 to intercept the threat.

"It's no different than E-2D," Patel said – except that the sensor will be new to NIFC-CA, as will the Mid Air Data Link (MADL) that was developed for F-35s to communicate with one another. The test will assess the Navy's ability to take unrelated technologies and successfully close the fire control loop.

Patel added that the F-35 brings significant capability to the fleet, but his office is only funded to look at the RF sensor for now. Many of its other sensors could be integrated into NIFC-CA if additional funds were appropriated.

Why Russia, Iran and China Should Fear David Axe the U.S. Marine's F-35 Stealth Fighter 12 Sep 2016

<http://nationalinterest.org/blog/the-buzz/why-russia-iran-china-should-fear-the-us-marines-f-35-17668>

The U.S. Marine Corps said it would soon begin testing its F-35B stealth fighters with the U.S. Navy's new fire-control network.

If the testing leads to operational use, the Marines' F-35s could function essentially as fast, armed, radar-evading surrogates for the Navy's E-2 radar planes—extending the detection and engagement range of a variety of munitions.

Marine Corps headquarters slipped its announcement of the testing into a Sept. 1 update on F-35B testing. The Corps declared its first F-35B squadron combat-ready in July 2015, but operational testing of the stealthy warplane continues.

The F-35B detachment of Marine Operational Test & Evaluation Squadron 1 at Edwards Air Force Base in California recently completed test-firings of the AIM-120 air-to-air missile.

Next up, according to Marine Corps headquarters—tests of the F-35B's compatibility with the Naval Integrated Fire Control Counterair network, or NIFC-CA. The announcement did not say when the NIFC-CA testing would take place, but the Navy had previously stated that it would test F-35s with NIFC-CA in September 2016 at White Sands Missile Range in New Mexico.

That test would involve F-35s detecting targets for a land-based battery of SM-6 surface-to-air missiles. It's not clear if the Marines are joining the Navy's F-35-NIFC-CA testing or conducting separate trials on their own.

Poorly understood outside of naval circles, NIFC-CA is arguably one of the most important developments in the U.S. military. NIFC-CA is, in essence, a network architecture that combines several different sensors, datalinks and munitions.

NIFC-CA allows, say, an aircraft to pass targeting data to a warship armed with

SM-6 missiles. The SM-6—a 22-foot-long weapon that mates a two-stage rocket booster with the seeker head of an AIM-120. The Navy hasn't released the SM-6's maximum range, but it could be as great as 250 miles. The sailing branch did claim that one 2014 at-sea test of the SM-6 resulted in the longest-range surface-to-air engagement in history.

In any event, the SM-6 clearly can "shoot" farther than a warship's sensors can "see." But if an aircraft flying far ahead of the ship can relay its own targeting tracks, it can help the SM-6 to strike at its farther-possible range.

NIFC-CA began entering frontline service in 2013. At present, the standard application of NIFC-CA combines SM-6-armed destroyers with Navy E-2D radar-early-warning planes. But there are only a handful of E-2Ds in service. The Navy wants to add more aircraft and munition types, including surface-to-surface weapons, to the NIFC-CA architecture—and clearly the Marines want in, too.

If the upcoming F-35B-NIFC-CA testing proves fruitful, it's possible that, in future wars, F-35Bs flying from Navy assault ships or even from British aircraft carriers or land bases, could stealthily penetrate enemy air defenses, detect enemy ships, planes and even ground forces and cue U.S. warships to lob far-flying missiles over the horizon at the targets.

The expansion of the NIFC-CA network has reassured U.S. military leaders that American naval forces should be able to defeat so-called "anti-access area-denial" systems—radars, jet fighters, ballistic missiles, etc.—that China, Russia and Iran are creating in order to keep U.S. forces away from their borders.

Asked in August 2016 whether the Navy's aircraft carriers could safely operate inside enemy anti-access umbrellas, Adm. John Richardson was unequivocal. "Yes," Richardson said. Adding the Marines' F-35Bs to the Navy's fire-control network should only boost his confidence.

F-35 and Aegis Combat System Successfully Demonstrate

Integration Potential in First Live Missile Test

Lockheed Martin

<http://www.prnewswire.com/news-releases/f-35-and-aegis-combat-system-successfully-demonstrate-integration-potential-in-first-live-missile-test-300326947.html>

SEP 13, 2016



Demonstration shows capability to extend the battlefield using Naval Integrated Fire Control-Counter Air (NIFC-CA)

WHITE SANDS MISSILE RANGE, N.M., Sept. 13, 2016 /PRNewswire/ -- Two pre-eminent weapon systems, the F-35 Lightning II and Aegis Weapon System, worked together for the first time during a live fire exercise. The joint Lockheed Martin, (NYSE: LMT) U.S. Navy and U.S. Marine Corps exercise was the first live fire missile event that successfully demonstrated the integration of the F-35 to support Naval Integrated Fire Control-Counter Air (NIFC-CA).

During the Sept. 12 test, an unmodified U.S. Marine Corps F-35B from the Marine Operational Test and Evaluation Squadron 1, acted as an elevated sensor and detected an over-the-horizon threat. The F-35B sent data through the aircraft's Multi-Function Advanced Data Link (MADL) to a ground station connected to the Aegis Weapon System on the USS Desert Ship (LLS-1), a land-based ship. The target was subsequently engaged and intercepted by a Standard Missile 6.

"One of the key defining attributes of a 5th Generation fighter is the force multiplier effect it brings to joint operations through its foremost sensor fusion and external communications capabilities," said Orlando Carvalho, executive vice president, Lockheed Martin Aeronautics. "Those attributes were successfully proven at White Sands Missile Range in a very realistic demonstration of distributed lethality leveraging a U.S. Marine Corps F-35B and the U.S. Navy's Aegis Weapon System. This only scratches the surface of the potential warfighting capabilities F-35 aircraft will ultimately enable across our military forces."

This capability, when fully realized, will significantly increase the warfighters' situational awareness using Aegis and the F-35 together to better understand the maritime operational environment. Using any variant of the F-35 as a broad area sensor, the aircraft can significantly increase the Aegis capability to detect, track and engage.

"NIFC-CA is a game changer for the U.S. Navy that extends the engagement range we can detect, analyze and intercept targets," said Dale Bennett, executive vice president, Lockheed Martin Rotary and Mission Systems. "The F-35 and Aegis Weapon System demonstration brings us another step closer to realizing the true potential and power of the worldwide network of these complex systems to protect and support warfighters, the home front and U.S. allies."

Aegis Baseline 9 delivers a fully open architecture system on U.S. destroyers and is the basis for current and future Aegis Integrated Air and Missile Defense (IAMD). Baseline 9 is being fielded on in-service destroyers, new construction destroyers and Aegis Ashore. The Aegis Common Source Library-enabled derivatives are on the Coast Guard cutters, Freedom variant Littoral Combat Ships and will be included on the upcoming frigate ships.

As a proven world leader in systems integration and development of air and missile defense systems and technologies, Lockheed Martin delivers high-quality missile defense solutions that protect citizens, critical assets and deployed forces from current and future threats. The company's experience spans missile design and production, hit-to-kill capabilities, infrared seekers, command and control/battle management, and communications, precision pointing and tracking optics, radar and signal processing, as well as threat-representative targets for missile defense tests....

F-35 and Aegis Combat System Successfully Demonstrate Integration Potential in First Live Missile Test

13 Sep 2016 LM PR <https://www.prnewswire.com/news-releases/f-35-and-aegis-combat-system-successfully-demonstrate-integration-potential-in-first-live-missile-test-300326947.html>

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**VICE-ADMIRAL BARRETT ON THE WAY AHEAD OF THE AUSTRALIAN NAVY:
DESIGN THE FORCE FOR DECISIVE AND DISTRIBUTED LETHALITY**

01 Sep 2016 Robbin Laird <http://www.sldinfo.com/vice-admiral-barrett-on-the-way-ahead-of-the-australian-navy-design-the-force-for-decisive-and-distributed-lethality/>

A key speaker at the Williams Foundation seminar on air-land integration was the Chief of the Australian Navy, Vice Admiral Tim Barrett.

Barrett's speech focused on the opportunities and challenges of the largest recapitalisation of the Australian Navy since World War II.

New submarines, destroyers and amphibious ships and associated fleet assets are being built in Australia to shape a new maritime capability for Australia.

But this force is being built in the time of significant innovation in the Pacific whereby new force concepts are being shaped, such as kill webs, distributed lethality, and fifth generation airpower.

Barrett made it very clear that what was crucial for the Navy was to design from the ground up any new ships to be core participants in the force transformation process underway.

In his presentation at the conference, he underscored that "we are not building an interoperable navy; we are building an integrated force for the Australian Defence Force."

He drove home the point that ADF integration was crucial in order for the ADF to support government objectives in the region and beyond and to provide for a force capable of decisive lethality.

By so doing, Australia would have a force equally useful in coalition operations in which distributed lethality was the operational objective.

He noted that it is not about massing force in a classic sense; it is about shaping a force, which can maximize the adversary's vulnerabilities while reducing our own.

And he re-enforced several times in his presentation that this is not about an 'add-in, after the fact capability'; you need to design and train from the ground up to have a force trained and equipped to be capable of decisive lethality.

He quoted Patton to the effect that you fight war with technology; you win with people.

It is about equipping the right way with right equipment but training effectively to gain a decisive advantage.

The recapitalisation effort was a "watershed opportunity for the Australian Navy."


But he saw it as a watershed opportunity, not so much in terms of simply building new platforms, but the right ones.

And with regard to the right ones, he had in mind, ships built from the ground up which could be interoperable with JSF, P-8, Growler, Wedgetail and other joint assets.

"We need to achieve the force supremacy inherent in each of these platforms but we can do that only by shaping integrated ways to operate."

He highlighted that the Navy was in the process of shaping a 21st century task force concept appropriate to a strategy of distributed lethality and operations.

"...The [RAN] recapitalisation effort was a "watershed opportunity for the Australian Navy." But he saw it as a watershed opportunity, not so much in terms of simply building new platforms, but the right ones. And with regard to the right ones, he had in mind, ships built from the ground up which could be interoperable with JSF, P-8, Growler, Wedgetail and other joint assets.

"We need to achieve the force supremacy inherent in each of these platforms but we can do that only by shaping integrated ways to operate." He highlighted that the Navy was in the process of shaping a 21st century task force concept appropriate to a strategy of distributed lethality and operations. A key element of the new approach is how platforms will interact with one another in distributed strike and defensive operations, such as the ability to cue weapons across a task force..." 

A key element of the new approach is how platforms will interact with one another in distributed strike and defensive operations, such as the ability to cue weapons across a task force.

After his presentation, I had the chance to sit down with Vice Admiral Barrett and to expand the conversation.

Clearly, a key element in his thinking is how to get the new build of ships right for an age in which one wants to build an integrated, but distributed force.

Question: It is clear that you are taking the long view of getting the ship building piece of this right in terms of ensuring that ships are not built simply as separate platforms, but as building blocks in an integrated force. How do you do that?

Vice Admiral Barrett: "I am taking a very long view, and believe that we need to build our ships in Australia to generate naval capabilities integrated within the ADF.

"We need agility in the process of changing ships through life—continuing to evolve the new ships depending on how the threat is evolving.

"This means that we need to control the combat system software as well as build the hulls. We will change the combat system and the software many times in the life of that ship; whereas, the hull, machinery in the plant doesn't. That might sound like a statement of the obvious.

"But it's not a statement that's readily understood by our industry here in Australia.

"We need to organise ourselves to have an effective parent navy capability.

"We need to manage commonality across the various ship build processes.

"That will not happen if we build someone else's ship in Australia which is designed to operate in separate classes.

"I don't want an individual class to be considered in isolation. I want to cross-learn and cross-operate throughout our various classes of ships, and notably with regard to software integration and development."

Question: Clearly, building a sustainable navy from the outset is crucial to your design effort. How do you view the challenge of building a more sustainable navy from the outset?

Vice Admiral Barrett: "It is crucial to deterrence. If your ships are not operating at sea they will have little effect.

"For example we have changed our approach to the Collins submarine largely around sustainment and working more openly with industry to achieve much greater at-sea operational tempos.

"We have put in place an enterprise approach, which focuses on availability of submarines; Industry and Navy are working closely together now to achieve that core objective.

"I've got industry keenly interested in the results of what the submarines do when they leave port and go on operations. And we've had a dramatic turnaround in submarine availability as partnering has improved.

"For me, deterrence, lethality, availability, sustainability, and affordability are highly interrelated for a Navy and its combat performance.

"And clearly as we design new ships, designing in more sustainable systems and ships is crucial."

Question: Wedgetail shows an interesting model, namely having the combat squadron next door to the Systems Program Office. This facilitates a good working relationship and enhances software refresh as well. You have something like this in mind for your ship building approach. Could you discuss that approach?

Vice Admiral Barrett: "We do and are implementing it in our new Offshore Patrol Vessel program. And with our 'ship zero' concept we are looking to integrate the various elements of operations, upgrades, training and maintenance within a common centre and work flow to get greater readiness rates and to enhance an effective modernization process as well.

"We are reworking our relationship with industry because their effectiveness is a key part of the deterrence process. If I have six submarines alongside the wharf because I can't get them away, they are no longer lethal and they are no longer a deterrent force.

"Again, as an example we have dramatically improved availability by building maintenance towers alongside the submarine—rather than the previous way that it was done, where people arrived into that one gangway under the submarine then dispersed to do their maintenance work—is an example of how we need to work.

Question: In your presentation, you mentioned working with various air systems. Could you discuss, Navy's role in Wedgetail?

Vice Admiral Barrett: "We have Navy officers onboard who already provide a key communication role to the Air Force officers onboard the Wedgetail. They can inform those officers of the decision process on the ship and, conversely, explain later to those onboard the ships, what Wedgetail can do for them.

"Put in other terms, by such a work flow, augmented by the growing engagement of Virtual Wedgetail in navy training, Wedgetail becomes part of the maritime warfare system within the ADF.

"Wedgetail is an example of the way ahead for air-naval integration."

For an overview on the Navy's transformation plan, Plan Pelorus, see the following:
<http://video.defence.gov.au/play/1989#>

According to Vice Admiral Barrett in a speech delivered earlier this year, the Chief of Navy provided this overview to the transformation approach:

PELORUS recognises the need for technologically-advanced ships to combine in the modern fleet system, and to integrate seamlessly in the joint and networked environment.

This is a plan which recognises the need for ships to be capable of delivering the lethal force on which deterrence depends. It is a hard-nosed plan; one that recognises the need for ships to be affordable, adaptable and available—and ready to serve the nation's needs.

But Plan PELORUS looks beyond individual ships. It recognises that in the future, ships will only be entirely capable when they operate in fleet systems.

In the future, the whole will be massively greater than the sum of its parts. PELORUS is also about our people.

They remain what they have always been— the greatest single factor in our success in operations. PELORUS addresses those serving now and those we need to recruit.

http://www.adfjournal.adc.edu.au/UserFiles/issues/199%202016%20Mar_Apr.pdf

ADF tests cooperative engagement capability

18 April 2018



<http://www.australiandefence.com.au/news/adf-tests-cooperative-engagement-capability>

The ADF's ability to defeat enemy air threats has been boosted with the successful testing of the new Cooperative Engagement Capability.

Over the past few weeks off the coast of South Australia, Air Warfare Destroyer HMAS *Hobart* and NUSHIP *Brisbane* successfully tested the Cooperative Engagement Capability, which combines radar and fire control data into a common picture, allowing one ship to engage an adversary based on the other ship's data. It is the first time that the technology has been used by a nation outside the United States.

Cooperative Engagement Capability is one technology that will form a part of the Australian Joint Integrated Fires Capability being implemented in the ADF.

HMAS *Brisbane* and *Hobart* during CEC testing. Credit: AUSAWD



Minister for Defence Marise Payne congratulated the RAN and the Air Warfare Destroyer Alliance on reaching this important milestone.

"The new Cooperative Engagement Capability is a significant step-change for Australia as we face increasing threats from cruise missiles and advanced aircraft," Minister Payne said.

"Together *Hobart* and *Brisbane* bring revolutionary air defence capabilities – not by adding new radars or weapon systems, but by utilising existing sensors and weapons in a more effective manner. In the coming years, the Australian Joint Integrated Fires capability will link our ships, aircraft and land-based assets to create an increasingly sophisticated air defence network that can see over the horizon."

"Not only does this capability enable us, for the first time, to share targeting data in real time between ADF assets, it will also enable us to share it with United States assets, providing new levels of interoperability within a coalition force."

"This means a combat system can engage a target that it otherwise could not see, by using data from another warship's sensors"

"This new capability will provide Australian and United States warships the ability to share targeting data in real time. This means a combat system can engage a target that it otherwise could not see, by using data from another warship's sensors," Minister Payne said.

Defence is planning to integrate the CEC into other ADF capabilities, including the E-7A Wedgetail aircraft and the Integrated Air and Missile Defence program.

The CEC will also be integrated into the Future

Frigate's Aegis combat management system, together with the Saab Australia developed interface and the CEAFAF phased array radar, as part of a strategic enterprise approach to combat management systems.

"When NUSHIP *Brisbane* joins her sister ship, HMAS *Hobart*, in the fleet later this year, it will mark the beginning of a new era for air defence in Australia and our partners," Minister Payne said.

The new technology will provide the ADF with longer range, cooperative, and layered air defence.

Video: Successful F-35, SM-6 Live Fire Test Points to Expansion in Networked Naval Warfare

By: Sam LaGrone September 13, 2016

<https://news.usni.org/2016/09/13/video-successful-f-35-sm-6-live-fire-test-points-expansion-networked-naval-warfare#more-21593>

A Monday test pairing a Lockheed Martin F-35B Lighting II Joint Strike Fighter (JSF) with an Aegis Combat System armed with a Raytheon Standard Missile-6 is the latest step in expanding how the Navy and Marine Corps will share data on future battlefields.

Using targeting information transmitted from the Marine Corps F-35B, the Navy's Aegis test site at the White Sands Missile Range, New Mexico launched an SM-6 anti-air missile and struck a Beechcraft MQM-107 target representing an adversarial fighter.

The way I'd describe it was a center of mass hit," said Dana Potts with Lockheed Martin said in a Tuesday conference call with reporters. "It absolutely disintegrated the target."

The unmodified F-35 picked up the target with its own sensors and routed the track via the fighter's Multifunction Advanced Data Link (MADL pronounced: MAHdel) to the Navy's USS *Desert Ship* (LLS-1) test platform running the Baseline 9 Aegis Combat System. Lockheed and the Navy attached a MADL antenna to the combat system to receive the track information that fed the information to the SM-6.

The test is an expansion of the Navy's Naval Integrated Fire Control-Counter Air concept (NIFC-CA) – a scheme designed to tie together data from the ships and aircraft in a carrier strike group to create a network of sensors and shooters – a proverbial kill web.

For example, targeting data collected from a Northrop Grumman E-2D Advanced Hawkeye can be beamed to a guided missile cruiser or destroyer in the strike group. That ship could then launch an SM-6 at the target only using the E-2s track and not its own radar.

For now, the E-2D remains the key node in the NIFC-CA program-of-record acting as the quarterback for the carrier's air war but Monday's test shows the Navy the art of the possible, said Anant Patel, major program manager for future combat systems in the Program Executive Office for Integrated Warfare Systems (PEO IWS) said in the conference call.

"This was a demonstration to show that within the NIFC-CA architecture we can add another sensor. As long as it meets the quality of service, we can engage the target," Patel said.

"We have F-18s, F-35s all of those sensors we have to consider and that's a future effort we're going to have to do as part of our NIFC-CA capability growth."

The addition of the MADL to the mix of the program of record links NIFC-CA now uses – like Cooperative Engagement Capability (CEC) and Link-16 – the test is a move away from a carrier-centric construct.

<https://www.youtube.com/watch?v=deENa84hX14>

F-35 and NIFC-CA

While the F-35 is billed and branded as a strike fighter, it also possesses a little discussed electronic warfare capability that gives it an exceptional awareness of its surroundings.

To that end NIFC-CA has included F-35 as a planned sensor node in carrier strike group model – acting as a stealthy forward arm but that would route targeting information back to the CSG through the E-2, USNI News reported in 2014.

However, using MADL direct to the Aegis ships weren't part of the plan.

The difficult to detect and intercept MADL was designed for F-35s to talk to F-35s and not intended to share information beyond other JSFs, Bran Clark, a retired Navy officer, the former special assistant to the Chief of Naval Operations (CNO) and now a senior fellow at CSBA, told USNI News on Tuesday.

"Originally we didn't think F-35s would use through datalinks directly to ships... This gives them the ability to talk directly to the ship with a very hard to detect very hard to jam MADL link," Clark said.

Lockheed began studying routing the MADL data out from the JSF loop in 2013 with \$15 million in internal funds before winning approval from the Navy's chief weapons buyer, Sean Stackley, Potts said.

Last year, a Lockheed Skunk Works, Aegis, F-35 technical team did tests at Lockheed's JSF plant in Fort Worth, Texas last year to pull MADL data to a ground station that would represent the link to a Baseline 9 cruiser or destroyer, Potts said.

"It was absolutely breathtaking, the Aegis display in our labs as soon as [the test F-35] turned his radar on looking north... He picked up the conga line, if you will of aircraft going into [Dallas Fort Worth Airport]," he said.

"The display just exploded with hundreds of ranged tracks, so we knew it would work." However, the fact linking the F-35s powerful EW suite was such is such a late addition to NIFC-CA is an "indictment of the original planning process that lead to the F-35," Clark said.

New Combinations

The MADL linkage to Aegis and potentially other ground stations opens up the potential for a greater networked battlespace for U.S. forces and potentially U.S. allies.

In addition to the Navy's F-35Cs and Marine Corps F-35Bs, the Air Force's F-35As will be able to share its air tracks with a Baseline 9 ship.

"Eventually when we start linking everything that's relevant on the airplane off to the ship to a ground base, the commanders are going to be able to see and understand the battle space in a much more robust way," Potts said.

For example, a direct link to a Baseline 9 cruiser or destroyer from a Marine F-35B operating as part of an amphibious ready group could open up the air defense possibilities for the ARG, allowing SM-6 cueing for air threats.

Additionally, U.S. allies can further share information.

Japan, South Korea and Australia are not only acquiring F-35s but also other key nodes the U.S. uses for NIFC-CA. The South Korean Navy and the Japanese Maritime Self Defense Force are buying ships with the Baseline 9 backbone for NIFC-CA. Japan is also buying E-2Ds and Australia has purchased EA-18G Growler electronic warfare aircraft that are already part of a U.S. NIFC-CA construct.

The F-35 Just Got a Lot More Lethal

<https://www.youtube.com/watch?v=q3Yr7nI0IDM>

The test come as Naval Sea Systems Command and Naval Air Systems Command are in talks to combine their two separate networked weapons efforts.

"From our perspective, they just have the aircraft but we have the entire combat systems, Aegis and SSDS (Ship Self-Defense System), so how do we integrate all that into overall Navy?" Patel told USNI News in June.

"And then you look at what threat sets you're going after, they have different requirements and we have separate requirements, so basically understanding each other, what are the requirements, what the capabilities are, where are we today, what are our plans for the future, and then how do we consolidate?"

In terms of the future of the NIFC-CA construct, NAVSEA said there are several other opportunities to explore to expand the network.

"The more sensors, the better off we are," Patel said on Tuesday.

“160913-N-N0101-313 WASHINGTON, D.C. (Sept. 13, 2016) This graphic illustration depicts the U.S. Navy's first live fire demonstration to successfully test the integration of the F-35 with existing Naval Integrated Fire Control-Counter Air (NIFC-CA) architecture. During the test at White Sands Missile Range, New Mexico, Sept. 12, an unmodified U.S. Marine Corps F-35B acted as an elevated sensor to detect an over-the-horizon threat. The aircraft then sent data through its Multi-Function Advanced Data Link to a ground station connected to USS Desert Ship (LLS 1), a land-based launch facility designed to simulate a ship at sea. Using the latest Aegis Weapon System Baseline 9.C1 and a Standard Missile 6, the system successfully detected and engaged the target. (U.S. Navy graphic illustration courtesy of Lockheed Martin/Released) September 13, 2016” <http://www.navy.mil/management/photodb/photos/160913-N-N0101-313.JPG>



**Navy Conducts
First Live Fire
NIFC-CA Test with
F-35 13 Sep 2016**

[http://www.navy.mil/
submit/display.asp?
story_id=96652](http://www.navy.mil/submit/display.asp?story_id=96652)

The F-35 just proved it can take Russian or Chinese airspace without firing a shot

ALEX LOCKIE SEP 14, 2016

<http://www.businessinsider.com.au/f-35-aegis-integration-2016-9>

An F-35B just carried out a remarkable test where its sensors spotted an airborne target, sent the data to an Aegis Ballistic Missile Defence site, & had the land-based outpost fire a missile to defeat the target—thereby destroying an airborne adversary without firing a single shot of its own.

This development simultaneously vindicates two of the US military's most important developments: The F-35 and the Naval Integrated Fire Control Counterair Network (NIFC-CA).

Essentially, the NIFC-CA revolutionizes naval targeting systems by combining data from a huge variety of sensors to generate targeting data that could be used to defeat incoming threats.

So now with this development, an F-35 can pass targeting data to the world's most advanced missile defence system, an Aegis site, that would fire its own missile, likely a SM-6, to take out threats in the air, on land, or at sea.

This means that an F-35 can stealthily enter heavily contested enemy air space, detect threats, and have them destroyed by a missile fired from a remote site, like an Aegis land site or destroyer, without firing a shot and risking giving up its position.

The SM-6, the munition of choice for Aegis destroyers, is a 22-foot long supersonic missile that can seek out, manoeuvre, and destroy airborne targets like enemy jets or incoming cruise or ballistic missiles.

The SM-6's massive size prohibits it from being equipped to fighter jets, but now, thanks to the integration of the F-35 with the NIFC-CA, it doesn't have to.

The SM-6, as effective and versatile as it is, can shoot further than the Aegis sites can see. The F-35, as an ultra connective and stealthy jet, acts as an elevated, highly mobile sensor that extends the effective range of the missile.

This joint capability helps assuage fears over the F-35's limited capacity to carry ordnance. The jet's stealth design means that all weapons have to be stored internally, and this strongly limits the plane's overall ordnance capacity.

This limiting factor has drawn criticism from pundits more fond of traditional jet fighting approaches. However, it seems the F-35's connectivity has rendered this point a non-issue.

Overall, the F-35 and NIFC-CA integration changes the game when it comes to the supposed anti-access/area denial bubbles created by Russia and China's advanced air defences and missiles.

"One of the key defining attributes of a 5th Generation fighter is the force multiplier effect it brings to joint operations through its foremost sensor fusion and external communications capabilities," said Orlando Carvalho, executive vice president of Lockheed Martin Aeronautics, said in a statement.

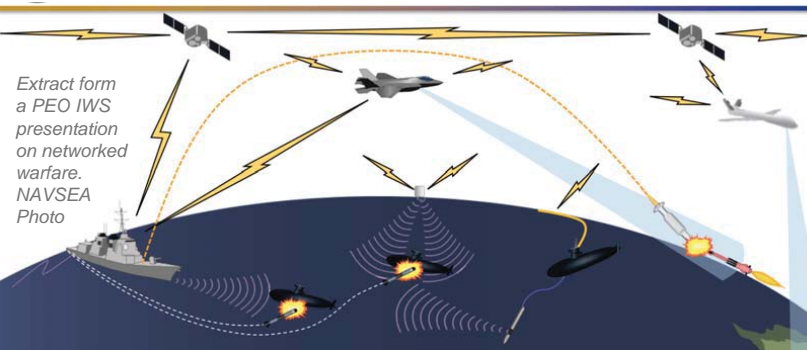
"NIFC-CA is a game changer for the US Navy that extends the engagement range we can detect, analyse and intercept targets," said Dale Bennett, another Lockheed Martin vice president in the statement.

"The F-35 and Aegis Weapon System demonstration brings us another step closer to realising the true potential and power of the worldwide network of these complex systems to protect and support warfighters, the home front and US allies."

Interview: Rear Adm. Mike Manazir on Weaving the Navy's New Kill Webs

By: **Megan Eckstein** October 3, 2016

THE PENTAGON – The U.S. military can no longer count on dominating any domain of warfare against near peer enemies and instead must aim for “local and temporal domain superiority”– making efforts to tie together weapons and sensors in a cross-domain web more important than ever, the Navy’s deputy chief of naval operations for warfare systems (OPNAV N9) told USNI News.



Extract from a PEO IWS presentation on networked warfare. NAVSEA Photo

F-35C Lightning IIs, attached to the Grim Reapers of Strike Fighter Squadron (VFA) 101, and an F/A-18E/F Super Hornets attached to the Naval Aviation Warfighter Development Center (NAWDC) fly over Naval Air Station Fallon's (NASF) Range Training Complex on Sept. 3, 2015. US Navy photo.



<https://news.usni.org/2016/10/03/interview-with-rear-adm-mike-manazir-weaving-the-navys-kill-web>

Rear Adm. Mike Manazir said in a Sept. 26 interview that the Navy has many effective kill chains – a sensor that provides targeting data to a platform that can then launch a weapon against a target – in the air, ground, surface and undersea domains. The service has even made progress netting together some of these kill chains within a single domain, bringing together airplanes that rely on different communications waveforms and were not built to be interoperable, such as a recent effort to **bring the F-35 Joint Strike Fighter and its unique Multifunction Advanced Data Link (MADL) communications into the Naval Integrated Fire Control-Counter Air (NIFC-CA) architecture.**

Now, these kill chains need to be strung together to create a cross-domain kill web, enabling any plane or any ship to pull information from whatever sensor happens to have relevant data, regardless of domain.

“If I have a multi-domain approach to an anti-access/area-denial problem, and I know that my undersea domain is the one with the lowest warfighting risk – in other words, they can get in the closest – how do I then take that information and move it into the domain with the highest warfighting risk, which would be the air domain?” Manazir said.

“If I can share information across a distributed fleet, and I can distribute the fleet such that I can maximize my kinetic and non-kinetic effects, I can get into the A2/AD environment, optimizing my risk, establish local and temporal domain superiority, whatever domain that is, and I can operate in there for a bit and I can move. And so the benefit of naval forces is we can move, and we can move at 30 knots theoretically. ... But this idea of a distributed fleet counts on the ability to connect, counts on the ability to share information, counts on the fact that I can use my fleet to establish in any of those domains local and temporal superiority and then move out, with the understanding that I will never be able to dominate anymore against Russian threats and against Chinese threats. Things like air dominance is just not a term that has any usefulness anymore; we don’t dominate. And so you have to create superiority in whatever domain that you are in from the time it takes for you to achieve that effect, and then you go somewhere else, you redeploy.”

Manazir, and the Navy's requirements community, have to change their thinking to make that vision a reality. The rear admiral, who until May served as the director of air warfare (OPNAV N98), said his previous job was platform-centric. Now, "I had started evolving my thinking from the fact that the next fight is not going to be platform-centric, it's going to be capability-centric."

The Navy has many of the platforms it will need for a future fight – a Super Hornet/F-35 combo, increasingly capable baselines of the Aegis Combat System, a Flight III destroyer, more advanced blocks of Virginia-class attack submarines, and so on – that together represent significant capability. They just can't all talk to each other in real time, with target-quality accuracy. For Manazir, the basic approach for tying these systems all together needs improvement.

"Instead of having a system of systems approach, where you're doing the engineering to connect the systems, you have a system of services approach where an airplane might say, hey I need a sensor out there that can tell me where this target is, and you use sensors out there – whether it's Aegis or another, F-18, F-35 – you could have an app-based approach and then the operator could say, hey, I get good data from this F-18, select, there it is, and be able to do it."

This preference for a systems of services approach has acquisition implications. For instance, to get an F-35 talking to a ship, the Navy wouldn't put a proprietary MADL radio receiver on all the ships. Instead, a software solution could help translate MADL and any other waveform into something the ship could understand. Manazir likened it to an American taking electrical devices to Europe; the American doesn't need a new outlet installed in the wall to accommodate the differently-shaped electrical plugs, but rather needs a universal adapter as a "cross-domain solution" to connect the American plug to the European outlet.

"We view the next fight as one in which you need to be able to be agile in the electromagnetic spectrum and be able to move information, and so in order to succeed in that fight, all platforms and weapons systems have to be able to communicate," he said.

One challenge is the sheer engineering of this – the "cross-domain solutions" that would help navigate all the sensors, platforms and weapons using different communications waveforms, as well as physical challenges of moving information from above the sea to under the sea, or from space to the surface, for example.

Once successful in that, the second challenge is creating trust in a system where operators are pulling information – and information that could lead to them shooting at a target, with lethal consequences – without knowing where that information comes from.

"That's what I'm looking for, the ability to just take all of these inputs and say I don't even care where it comes from," Manazir said. "I don't care if it comes from [satellites], I don't care if it comes from a guy with a telescope on a ridge somewhere and he beams it up into something that says 'hey this is a bad guy and here's where it is and here's a picture of him.'"

Getting to that point will require software solutions – a lot of algorithms that can sort through massive amounts of data from all manner of sources and present the operator with an actionable view of the battlespace and clear decisions to be made, Manazir said.

"Theoretically the human can sit ... and he or she is presented with red colored targets, amber maybe unknowns, and blue friendlies, they can say, okay, I see the battlespace, I can deliver an effect," he said. A human will still need to make the ultimate decision, of course, but he said this machine system could help make sense of every sensor's view of the Strait of Malacca, for example, and pinpoint which vessels could be threats, allowing a human to apply logic and rules of engagement and make decisions. If this can happen quickly enough, Manazir said the Navy will have achieved "decision superiority."

Referring to the OODA loop decision-making cycle of observing, orienting, deciding and acting, Manazir said the ultimate goal of sharing so much information between platforms and having machines determine information's relevancy is to "gain knowledge of the battlespace so that if the machines are doing ... OO and they just present to you a space, you can decide and act. And if you do it right, you can keep the adversary in the OO phase most of the time, and he's over there orienting and reorienting and reorienting and reorienting, and he can't act so you shoot."

U.S. Navy To Test F-35 With Aegis At Sea

05 Feb 2018 James Drew

SINGAPORE—The U.S. Navy hopes to further validate the Lockheed Martin F-35's performance as an airborne sensor for air and missile defense in an upcoming Aegis sea trial. Sometime between June and August, the Navy will attempt to use tracking data from an F-35 to shoot down an air-breathing target drone with a Raytheon Standard Missile-6 (SM-6) interceptor fired from an Aegis ship in the Pacific Ocean.

Steve Over, Lockheed's director of F-35 international business development, says the at-sea demonstration will be a follow-on to a September 2016 test involving a Marine Corps F-35B

and the USS Desert Ship at White Sands Missile Range, New Mexico. In that trial, targeting data from the F-35B was used to successfully intercept an MQM-107 Streaker target drone with an SM-6.

At the time, the government wanted to preserve the MQM-107 for reuse, but the test proved to be so successful that the radar-guided SM-6 destroyed it on impact. The SM-6's fuse had been replaced with a telemetry kit to measure its final proximity to the target rather than explode, but it struck the MQM-107 target anyway.

"The Navy got very excited when we did this successful test that they're planning the next test now," Over said during an interview at the Singapore Airshow here Feb. 4. "They plan to do a live-fire exercise out in the Pacific this summer [Northern Hemisphere]."

The key to these tests is

enabling the Aegis Combat System to receive information from the Joint Strike Fighter's Multifunction Advanced Data Link (MADL). This data link has a low probability of detection by passing information through a narrow, directional beam that is extremely difficult to intercept.

Over says last November the Navy outfitted one of its San Diego-based Aegis destroyers with a MADL receiver in preparation for the upcoming test. With this modification, the ship can receive targeting information directly from the F-35.

The purpose of this at-sea demonstration is to show how the F-35's advanced Northrop Grumman-built infrared distributed aperture system (DAS); active electronically scanned array (AESA) radar; and fusion algorithms can support air and missile defense as part of a networked "kill web" architecture.

The F-35's six-camera electro-

optical/infrared Northrop AAQ-37 DAS enables the pilot to look through the skin of the aircraft and see incoming air and missile threats at great distances. DAS's full capability became apparent in 2010 when an F-35 flying near Washington, D.C., detected a SpaceX Falcon 9 rocket launch at Cape Canaveral almost 800 nm (1,482 km) away.

Two networked DAS systems can be linked together to generate a three-dimensional target track, or it can simply cue the F-35's Northrop APG-81 AESA fire control radar, if within range, to get an even better track.

This targeting information can then be passed via MADL to any "shooter" capable of intercepting the target through kinetic or electromagnetic means. This could include the U.S.'s Aegis, Patriot or Thaad missile systems.

Flying at 30,000 ft., the F-35 can see farther than any land- or sea-based sensors. In the

September 2016 test, the MQM-107 was replicating a subsonic cruise missile flying low behind a mountain range and it could not have been seen without the F-35B.

"Aegis didn't even have its radar turned on," Over notes. "It couldn't have even seen the target drone because of the mountain range."

Over says the F-35B provided an initial target location as well as midcourse guidance updates to the SM-6. He says SM-6 is an "enormous missile" that could not possibly be carried by a typical fighter aircraft, so linking F-35 and Aegis allows the F-35 to kill a wider variety of targets without even firing a single shot.

"This is a logical evolution of the capability of the airplane," Over says. "It just requires software and the right communications link."

John Montgomery, Northrop's fifth-generation improvements and derivatives program manager, says the distributed aperture system ensures that no airborne missile can sneak up on the F-35. Northrop has been exploring ways to employ DAS for air and missile defense for several years. This capability was successfully demonstrated during a test designated FTX-20 on Oct. 16, 2014.

During that trial in Hawaii, a ground-based DAS and one carried aboard a Gulfstream testbed aircraft were able to establish a three-dimensional target track of a medium-range, surface-to-surface ballistic missile.

"This weapon system is going to evolve to do things legacy fighter airplanes could have never even thought about," Over says.

<http://aviationweek.com/awindefense/us-navy-test-f-35-aegis-sea>

Report Raises Chance Of More Australian F/A-18 Super Hornets

21 Oct 2016 Bradley Perrett

Expect Australia's finger to be on the trigger in case of further delays in the Lockheed Martin F-35 Lightning program. A parliamentary committee has called on the defense department to prepare a backup plan, increasing the possibility of the country ordering more Boeing F/A-18 Super Hornets.

The committee did not go as far as recommending that Canberra place another Super Hornet contract. But its proposal closely follows the reasoning of a submission from a think tank, the Australian Strategic Policy Institute (ASPI), urging the government to be ready to do so no later than 2019.

Separately, the Royal Australian Air Force (RAAF) has mentioned the possibility of a further Super Hornet order, apparently without much conviction, while also **suggesting the F-35B, the**

vertical-landing version of the Lightning, as potential equipment. Unmanned strike aircraft are notably absent from its list of alternatives.

The RAAF identifies F-35As, F-35Bs and Super Hornets as options, though it is very unlikely to want the latter

Australia is acquiring 72 F-35As to replace 71 Boeing F/A-18A/B Hornets, survivors of an original fleet of 75 that were delivered starting in 1985. Next, Canberra is due to decide in 2022 or 2023 how to replace 24 F/A-18F Super Hornets that entered service in 2010 as strike aircraft and are penciled in for retirement around 2030. The order should cover 28 aircraft.

The defense department told the panel, the Senate Foreign Affairs, Defense and Trade Committee, that Australia's F-35A acquisition program had leeway to ensure that initial operational capability would be reached as planned in 2020.

The committee is not

convinced. It "recommends that the Department of Defense develop a hedging strategy to address the risk of a capability gap resulting from further delays to the acquisition of the F-35A. The strategy should be completed by 2018 and capable of implementation by 2019 at the latest."

Buying more Super Hornets would be the only economical hedge. As ASPI told the committee, Australia has paid for all, or almost all, of the fixed costs associated with operating the type. Stretching out the Hornet force beyond 2023, when the last Lightning is due to arrive, looks like an improbably expensive alternative, since the 1980s fighters are expected to last into the early 2020s, thanks primarily to careful structural analysis.

The Liberal-National government's adoption of the committee's bipartisan recommendation would be politically prudent but not compulsory. It would mean that

the department would be poised for a Super Hornet order if the F-35 program slipped again.

The RAAF is unlikely to be enthusiastic. It once hoped for a homogenous combat fleet of 100 F-35As. But an earlier administration, unwilling to countenance the chance of a capability gap, forced it into the risk-reduction move of introducing Super Hornets as early replacements for F-111 strike bombers.

The service seems to still harbor hopes of an all-Lightning fighter and strike force. In a little-noticed address to an ASPI meeting in July, the head of the RAAF, Air Marshal Leo Davies, listed the candidates for Australia's next combat-aircraft program as Super Hornets, F-35As and F-35Bs.

More Super Hornets were presumably suggested as a way of sharing airframe usage with the current fleet, extending the life of the type. But the RAAF has never shown eagerness for keeping

the Super Hornet in service for longer than it must, and is unlikely to favor the option. In contrast, buying more F-35As would create the homogenous fleet the service has long desired.

Davies did not explain the merits of the third, quite surprising option, the F-35B. But an obvious possibility is that Australia has begun to wonder about the survivability of its northern airbases in the face of attack by Chinese cruise and ballistic missiles.

Unmanned strike aircraft, until now officially listed as candidates for Super Hornet replacements, were omitted. According to ASPI's account of the address, Davies's "reasoning was one of timing—since we have to make a decision by 2022 or 2023, it is unlikely that unmanned systems would be good enough for air combat in time." The think tank suggests that the decision could instead be deferred, since the Super Hornets could last until 2040.

But the RAAF may have another reason for sticking to the schedule. If, by 2030, all the fighter and strike squadrons are equipped with new or fairly new manned aircraft, then any combat drones ordered around that time would become supplementary, expanding the fast-jet force.

An impending order for armed, medium-altitude, unmanned aircraft, likely to be General Atomics MQ-9 Reapers, will presumably result in the RAAF having a squadron that will eventually need reequipping with jets.

Well past 2030, the service will also have 12 EA-18G Growler electronic attack aircraft, due to be initially operational in 2018. Their commonality with Super Hornets is not an argument for keeping the latter for longer, RAAF officers have suggested, since Australia could easily rely on the U.S. Navy's support system for Growler sustainment.

<http://aviationweek.com/combat-aircraft/report-raises-chance-more-australian-fa-18-super-hornets>

COMBAT CLOUD

Next Gen C2

BY CHRIS MCINNIS

ADBR Magazine March-April 2018
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Most readers will have heard or read discussions about the 'combat cloud'.

Like the white fluffy things from which its named is derived, the combat cloud can seem to be an ethereal thing – composed mostly of vapour and not necessarily establishing solid foundations upon which to build. That is a shame, particularly for the Australian Defence Force and Australia's defence industry, because combat clouds are potentially a critical element in Australia's realisation of a truly integrated force that can genuinely punch above its weight.

So, how do we define what a combat cloud is? Borrowing from its commercial progenitor, the combat cloud conveys a system in which data is pooled and is available from this via a number of different means. The essence of the 'cloud' notion in combat cloud is that a user is not dependent upon information being pushed to them via a specific means; they are connected to the cloud via whatever means they have at their disposal, and can pull data they are authorised to see as and when necessary.

This aspect is only part of the story though. The combat cloud terminology may suffer from being an idea that is a little before its time, as the more recent notion of an 'internet of things' is a more appropriate descriptor for what people seem to be trying to achieve with the combat cloud. The

combat cloud is not just about smoothing the passage of information in the way that Dropbox or iCloud does for its users.

Instead, the concept of the combat cloud is about sharing information and resources across a networked force in a manner that allows the information and resources – sensors, weapons, processors, and deciders – to be optimised for the task at hand. This is more akin to a combat internet of things than a combat cloud, because a user can control and exploit resources anywhere on the network, not merely access the information available on the network.

Much is made of the F-35A's own and multi-ship fusion capabilities that enhance its ability to locate, identify, and track targets. This is indeed impressive, but the combat cloud allows this fusion effort to be scaled up exponentially. Instead of the data collected by the F-35A's sensors being processed solely onboard, it can also be pooled with information from the E-7A Wedgetail, Hobart-class DDG, EA-18G Growler, MQ-4C Triton, Jindalee Over-the-Horizon-Radar (JORN), and orbital sensors, and then processed in server racks onboard a nearby orbiting KC-30A tanker to generate a high-fidelity multi-source track.

The combat cloud concept matters for the ADF because it has the potential to enhance a small force's lethality, survivability, resilience, and efficiency. The combat cloud has the power to enhance

"The concept of the combat cloud is about sharing information across a networked force."



the ADF's potency by allowing engagement at greater ranges, using a greater array of weapon systems from potentially unexpected aspects. Physics dictates that an aircraft can only carry a limited number of missiles of a certain size, and that the more missiles the aircraft carries, the larger its signature becomes and the less distance it can travel.

But in a combat cloud, the aircraft is not dependent upon the weapons it carries. Instead, it can call for fires from weapons on any of the platforms available in the network.

In this instance, an F-35A called on land-based long-range surface-to-air missiles (SAM) to engage targets far beyond the horizon of the ship's own sensors. The SAM battery's crew, coordinating via datalink with the F-35A formation, swap the explosive warheads on several missiles for a microwave attack system designed to disable electronic systems and arrange to fire two salvoes. The first salvo of explosive and microwave weapons is fired, intended to disrupt the enemy strike package.

Meanwhile, a second salvo of weapons flies to programmed waypoints to await updated targeting information from the F-35A. The first salvo does its work and the second salvo, approaching from a different aspect, targets remaining high value targets thanks to updated information from the on-scene F-35A. The enemy's inbound strike package had no idea what hit them. There were no emissions until aircraft started exploding or falling out of the sky with malfunctioning electronics.

In many ways, it was the combat cloud that hit them because the combat cloud had enabled crumbs of information from multiple sources to be fused into robust tracks. Aside from low probability of intercept/low probability of detection datalink transmissions, neither HMAS Hobart nor the F-35A force emitted at all during this engagement.

The F-35A's targeting data was derived from its own impressive onboard systems but was also fused – in server racks

onboard a KC-30A refuelling a pair of Growlers – with sensor information from offboard systems. This was important as the F-35A force had detected the incoming enemy aircraft minutes earlier but could not identify them without giving away their own presence.

The cloud's resilience had also been on show. The processing performed onboard the KC-30A was usually done in server rooms located in Canberra via satellite communications. But a Carrington Event the year before this story had disrupted most satellite communications. Enemy counter-space operations leading up to the attempted strike had compounded earlier problems. But due to the combat cloud, commanders had been able to divert processing power from routine activities towards the fusion of fragments of information from numerous sources to derive a sufficiently clear picture. The only element of this that had been 'by design' was the flexibility in the system to rapidly re-orient.

Efficiency had also been optimised due to the combat cloud. HMAS Hobart's long-range SAMs were closer to the inbound strikers, but the cloud had recommended to the area air defence commander aboard an E-7A Wedgetail that the DDG's weapons be preserved for defence of the amphibious task group she was escorting. Besides, the upgrades to allow HMAS Hobart's crew to swap out warheads were not due to come online until next year, and the enemy's single axis formation presented an opportunity to disable multiple targets



ANDREW McLAUDHRAIN

with a limited number of non-ketic payloads.

The efficiency had also been apparent in the cloud's optimisation of sensor allocation. Instead of the Wedgetail's MESA radar radiating continuously, the cloud's processing had identified the few targets that other sensors had been unable to identify and directed pulses of the MESA radar onto those targets, and those targets only, until they were identified sufficiently.

Moreover, the smarts of the combat cloud allowed the battery commander to launch dumb weapons, preserving her active radar-homing missiles for subsequent missions. The fidelity and granularity with which the combat cloud could resolve targets, and the assuredness with which weapons could be guided to the target via a variety of data links, meant the weapons themselves could simply do as they were told until impact.

This key breakthrough had enabled the rapid warhead swap as the missile's payload would not interfere with a delicate guidance system.

Of course, most of the above is fiction. The ADF will have a HMAS Hobart, F-35A, and land-based SAMs, but otherwise this is a made-up story. But it does not need to be.

This fictional combat cloud vignette illustrates why the combat cloud is more than an easily accessible data swamp, and why it offers such potential for the ADF's realisation of an integrated force. Like its real-world namesake, the combat cloud presents an outside observer with a seemingly unified and impenetrable mass, with untold latent potential. This is precisely why Peter Layton felt the combat cloud was "perhaps better named a 'combat thunderstorm', hurling destructive lightning bolts from any part of the cumulonimbus."

The ADF and its industry partners have a unique opportunity to drive towards a combat cloud. The ADF's highly capable mix of USAF, USN, and bespoke equipment on a relatively small scale means it is well placed to tackle the challenges of integrating weapons systems with fundamentally different, and often hostile DNA. Proprietary, security, and other regulatory controls on information sharing must be overcome.

However, this presents an opportunity for Australian industry to present itself as an impartial broker, one that can potentially find a way to bridge the divides that arise between industry primes' valuable intellectual property, the need for security, and government's desire to control

the release of sensitive information. In an insightful study on battle network competition in the twentieth century, the US-based Center for Budgetary and Strategy Assessment identified that as competitions went on, the rate of change accelerated until the fundamental character of the competition was disrupted.

Realising the combat cloud's vision is essential if the ADF and its partners are to realise and maintain comparative advantage. A combat cloud that delays or precludes the integration of a new sensor, weapon, processor, or algorithm due to integration delays, is the combat cloud that the enemy in our scenario possessed.

The results speak for themselves. ■

Wing Commander Chris McInnes is a serving officer in the Royal Australian Air Force, and is the Co-Editor of the Sir Richard Williams Foundation's 'The Central Blue' blog. He holds a Bachelor's Degree in History, Politics and Management from UNSW Australia; completed the Australian Command and Staff Course (Joint) in Military and Strategic Leadership at the Australian Defence College; and holds a Master's Degree in Military and Defence Studies from the Australian National University.

ANDREW MCLAUGHLIN

Initial Point

ADBR May-June 2018

ANDREW MCLAUGHLIN

Thanks Binny!

Australian Defence Business Review Magazine - March/April 2018 Vol.37 No.2

I first met Mark Binskin in about 1999 when he headed up the then new AIR 5077 Project Wedgetail airborne early warning and control office.

I will always remember how kind 'Binny' was to this bogart defence writer who barely knew anything about AEW&C.

In 2004 Binny was instrumental in me getting approval from the RAAF to write my first book, *Hornets Down Under*. As Commander Air Combat Group, he enthusiastically facilitated access to squadrons, aircraft and people to interview for the book, and approved hundreds of photographs.

I was also privileged to attend the annual 2004 International Hornet users' group conference with him in San Diego, and from there I went straight to Las Vegas where I was embedded with the RAAF at Red Flag.

Binny recently told a story at a community event that, when he was tapped to become Chief of Defence Force, he was told it should be a quiet tour, as Australia's large commitment in Afghanistan was winding down.

But barely two weeks after taking command in 2014 came the shock news that Russian separatists had shot down a Malaysian airliner over Ukraine, with the loss of all passengers and crew onboard including at least 27 Australians.

Australia's response to the shooting down was

stunning, both in its scale and timeliness.

Special forces were dispatched to Ukraine to help secure the crash site and to support an Australian Federal Police forensic team. RAAF C-17s and KC-30s provided an air bridge between Australia and the Netherlands (where MH17 had originated) to support the deployment, and to perform the grim task of transporting evidence and human remains home.

The following 12 months saw the rise of the brutal Islamic State of Iraq and the Levant (ISIL), better known as Daesh. Within six weeks of the fall of Mosul, Australia was preparing to deploy to the Middle East again to support coalition operations against Daesh.

RAAF C-17s and C-130s were first to see action in August 2015 when they participated in mass airdrops to thousands of Yazidis on Mount Sinjar and under threat of a massacre by Daesh.

This was quickly followed in September by a deployment of six Super Hornets, an E-7A Wedgetail, and a KC-30A MRTT, the RAAF's first air combat deployment since 2003, and its first true test of an organic air task group.

Through all this time, the RAN has continued its ship rotations to the Arabian Gulf region to conduct counter-piracy and drug interdiction missions, while Army regular and special forces troops have

contributed greatly to the training and rebuilding of the Iraqi Army.

Through all this, he has always found time to send me a quick text of encouragement, or to catch up for a coffee to chat about our mutual loves of aviation, motor sport, and family. He treats all people of all ranks and from all backgrounds with equal warmth, kindness and respect.

Binny will retire as CDF on July 6, and like the vast majority of Australians in uniform, he has represented Australia and the ADF for 40 years with the highest levels of honour and distinction.

I'm honoured to call him a friend.

A new look

By now you will have noticed ADBR has a new logo and look.

Since late last year, we are focusing our attention less on the 'business' side of Defence, and more towards subjects such as multi-domain command and control, force level design and integration, next-generation EW, recapitalisation and sustainment, cyber and information warfare, and capability sustainment.

All of these will be covered in the context of Smart Buyer, human performance, future and disruptive technologies, and advances in academia and STEM research.

As always, I welcome your feedback. ■



<https://www.defensenews.com/global/asia-pacific/2018/06/27/australia-cleared-to-buy-185-million-in-aegis-equipment/>



Australia cleared to buy \$185 million in Aegis equipment

Aaron Mehta 27 Jun 2018

Australia wants parts for radars to make sure the Aegis combat system will work on its newest ships, such as the Hobart-class destroyer. (WILLIAM WEST/AFP/Getty Images)

WASHINGTON — The U.S. State Department has cleared Australia to purchase long-lead equipment for integrating its CEAFAAR 2 phased array radar system with the Aegis combat system, with a potential price-tag of \$185 million.

Australia seeks to add 9 Aegis capable Future Frigates over the next 20 years, while upgrading their three existing Aegis capable Hobart Class destroyers, per an announcement by the Defense Security Cooperation Agency.

"This sale enhances Australia's self-defense capability, while significantly improving interoperability with U.S. Navy AEGIS combatants in the region," the notification reads. "By deploying a surface combatant fleet that will incorporate Cooperative Engagement Capability (CEC), Australia will significantly improve network-centric warfare capability for U.S. forces operating in the region."

Designed by Australian company CEA, the CEAFAAR radar is a modular phased array radar system already in use by Australia's navy. The goal of this equipment package is to get everything aligned between the radar and the Aegis weapon systems going on the new frigates.

Included in the package are a number of Aegis-related equipment, including "Command Display System (CDS) Consoles (including 2 consoles in Gun Weapon System configuration); Multi-Mission Display (MMD) systems, including projectors, sensors and cameras; Tactical Equivalent Core Computing System (CCS) Cabinets; Tactical Equivalent AEGIS LAN Interconnect System (ALIS) Cabinets; Tactical Equivalent AEGIS Conversion Equipment Group Input/Output (ACEG I/O) Cabinets; Tactical Equivalent Advanced Storage Area Network (ASAN) Cabinets; Global Command and Control System - Maritime (GCCS-M); Cooperative Engagement Capability (CEC) sites systems, to include processing rack, simulation equipment and workstation; AN/SPQ-15 Converter/Receiver and /signal data converter equipment; Defense Visual Information Distribution Service (DIVDS) cabinet; AN/SQQ-89 Sonobouy Processing Core Computing System racks, with console and laptop; AEGIS simulator racks and workstations; AEGIS Training System; and various ancillary equipment and support products, including desktop computers, displays, test units and compilations servers, printers, workstations, spares, cabling and software licenses."

Technical assistance is also requested. Primary work will occur at the Lockheed Martin Rotary and Mission Systems facility in Moorestown, NJ.

Being cleared by the State Department does not guarantee a sale will be completed. Congress can still intervene, and final price and quantity are often altered during negotiations. The proposed sale is being handled under a Foreign Military Sales vehicle.

This is the second Aegis-related FMS notification in as many days. On Tuesday, a notification that Spain is seeking to buy 5 Aegis weapon systems, potentially worth \$860.4 million, was released.

Britannia rules waves: UK's \$35bn frigate win

Simon Benson 29 June 2018

The largest peace-time warship building program in Australian naval history has been awarded to British defence giant BAE Systems under a \$35 billion contract to deliver nine of the most advanced anti-submarine warfare vessels in the world.

Cabinet's national security committee last night signed off on the "hunter-killer" global combat ship as the future backbone of the nation's defence posture in the region.

The deal is expected to create 4000 Australian jobs and deliver the most technologically advanced stealth-capable submarine killer as the replacement for the eight ageing Anzac-class

frigates that began service in 1996. The new fleet will be assigned as the Hunter Class with construction to begin in 2020 and the first ship delivered by 2027 in what a Defence source said was the most significant warship project since World War II.

A statement issued last night after the NSC meeting confirmed that construction would take place in South Australia at the Osborne shipping yard and ensure a continuous naval shipbuilding industry until at least 2042.

The deal was signed at 5pm by NSC members including Malcolm Turnbull, Defence Industry Minister Christopher Pyne, Defence Minister Marise Payne and Finance Minister Mathias Cormann. The Prime Minister will announce the decision this morning in

Adelaide, with the government expected to use the estimated 2000 South Australian jobs created under the project as a key campaign pitch in the upcoming by-election in Mayo.

The future frigates will become pivotal to defence capabilities in the region against the backdrop of increasing Chinese military activity. With the rapid increase in the number of submarines being deployed in the region, combat vessels with anti-submarine capability are regarded as critical for Australia's defence needs.

The Defence source said the BAE-designed ships were "state of the art" and would be the most capable vessel of its kind. "They kill submarines," the source said.

The frigates, at a cost of about \$4bn each, will form the

last piece in sovereign naval defence capabilities, which include the offshore patrol vessels, the \$9bn air warfare destroyer program and the 12 new French-built submarines that will cost \$50bn. BAE Systems won the contract ahead of competing bids by Italian firm Fincantieri and Spain's Navantia. It will be the largest surface warship project commissioned and rivalled only by the submarine project.

Critics of the BAE Systems bid argue that the type 26 global combat ship has yet to see service as no ships have been built, whereas the Spanish and Italian ships were in service. This was considered by the Australian Strategic Policy Institute as the highest risk option for likely cost overrun.

The decision to go with BAE was based on a Defence

assessment that the global combat ship was "by far and away" the most capable and lethal ship of the three. Britain's Royal Navy is expected to have ships in service several years ahead of the first Australian ship being delivered.

According to the Defence source, the British bid had an "added bonus" of being delivered by one of Australia's closest strategic and political allies and a partner in the "five-eyes" intelligence network that also includes the US, Canada and New Zealand.

Mr Turnbull said the decision to go with the BAE bid was based on sheer capability.

"The frigates, to be designed by BAE Systems and built by ASC Shipbuilding, are central to our plan to secure our

nation, our naval shipbuilding sovereignty and create Australian jobs," the Prime Minister's statement said.

After a comprehensive competitive evaluation process, the government had assessed BAE's global combat ship as having the capability best suited for Australia. "(It) will provide our nation with one of the most advanced anti-submarine warships in the world — a maritime combat capability that will underpin our security for decades to come," he said.

"The Hunter class will provide the Australian Defence Force with the highest levels of lethality and deterrence our major surface combatants need in periods of global uncertainty. The Hunter class will have the capability to conduct a variety of missions

independently, or as part of a task group, with sufficient range and endurance to operate effectively throughout the region.

"The frigates will also have the flexibility to support non-warfare roles such as humanitarian assistance and disaster relief."

The ships' combat platform will include the US Navy's Aegis combat-management system and Australian-developed CEA phased-array radar.

It will also be fitted with an advanced anti-ship missile system, sea sparrow missiles, and MK41 vertical launch defence systems. **The ship will carry a torpedo-armed Romeo helicopter with space for a second**

Romeo or drone.

The government said the Australian component of the contract would be 65-70 per cent, which would create about 4000 direct and indirect jobs. More than 500 businesses across the country had been "prequalified" for the contract's supply chain. Mr Turnbull said the frigates would be "built in Australia, by Australians, using Australian steel". "This \$35bn program will create 4000 Australian jobs right around the country and create unprecedented local and global opportunities for businesses large and small," he said.

As a requirement of the bid, a corporate structure would be created, with the government-owned ASC, the former Australian Submarine Corporation, made a

subsidiary of BAE systems for the duration of the contract. The federal government would retain a sovereign share of ASC, which would return to full federal government ownership at the end of construction. BAE would be responsible for the design and the ASC for the majority of construction. The statement said this "ensures BAE Systems is fully responsible and accountable for the delivery of the frigates and ensures the work will be carried out by Australian workers and create Australian jobs".

The government said that at the end of the delivery scheduled for 2042, ASC would retain intellectual property, a skilled workforce and associated equipment.

The Australian 29 Jun 2018

version of the Joint Strike Fighter, the vertical takeoff and landing F-35B. The amphibious assault ships could be easily converted to carry up to 23 Navy [F-35Bs at a time](#), or just under half as many fighter planes as a supercarrier.

Building such carriers would be an acknowledgement that the hulking *Nimitz* and *Ford*-class supercarriers are not the solution to every crisis. In big war situations that require large amounts of airpower—against Russia or China, for example—supercarriers are indispensable. While the likelihood of a big, conventional war has gone up in recent years, there are still existing conflicts, such as Syria, Iraq, and Libya, that could be serviced by a less capable *America*-class carrier.

These smaller, low-end carriers do come with tradeoffs. The small size and the lack of a full-length flight deck and aircraft launching catapults would make it incapable of hauling other aircraft that supercarriers carry, like the [E-2C/D Hawkeye airborne early warning and control aircraft](#) and [EA-18G Growler electronic attack aircraft](#). The lack of the former would restrict the carrier's ability to detect distant threats and manage the battle in the air and the latter would make suppressing enemy air defenses more difficult. But those situations are more common in big wars, and for that we have the supercarriers. Smaller carriers could also not launch and recover near carrier-borne drones like the [MQ-25 Stingray refueling and reconnaissance unmanned aerial vehicle](#).

Cost is another major issue that drives the argument. The first of the *Ford*-class carriers will [cost an estimated \\$13 billion dollars](#). USS *America*, on the other hand, cost \$3.4 billion. That's a pretty good number for being able to field half as many aircraft, with the caveats mentioned above. You could buy three *America* carriers for one *Ford*.

Still, a force of *America*-class carriers might be more expensive to run on a daily basis just because of manpower costs: *Ford* has [4,660 crew overall](#). The three smaller carriers would have a total 3,600 crew members plus their air wing personnel, which would probably be at least another 500 or so each. That's at least another 500 personnel manning the smaller carriers—which, incidentally, could be sent to three different trouble spots around the world.



A F-35B fighter takes off from the USS America, November 2016. U.S. Marine Corps Photo by Cpl. Thor Larson.

Just like any other complicated issue, there are arguments both for and against a high/low mix of carriers. America can get by on an all-supercarrier force, and it could also live with a high/low mix. That having been said, unless the costs of supercarriers is brought under control we could be forced into a high/low mix of ships. It wouldn't be a bad place to be.

A 'clever' Australia needs a larger, more potent navy

12 Jan 2018 | Richard Menhinick



<https://www.aspistrategist.org.au/clever-australia-needs-larger-potent-navy/>

In an interview in *Australian Foreign Affairs*, Paul Keating noted that China under Xi Jinping was looking to craft a new form of global governance, rejecting the notion of China as a strategic client of the US. Keating also talked about our need to be clever.

He observed that 'before the Industrial Revolution, China was on the top of the system and had a tributary system of states which bowed and genuflected to them. Let's hope we're not going to be bowing and genuflecting.' He went on to say that 'self-reliance and self-help should be the keynote of our foreign policy'. In my view, that needs to expand to defence policy as well.

Depending on the US isn't the answer, just as in 1942 Britain in its own 'darkest hour' could do little to help us. This is our real dilemma. From a defence perspective, how does Australia become clever and manage the emerging behemoths in our Indo-Pacific region, while maintaining our key alliances and using the US as a 'balancer'?

We could start by looking at maritime issues from a true strategic perspective, rather than, as is often expressed, a job policy for South Australia and other states. We also need to educate Australians—ignorance of the sea in Australia's historiography is overwhelming.

In 2002, I coined the phrase that as a nation we are 'girt by beach' not 'girt by sea'. Australians and beaches have synergy, and if we consider maritime issues, our thinking is, at best, only about three kilometres to sea—the view we get from the beach. Before 1914, we started very well with an effective naval force that had strategic dominance over the German Pacific fleet, deterring attacks on Australian cities, but then came the horrendous casualties in land warfare, especially on the Western Front.

The impact of that on the Australian psyche was felt throughout World War II and continues to skewer defence culture and thinking in Australia, resonating in a deeply personal and tragic way in Australian remembrance. For matters pertaining to the sea, we see ourselves as a small element within a larger maritime force, first British and now US.

As a result, when naval officers speak on maritime issues there remains a hesitancy to challenge the primacy of land forces and land-based air power. The emphasis is on individual naval programs, employment opportunities and the like. Basically, we're content to be thankful for what we have and to stay relatively quiet. ←

Little focus is put on the enduring concepts of sea control and maritime strategy, which are supposed to be the rationale for developing and deploying maritime power, especially for an island continent. In a region increasingly dominated by China and India, Australia is unlikely to fight at home unless our maritime forces are first destroyed.

Australia is surrounded by the three largest oceans on earth, yet governments over more than three decades have failed to focus on forward defence via powerful, sustainable and deployed maritime forces. China and India are focusing increasingly on that area.

Despite much that is written and spoken, we have a navy that remains a sea-denial element of a continental strategy. There's little ability to take power and project it forward. Mobile sea-based air power and strike is neglected, almost vilified, and to even debate it is heresy in Australian defence circles. We've been lulled into thinking that transporting land forces over the sea is the navy's primary role, not taking the war to the enemy, violently and aggressively.

The navy of today and tomorrow is the same size in a ship sense as it was in 1976 when I joined, with about a dozen destroyers and frigates. However, strategically we're significantly less effective vis-à-vis the region. The minister's introduction to the 2016 defence white paper states that it 'sets out the most ambitious plan to regenerate the Royal Australian Navy since the Second World War'. That sounds impressive, but it's essentially misleading—in essence, we're doing ship replacement. The navy remains too small and it's a self-defence force, with limited power projection or ability to conduct sea control at distance.

We should be talking to the Australian public about strategic truths in a language they understand, explaining to them the new reality. To have self-reliance and self-help in this era requires a much larger, more potent navy. **Fixed-wing, strike-capable aircraft carriers are required to project maritime air power via the short take-off, vertical landing version of the joint strike fighter.** And we need perhaps twice the number of destroyers and frigates, so that we can really carry out aggressive operations against numerically larger air, surface and submarine threats, to dominate, deter and if necessary defeat. The submarines we're getting are potentially good, but that's an isolated area of improvement.

Even with the less-than-lethal force of today, the navy is about 2,000 personnel too small, resulting in stresses at each and every operational interface. Can we afford to be clever? Not on a 2% defence budget—so that's the first discussion we need to have as a nation.

As an island continent in the new Indo-Pacific reality, we cannot remain mute as our maritime forces continue to be deficient.



Richard Menhinick had an extensive career in the Royal Australian Navy, including commands at sea, ashore and on operations. He has also worked in strategic analysis and policy formulation. [Image courtesy of the Department of Defence.](#)

Kongsberg's New NSM/JSM Anti-Ship & Strike Missile 23 Sep 2014 Defense Industry Daily "...[JSM] Size shrinks slightly to 3.7m/ 12'2, & weight drops to 307 kg/ 677 pounds...." <http://www.defenseindustrydaily.com/norwegian-contract-launches-nsm-missile-03417/>

**LHD Juan Carlos I
Harriers Feb 2014**

L 61 Juan Carlos
I Apontaje de un harrier
**Spanish aircraft
carrier operations**

Published on Dec 24, 2014
<https://www.youtube.com/watch?v=6Klagzoiytl>

VIDEO

F-35 STOVL Specifications



VIDEO
YOUTUBE

[http://www.youtube.com/
watch?v=odaknd0_Gnl](http://www.youtube.com/watch?v=odaknd0_Gnl)

F-35B STOVL	
Length	51.2 ft / 15.6 m
Height	14.3 ft / 4.36 m
Wingspan	35 ft / 10.7 m
Wing Area	460 ft ² / 42.7 m ²
Horizontal Tail Span	21.8 ft / 6.65 m
Weight Empty	32,300 lb
Internal Fuel Capacity	13,500 lb / 6,125 kg
Weapons Payload	15,000 lb / 6,800kg
Standard Internal Weapons Load	<ul style="list-style-type: none">• Two AIM-120C Air-to-Air Missiles• Two 1,000-Pound GBU-32 JDAM Guided Bombs
Maximum Weight	60,000 lb Class
Propulsion* (Uninstalled Thrust Ratings)	F135-PW-600 38,000 lbs Max. 26,000 lbs Mil. 40,500 lbs Vertical
Speed (Full Internal Weapons Load)	Mach 1.6 (~1,200 mph)
Combat Radius (Internal Fuel)	>450 nm / 833 km
Range (Internal Fuel)	>900 nm / 1,667 km
Max g-Rating	7.0

**Maximum Power (Max) = With Afterburner; Military Power (Mil) = Without Afterburner; Vertical = Without Afterburner*

Shaping a New Combat Capability for 21st Century Operations: The Coming of the F-35B to the New British Carrier

27 Sep 2015 Robbin Laird

Editor's Note: **The practical implications of the analysis provided by the RAF Group Captain for journalists, analysts and GAO types is pretty fundamental: don't analyze the ship without reference to the plane; and don't discuss the plane as a replacement platform for together the Queen Elizabeth and the F-35B are a 21st century air system. We have argued that no platform fights alone, and clearly this true for the Queen Elizabeth.**

Earlier I have visited the Queen Elizabeth and discussed the initial approach to shaping a cross-modernization strategy for the Royal Navy and the Royal Air Force.

The SLD team has visited the RAF based at Beaufort USMC Air Station and talked with the team there about the working approach with the USMC in shaping the standup of the initial F-35B squadrons.

And onboard the USS WASP during the recent sea trials, Brits and Americans worked together on the ship integration trials.

What is often missed is that the F-35B coming to the carrier or the large deck amphibious ship is not just about the airplane, it is about the evolving combat air system which the integration of the ship and the strike/ISR/C2 aircraft brings to the force.

During my visit to the United Kingdom in September 2015, I have had a chance to discuss with the Royal Air Force two key elements of their fighter transition, the coming of the F-35 and the modernization of the Typhoon, and their interaction with one another.

In this piece, the focus is on the F-35 part of the equation but given the background of the person interviewed that interactivity is built into his operational thinking.

In London, on September 18, 2015, I had a chance to talk with Group Captain Ian Townsend, the replacement for Group Captain Godfrey, and a key officer involved in working the F-35 introduction into service for the RAF.

He is an experienced Typhoon pilot and has been involved with the dynamics of dealing with the Russians in protecting UK airspace as well in the Baltic Air Patrols for NATO.

He has also been involved in working with the Japanese and bringing to the Japanese an understanding of Typhoon and UK thinking about the introduction of the F-35 to the force.

This is another aspect of the allies working together to think through the evolution of 21st century airpower.

Question: You are working the task of bringing the F-35B to the UK in 2018 and preparing for its integration with the Queen Elizabeth.

What role does your engagement with the Marines at Beaufort play in this process?

Group Captain Townsend: We have a pooling implementation agreement or PIA with the Marines.

The PIA formalizes how we're going to work alongside them. We currently have 14 maintainers at MCAS Beaufort but, by the end of 2018, we'll have about 242 maintainers.

They are all operating under the U.S. Marine Corps regulations and will be ready to come back to the U.K. and operate F-35 independently in late 2018.

(When visiting MCAS Beaufort Group Captain Paul Godfrey commented: "Without the Marines, the F-35 program would not be where it is today.")

Question: And concurrently, you are building your own infrastructure in the UK to then support your F-35s in the UK?

Group Captain Townsend: That is correct. It is a massive effort to put in place the UK infrastructure but we are learning significant lessons from other F35 partner nations.

We are conducting developmental test flying, operational test flying and frontline flying all at the same time, something we call concurrency. We've never done that before.

If we hadn't taken that approach, none of the F-35 operators would be where we are right now.

The Marine Corps wouldn't be IOC, if they haven't taken that approach.

And we certainly wouldn't be thinking about IOC in 2018 if we hadn't taken that concurrency approach.

Working alongside the Marines not only allows exposure to F-35 operations through the maintenance department, but our pilots are also working alongside their Marines equivalents.

We're training to the 501 Operational Conversion Syllabus, so we will now know exactly what the Marines are trained to go and do, which I think will make us better partners in the future as well.

Question: And by then, the Queen Elizabeth will be doing sea trials and getting ready to accept you?

Group Captain Townsend: That is the target. The first period of developmental testing onboard the Queen Elizabeth happens at the end of 2018.

We have a second period in the mid-part of 2019, and then we will conduct continuation training on the ship before she achieves operational capability at the end of 2020.

Question: One misunderstanding often is that the Royal Navy is seen to be flying the F-35B where it is really the RAF.

And the RAF is flying both the upgraded Typhoon and F-35B and

working through their integration.

How would you describe the importance of the RAF working both processes concurrently?

Group Captain Townsend: I think this plays very nicely into the fact that the Royal Air Force is the air-minded service.

We focus solely on being the expert deliverers of air power.

However, being a joint force, we have the additional benefit of having Fleet Air Arm pilots embedded within the U.K. Lightning Force.

So there is no Royal Air Force Lightning Force.

There is no Royal Navy Lightning Force.

We are just one force.

And we're bringing together the expertise of both elements of light blue and dark blue uniforms to provide the very best effect for carrier strike in the future.

Question: It was clear looking at reactions to the USS Wasp sea trials, that the core point of the integration of the ship with the airplane was largely missed.

The Queen Elizabeth is a ship designed for the F-35B and the F-35B will provide unique capabilities,

which the ship can capitalize on in shaping its concept of operations.

How would you describe this synergistic process?

Group Captain Townsend: As an airman, I like anything that enhances my ability to deliver air power, and the ship certainly does that.

The ship has been tailor-made from first principles to deliver F-35 operational output. The ship is part of the F35 air system.

I think this is the key change to where we were in Joint Force Harrier where the ship was really just a delivery vehicle.

The ship was just a runway.

The Queen Elizabeth class aircraft carriers are much more than that.

They are right at the heart of the air system's capability fundamentally enabling and supporting what the air vehicle is doing three, or four, or five hundred miles away from the ship.

And that wasn't quite the same in Joint Force Harrier with the Invincible Class CVS carriers.

So it's very different for us.

Everyone involved in embarked F-35 operations needs to understand what the air vehicle is going off to do because everybody on the ship is

much closer to that end delivery of effect.

This is a very different concept of operations from 15 years ago.

When I launched from the CVS in 2005 to fly an operational mission in Afghanistan, once I left the deck, I was gone.

The next contact I would have with the ship was when I called for recovery, several hours later.

Whilst I was airborne the ship and I became very separate operational platforms.

When a UK Lightning launches from the QUEEN ELIZABETH, the information link between the air vehicle and the ship now means that they remain connected during the operation greatly enhancing operational capability.

In terms of being an information node or a C2 node, we're in a much different place now.

And I think that's really quite interesting for us as air commanders in terms of our ability to control what is going on forward with the airplanes.

I also think from a pilot's perspective, being on the deck in my F-35, being able to see in

my cockpit what is going on in the battle space, because my brothers in their F-35s already in the operational battlespace have sent information back to me, I think that's really exciting as well.

We are no longer launching into the unknown.

We can see what's happening.

We understand what we're going off to go and do, but we can see the real-time situation in the battle space before we launch off the deck.

This is a significant operational benefit..

Question: The impact of the global fleet of F-35s is significant as well in shaping enhanced capability for the Queen Elizabeth-F-35 enabled air system as well.

How do you see the impact of the F-35 global enterprise on the RAF?

Group Captain Townsend: There are many benefits.

Not just in terms of training alongside each other and seeing the TTP developments, but practically when you're in the battle space, how much information can you get from all of these different F-35 partners that are out there.

Broadening that question a little bit further, being part of the global platform and global sustainment, what are the opportunities there about not having to take all logistics with you?

What can you do to leverage off an Italian ship that's nearby that might have the particular part that you need but you might not have it because you haven't had to take anything forwards.

There's an awful lot of questions being raised and a lot of opportunities available about being part of this global platform.

Again, this is something that we in the U.K. have never done before and there are a number of lessons ahead.

Question: I believe that any new platform needs a decade to put its legs under it.

But the basic point is that we're moving in a different direction from the beginning, rather than spinning our wheels with historic patterns.

And your perspective is the need to get on with it, more or less?

Group Captain Townsend: I think that's absolutely right and inevitable.

But at least, the foundation has been set.

The partners involved in the global platform understand each other's business, from the outset, in a way that we haven't really seen ever before.

I think the closest equivalent you could come to would be the F-16 program that was widely sold across the world, but every nation did F-16 differently.

There were different support solutions for every F-16 operating nation.

By and large, anyone operating F-35 is going to be doing it in broadly the same way with the same sort of broad sustainment solution.

That's part of the global program. That's what makes it an attractive option for everyone that's involved.

Question: How would characterize the role of the F-35 compared to the other elements in the evolving RAF air combat force?

Group Captain Townsend: The F-35 is **not** a multi-role fighter. Multi-role, in current thinking, would be a sequential series of tasks.

The F-35 is doing a number of missions simultaneously.

The concept of mission simultaneity is really important.

The airplane has the ability to do things without the pilot asking it to do it.

Automatically conducting, particularly, ISR whilst it's conducting an OCA mission or an attack mission in a very different way than platforms have done business in the past.

This is something that other operators are working in the package alongside F-35 need to understand.

That the F-35 operator won't be going through sequential thought process.

He will be thinking about the battle space in a broader sense, a much different way than a Typhoon operator would be thinking about the battle space.

I think there is another step change and difference in the way in which the information is displayed to the pilot which is important and is extremely intuitive.

I'll give you an example. I commanded a Typhoon squadron for two years.

Very early on this job with F-35, I was lucky enough to fly the F-35 simulator. and the

different way in which F35 displays information compared to Typhoon is eye-catching.

In fact, I asked for the simulator to be stopped because I was taken aback by the information being displayed to me.

There was just so much data available at my fingertips, but displayed in a really different sense in Typhoon.

So very, very quickly, I knew a great deal about the entity being targeted – sensor fusion at work.

I think it's a very different way of displaying information that any other fast jet has done before.

Knowing what my wingman is seeing and my wingman knowing what I am seeing, and my ability to communicate what I want to have achieved by my formation, by my package, which all may be by the air wing that's air-borne at the time.

This airplane changes the game in a way which we can conduct that sort of business.

Question: What is the potential for the Royal Navy of having you guys on board and of re-thinking where they want to take the development of the surface fleet?

Group Captain Townsend: I think this plays very much into the concept that 'Aegis is my wingman'.

I think from a U.K. perspective, Type 45 is my wingman.

The importance there is that the F-35 pilot for the U.K. or for any of F-35 operator, the information he has available to him allows him to make decisions for other operators in the battle space. And that is not simply other operators meaning other airplanes; that is, other operators being air, land, or maritime platforms.

The ability for the F-35 pilot to control the battle space in its entirety means that people operating in the surface fleet, for example, need to understand what the F-35 can achieve.

Because if they don't, they don't know what the F-35 pilot is going to ask them to do when they ask them to do it.

So they have to instinctively understand the capability of the airplane, because every, every platform involved in the battle space now is part of what the F-35 air system can deliver in terms of operational effect.

I think the fifth-generation capability sets the context for the battle space.

You have to understand, when you've got a capability that is so different in the battle space.

If you cannot connect into it or influence or, or interact with it, your utility and your fourth-generation platform or your surface ship Type 45, is significantly reduced.

Question: Training for the expanded battlespace is a challenge, and the F-35 is part of the evolving training challenge.

The UK has very limited air space in which to train. How are dealing with this challenge?

Group Captain Townsend: There are number of reasons that make the U.K., I think, unique in its approach to synthetics.

We don't have access to airspace around the U.K. that allows us to use the full capability of F-35.

For security reasons, we wouldn't want to expose the full capability of F-35.

And we also lack some of the threats, some of the high-end surface-to-air missile threats, for

example, that we want to train against.

All of this forces us into the synthetic environment which is not a scary place for the U.K. fleet because the Typhoon force has been exploiting synthetics now aggressively for the last couple of years.

Now the peculiar thing for the U.K. is the closer we get to conducting a warfighting operation, the more we will fly the simulator rather than the live airplane.

And if I was to put that premise to any USAF pilot or U.S. Marine Corps pilot, they would look at me cock-eyed.

But it's the only way we can train at the high-end.

Fortunately, we've already got capability demonstrated and we've been using this for the last five or six years at RAF Waddington where we've got a joint synthetic environment that allows us to connect Type 45 to Typhoon to E3 with a joint flight simulator so we can conduct CAS for the fire support team.

That technology is already proven.

What we need to do now is take

the next step which is introduce the higher security capable F-35 into the lower security environment of Typhoon and E3. Again, not impossible, proven through scientific programs, what you need to know is make our frontline service capability.

But synthetic training is, is something that we're looking at extremely closely because it's the only way we're going to get operational capability from the F-35.

We can't do it live in the U.K.

Question: There clearly are major shifts underway with regard to command and control under the impact of fifth generation warfighting approaches.

How do you view this dynamic?

Group Captain Townsend: In the legacy case such as my operations in Iraq and Afghanistan and the Balkans with Harrier, I was told to go to a particular place with a particular weapon load to conduct a specific task at a certain time, even told which direction to fly sometimes to drop my ordnance.

We cannot constrain F-35 in that way.

We need to find a way to direct air missions in F-35, that relay the

commander's intent and then allow the pilot in F-35 to assimilate the information he's presented with to make the decision at the source in line with the commander's intent.

The air-tasking message and the air-tasking order at the moment, is not a great vehicle through which to achieve that.

And I think then, we get into the realities of F-35 pilots conducting mission command.

There is a danger that the information that could be passed back from the F-35 community in all these F-35 packages back to the CAOC could lead the air command element to be more directive, because they've got more information in their CAOC than ever before.

I think that would be a mistake.

The F-35 should give us the confidence to allow the pilot to make more decisions than ever before, but we have to get the commanders intent and this breadth of tasking rather than directive tasking framed in the right way....

The largest ship 1.2 billion USD 22 Dec 2014 Stylish Barker

The distance from the dock landing ship project was added to the aircraft ramp to shorten by half.

http://www.cumhuriyet.com.tr/haber/turkiye/168694/En_buyuk_gemiye_1.2_milyar_dolar_kaynak.html#

https://translate.googleusercontent.com/translate_c?depth=1&hl=en&ie=UTF8&prev=_t&rurl=translate.google.com.au&sl=tr&tl=en&u=http://www.cumhuriyet.com.tr/haber/turkiye/168694/En_buyuk_gemiye_1.2_milyar_dolar_kaynak.html&usq=ALKJrhhdH65r4UmgUVqyo8ZULglLvc8MA

“Turkish Navy will be the “dock landing ship - LPD” project appeared to be an aircraft carrier setting. LPD ships will be built in Turkey at the request of the Navy, Juan Carlos (Australia) and Canberra (Spain) with a 12 degree incline ramp as the ship (ski jump) will be placed. Earlier in lpd it was stated that they had this ramp. Ski Jump, shorten the distance from the plane in half. Turkey will take part of this development in parallel with the purchase of 100 F-35-A, to deploy the aircraft carrier 16 - 20 F-35 B (Short Take - Vertical Landing), reportedly, be ordered. Turkey's largest warship will have \$ 1.2 billion have been earmarked for the LPD.

Production of the ship, was delivered to the Sedef Shipyard in collaboration with the Spanish Navanti.

A force main base support battalion-sized Intercontinental requiring at least one will be able to refer to the crisis of its own logistical support LPD, today for the Spanish Royal Navy Ship In The helicopter will be like. Navanti shipyard to be built in 2005 Juan Carlos began in the year to 30 September 2010 was delivered to the Spanish Royal Navy. Juan Carlos I of length 231 vessels, 32 meters in width, while the total weight of 27 thousand tons. 247 people on board crew doing tasks.

Ship Juan Carlos I, 46 Main Battle Tank, 31 pieces Tactical Wheeled Vehicles, 27 pieces of armored Amphibious Assault Vehicle (AAV), or move the 30 Hummer vehicle. In the hangar of the ship 12 or 6 NH-90 EH-101 helicopters, out of them 7 McDonnell Douglas AV-8B Harrier II and F-35B aircraft capable of carrying. Flight deck NH-90, S-70B SeaHawk, Boeing CH-47 Chinook, CH-53 or V-22 Osprey tiltrotor helicopter can do such as take off and landing. The ship will have a butt that can take water pool. This will be carrying tanks with a capacity of 6 boats in the pool. In amphibious operations so the tank can be moved to the enemy coast. LPD to 12 degree slope with a ramp (ski jump), it was decided to put the short time ago.

The ship can accommodate a total of 1450 people. Ships capable of 50 days at sea without logistical support duties can reach a cruising speed of 22 knots. TAF was determined to enter the vessel's 6-year calendar. LPD, the Aegean, the Black Sea and the Mediterranean area and the necessary operations can be used in the Atlantic Ocean and the Indian Ocean. Dock landing ship, can also be used in natural disasters in the region needed a full-fledged hospital site.”



The Construction Of The Multipurpose Amphibious Assault Ship TCG Anadolu Has Started 02 MAY 2016

<https://turkishnavy.net/2016/05/02/the-construction-of-the-multipurpose-amphibious-assault-ship-tcg-anadolu-has-started/>



The model of TCG *Anadolu* taken during the IDEF 2015 defence exhibition.

The construction of the multipurpose amphibious assault ship L-408 TCG *Anadolu* has started on 30th April 2016.

The ship is based on Navatia's Juan Carlos 1 design. TCG *Anadolu* will be similar to SPS *Juan Carlos 1* in Spanish Navy and HMAS *Adelaide* and HMAS *Canberra* in Royal Australian Navy.

During the ceremony President of Turkish Republic Recep Tayyip Erdoğan made a speech. During his speech he stated that TCG *Anadolu* will be the first ship in Turkish Navy from which F-35B SVTOL planes will operate. This is the first time official declaration of the long known desire of Turkey to operate fixed wing planes from her ships. This statement also made it clear that Turkey will procure F-35B planes along with her order of F-35A planes.

In his speech Mr. Erdoğan also asked the announced delivery time of 5,5 years to be shortened to 4 years and stated that if TCG *Anadolu* can be delivered in 4 years, more ships –though not clearly stating which class- will be ordered.

Unlike her nears sisters in Spanish and Australian navies the Turkish ship will only have diesel engines. There will be five MAN 16V32/40 engines each creating 7.680kW and propelling the ship up to 21 knots. The range is estimated to be 9.000 nautical miles.

The ship will have one Mk-49 launcher for Rolling Airframe Missile, 2 Mk-15 Phalanx Block 1B CIWS, 5 Stabilized Gun platforms probably armed with 25mm gun for self-defence.

The ship will carry 6 F-35B Lightning II planes 4 T-129 ATAK attack helicopters 8 cargo helicopters 2 S-70B Seahawk helicopters and 2 UAVs.

The contract for this project was signed on 7 May 2015 during the IDEF 2015. The delivery scheduled for 2021 but this may be shortened.

When completed she will be the largest warship of Turkish Navy. Being the capital ship she will be the apple of the Turkish Navy. At the same time she will be the most wanted target for other navies. It is about time that other ship building projects especially about ships that will escort and protect TCG *Anadolu* must start. As an example, the two other navies operating similar ships have initiated AEGIS based air defence destroyers -not to anyone's surprise designed in Spain- to escort their amphibious assault ships.

Turkish Navy has long been working on TF-2000 air defence destroyer program. According to preliminary plans the ship will be about 150 meters long and will have displacement between 7.000 and 8.000 tons. Her primary sensor and weapon systems are yet to be determined. Turkish defence electronics company ASELSAN is developing a phased array radar system to be used by the navy.

Large capital ships like TCG *Anadolu* never sail alone. They are always dispatched with a number of escorts whose main mission is to protect the capital ship no matter what the cost. The ability of current frigates of Turkish Navy which will be tasked with the protection of TCG *Anadolu* when she is completed may not be sufficient to counter all the threats they will face in the near future. Therefore more advanced ships with complex sensor systems and long range missiles are needed. And this need is getting urgent with every passing day.



Turkish LHD programme gathers momentum 27 Feb 2017

Michele Capeleto <http://www.janes.com/article/68285/turkish-lhd-programme-gathers-momentum>

“Turkish shipbuilder SEDEF has told Jane's that the Turkish Navy should have its new landing helicopter dock (LHD) two years earlier than originally expected and confirmed that the company is currently in negotiations to build a second LHD.

SEDEF's defence industry manager Selim Bugdanoglu told Jane's that at the moment a formal tender for the second vessel "is planned for around the date of launch for [first-in-class vessel] Anadolu", which is currently set for January 2019.

The project's roots stretch back just over a decade, to a Request for Information that was issued in April 2007, followed by local bid submissions in early 2010 and the selection of a joint SEDEF/Navantia proposal in late December 2013.”

Japan, South Korea may refit naval ships for F-35 fighters

Mike Yeo 26 Dec 2017

<https://www.defensenews.com/global/asia-pacific/2017/12/26/japan-south-korea-may-refit-naval-ships-for-f-35-fighters/>

Amid growing tensions in the region, both Japan and South Korea are reportedly investigating options to operate the Lockheed-Martin F-35 Lightning II Joint Strike Fighter on board their respective ships.

Quoting reports from unnamed military sources in their respective countries, Japan's Kyodo news agency and South Korea's Yonhap said that the short take-off vertical landing, or STOVL F-35B variant is being considered for operations from Japan's Izumo-class DDH helicopter destroyer and South Korea's Dokdo-class amphibious assault ship, turning them into combat-capable aircraft carriers.

Kyodo's also reported that the F-35Bs could be used to defend Japan's far flung southwestern islands, which lack long runways needed for conventional fighter jets to operate.

That strategy is being considered in response to North Korea's ballistic missile and nuclear capabilities, as well as China's rapid military modernization,

Asked about the reports at a media conference on Tuesday, Japanese defense minister Itsunori Onodera repeatedly denied any plans to modify the Izumo-class to operate F-35Bs, only going as far as saying the ministry is constantly "conducting various studies evaluating Japan's defense capability."

Modification of the ships to operate the F-35B will enhance flexibility and expand the range of missions, with Yonhap quoting a source as saying that the South Korean military is looking at "maximizing the strategic value of the vessel's capabilities." The ships can carry several helicopters during normal operations, with the Izumo and Dokdo class designed to carry a maximum of 14 and 10 helicopters respectively.

Both ship classes will however need to be modified extensively internally and externally to operate the F-35B, including the application of a thermally protective coating on areas of the flight deck to withstand hot exhaust gases during F-35B vertical landings, and possibly even reshaping the flight deck to allow rolling takeoffs.

They will also need to have the ammunition magazines hardened and enlarged to accommodate the F-35B's weapons, while aviation fuel storage facilities will also likely need to be expanded to account for higher fuel consumption compared to helicopters.

Reuters has suggested that a ski-jump may be fitted to the Izumo as part of any modification program for the F-35B, however with the Izumo-class being 248 meters long and the Dokdo 199 meters, both already have flight decks long enough for the F-35B to carry out rolling takeoffs — no ski-jump needed.

Both Japan and South Korea have a single Izumo and Dokdo-class ship in service, with another ship of each class being constructed. The two countries are also operators of the F-35A conventional take off and landing version, with Japan and South Korea having 42 and 40 F-35As on order respectively.

The possession of aircraft carriers by Japan will be a significant shift in its defense posture and is likely to be a contentious issue, with critics likely to point to Japan's pacifist constitution banning the country from acquiring what is referred to as "war potential."

But Corey Wallace, an Einstein postdoctoral fellow in the Graduate School of East Asian Studies at Berlin's Freie Universitat wrote in the East Asia Forum that Japan's constitution does not explicitly ban specific capabilities — offensive or otherwise. Rather, its government interprets 'war potential' as referring to the total strength of Japan's Self-Defence Forces relative to potential threats and international conditions, and not whether a given capability is mostly offensive or defensive.

North Korean Threat Prompts New Japan, Korean Buys

02 Jan 2018 Chen Chuanren

<https://www.ainonline.com/aviation-news/defense/2018-01-02/north-korean-threat-prompts-new-japan-korean-buys>



Responding to the increased missile threat from North Korea, Japan has crafted a record \$46 billion defense budget. This is the sixth consecutive annual increase in its defense spending and includes new acquisitions. Meanwhile, the Republic of Korea will reportedly exercise an option to buy at least 20 more Lockheed Martin F-35s, again in response to North Korean belligerence.

In the new Japanese defense budget are two Aegis Ashore radar systems, paired with the joint U.S.-Japan SM-3 Block IIA missile that is aimed to cover the entirety of Japan. Tokyo will also upgrade its Patriot PAC-3 surface-to-air missiles to PAC-3 MSE standard, as its last-tier defence. The MSE upgrade doubles the PAC-3 missile range from 20 km to around 30 km. Patriots are now deployed to more sites in Japan, including the southern islands of Ishigaki, across the highly contested Senkaku (Diaoyu) island.

The Japanese Air Self Defense Force (JASDF) plans to acquire Kongsberg Joint Strike Missiles (JSMs) for its fleet of F-35As, plus Lockheed Martin AGM-158B joint air-to-surface standoff missiles (JASSM-ERs) and AGM-158C long-range anti-ship missiles (LRASMs) for F-15J/DJ Eagles.

Nikkei Asian Review reported that the JASDF is seeking airborne electronic warfare capabilities. With only handful of such platforms available in the market, the report mentioned the Boeing E/A-18G Growler. The Japanese Ministry of Defense will factor these requirements into the next Mid-Term Defense Program, which will be revised at the end of 2018, so that these aircraft can be acquired between FY 2019 and 2023.

Separately, on December 22 Japan awarded Boeing a contract worth \$279 million for its first KC-46A Pegasus tankers. Japan announced its decision to buy four KC-46s in 2015. The JASDF already operates four KC-767 tankers, which, like the KC-46A, is based on the 767 airframe.

According to the JoongAng Ilbo newspaper, Korea's Defense Acquisition Program Administration (DAPA) has begun the acquisition process for 20 additional Lockheed Martin F-35A Lightning II stealth fighters. However, Israeli website Defence Industry Daily said that other Korean reports suggested the additional order could be for 26 jets, **including six F-35B STOVL versions for operation from a Korean Navy assault ship that is now under construction.** The Republic of Korea Air Force (ROKAF) ordered 40 F-35As in 2014, and the first airframe is expected to roll out this year.

The F-35s will be part of South Korea's 'kill-chain' pre-emptive strike plan, which involves a series of planned strategic strikes to supposedly eliminate North Korea's key offensive capabilities in the event of war.

Japan said to be interested in acquiring F-35Bs

A report by Tokyo Shimbun says Japan is considering the purchase of F-35Bs so that it can deploy fighters further south in the Okinawa Prefecture.

26 Dec 2017

<http://alert5.com/2017/12/26/japan-said-to-be-interested-in-acquiring-f-35bs/>

UAE Navy: A helicopter-carrier for F-35 aircraft too

16 Aug 2017

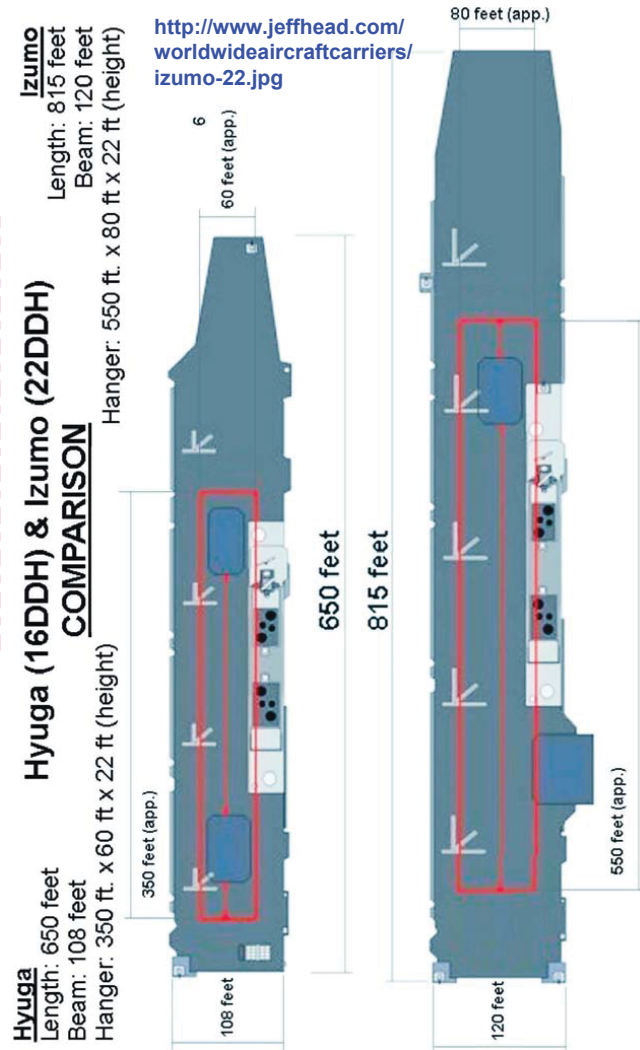
“Crown Prince of Abu Dhabi Sheikh Mohammad Bin Zayed Al Nahyan is said to have intention now to acquire a helicopter-carrier that is able at the same time to carry a variant of the F-35 aircraft which has vertical take-off and landing capabilities.”

http://www.tacticalreport.com/view_news/UAE-Navy:-A-helicopter-carrier-for-F-35-aircraft-too/5473

The Japan Self-Defense Force is barred from deploying military aircraft to Shimochi-jima airport, which has the longest runway in the Ryukyu Islands. Therefore, defense officials are thinking of using the F-35B at airports with shorter runways.

Also, the deployment of F-35Bs on the Izumo-class helicopter destroyers are bound to draw controversy during current laws. The ships will have to be modified with ski-jumps and upgraded aviation fuel storage facilities. Tokyo might even build a new-class of ship to handle the F-35B, according to the article.

Officials are still mulling whether to convert some F-35As under order to the B-model or buy new jets.



MSDF helicopter flattop Izumo designed as aircraft carrier

THE ASAHI SHIMBUN February 23, 2018

<http://www.asahi.com/ajw/articles/AJ201802230054.html>

Despite the Defense Ministry's denial that the helicopter carrier Izumo, launched in 2015, was planned to be refitted into an aircraft carrier, former Maritime Self-Defense Force executives confirmed that that is how the blueprints were drawn up.

"It is only reasonable to design (the Izumo) with the prospect of possible changes of the circumstances in the decades ahead," a then MSDF executive told The Asahi Shimbun. "We viewed that whether the Izumo should be actually refitted could be decided by the government."

The former executive said a consensus was reached privately among the MSDF that the Izumo should be considered for conversion into an aircraft carrier. But the MSDF couldn't explain the need publicly due to the government's view that aircraft carriers capable of launching large-scale attacks are equivalent to the military capability prohibited by the war-renouncing Article 9 of the Constitution.

Ever since the Izumo's construction, experts both in and outside Japan have pointed out the possibility of turning it into a full-fledged aircraft carrier.

However, the Defense Ministry publicly denied any plan to deploy fighter jets with strike capabilities on the Izumo and contended that it was not an aircraft carrier.

The ministry has since done an abrupt about-face and now is mulling the possibility of refitting the vessel into an aircraft carrier.

Such a reversal has inevitably raised suspicions that the ministry had this plan in mind from the beginning.

Refitting the Izumo, the Maritime Self-Defense Force's largest vessel, into an aircraft carrier had been considered since late 2000 to bolster the nation's defenses against China's increasing maritime advances around Japan's southwestern islands, according to the MSDF executives.

Equipped with a flat deck from bow to stern, helicopters can land on and take off from the five spots of the flight deck at a time. The Izumo's basic design was formulated from 2006 through 2008.

In 2008, Chinese naval vessels and other warships passing through the waters between the main Okinawa island and Miyakojima island, which lies to the southwest, were spotted for the first time. At that time Chinese government vessels intruding on Japan's territorial waters became common.

According to MSDF executives at that time, the MSDF saw the need to secure Japan's competitive edge in the airspace to counter possible China's maritime expansion in the East China Sea.

However, the runway at the Air Self-Defense Force Naha Base is the only one that allows ASDF aircraft to take off and land in and around Okinawa.

Therefore "the plan to construct the Izumo was settled with its future conversion in mind to prepare for any possible contingency of the unavailability of the ASDF Naha Base," according to one of the executives.

In those days, the U.S. F-35B stealth fighters, which could take off and land vertically, were in development, leading to a design conception of the Izumo on the premise that it could be converted to handle landings and takeoffs of the F-35B and other aircraft, such as the Osprey transport aircraft.

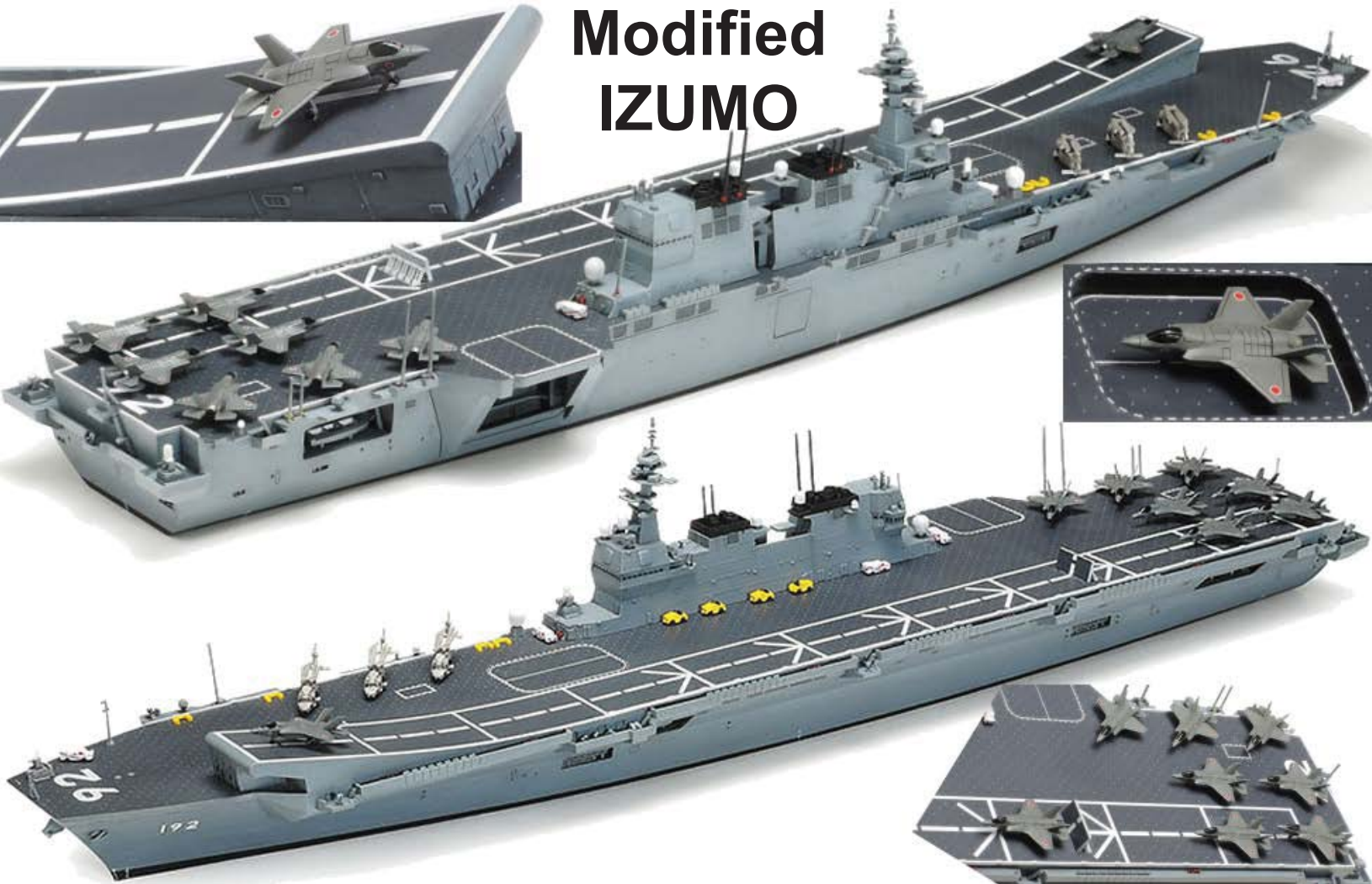
The approximately 250-meter long Izumo's elevator connecting the deck with the hangar was designed to accommodate the F-35B fighter, which measures about 15 meters in length and about 11 meters in width.

Paint that can withstand the exhaust heat generated from F-35 fighter jets during landings and takeoffs was selected for the deck of the Izumo. It has also been expected to retrofit the Izumo with a sloping deck for takeoffs, the former MSDF executives said.

If the Izumo is converted to enable landings and takeoffs of the F-35B, the vessel can be utilized to refuel U.S. stealth fighter jets anywhere in the world at any time, including during military emergencies under the new national security legislation.

Even if it is designated a "defensive" aircraft carrier or with some other terminology, the refitted Izumo would be a vessel capable of attacking enemy targets.

Modified IZUMO



Japan and South Korea Consider Carrier Options

Highlights

- *Two East Asian countries are looking to modify some of their vessels so they can carry F-35B stealth fighters.*
- *Due to the smaller size of each country's navy, the modernization plans will be limited.*

China will soon possess a much larger carrier fleet, including vessels with catapult-launch technology similar to U.S. vessels.

With the seas heating up around them, Tokyo and Seoul are considering their next moves. Accelerating geopolitical trends, from the Chinese navy's continued development to North Korea's nuclear program, are driving Japan and South Korea, two key naval powers in the Western Pacific, to evaluate plans for the development of aircraft carriers. However, both appear to be pursuing a more restricted strategy because of their limited military budgets and — in Japan's case — the constraints imposed by history. Nevertheless, their serious consideration of this naval expansion attests to the heated maritime competition in the region.

Dipping a Toe in the Water

Japan once fielded one of the best carrier fleets in the world, but its past capabilities on the sea have hindered, more than heralded, the return of a carrier fleet. Wary of its own military history, in which carrier fleets spearheaded assaults and invasions across the Pacific early in World War II, Japan largely chose to eschew aircraft carriers after 1945. With "offensive weapons" prohibited by Japan's pacifist constitution — and questions about whether carriers constitute such weapons — the Japanese Maritime Self-Defense Force has taken pains to make its Hyuga- and Izumo-class vessels appear less like helicopter carriers, describing them as helicopter destroyers, even though they effectively function like the former.

All that, however, appears to be changing. According to Japan's Kyodo News agency, the government is considering making its two Izumo vessels into full-fledged aircraft carriers capable of transporting and launching F-35B stealth fighters. While still in its infancy the proposal stems from Japan's broader move to normalize its military. It is concerned about its perceived inability to launch pre-emptive attacks against North Korean missile bases and about China's rapidly growing naval capability, including its carrier fleet.

Not to be left out, South Korea is also reportedly considering acquiring a carrier fleet. Much like Japan, South Korea is mulling whether to alter its Dokdo-class helicopter carrier to host the F-35B, which will feature advanced software and stealth capabilities. Beyond Seoul's pressing concern over the threat posed by North Korea and the rising power of China's navy, South Korea also wishes to remain in step with developments in Japan, especially due to the long-standing maritime and territorial disputes between the two.

Carrier Comparison: United States, China, Japan, South Korea

While China is rapidly increasing its aircraft carrier fleet, Japan and South Korea are considering modifying existing ships to make them capable of deploying F-35B stealth fighters. The Chinese carriers will be able to deploy more than twice as many aircraft as the prospective Japanese and South Korean vessels, but the advanced F-35Bs are expected to offset much of that advantage.

Trailing in China's Wake

The major catalyst driving Tokyo's and Seoul's plans is China, which has been rapidly expanding its carrier fleet. While the Type 001A, China's first domestically produced aircraft carrier, will set sail for sea trials in the next few months, there are indications that Beijing has commenced preparations to construct another aircraft carrier, the Type 002, at the Jiangnan Shipyard in Shanghai. Together with the already operational Type 001 Liaoning, the Chinese navy will soon boast three aircraft carriers, with the possibility of more to come. And this rapid increase of China's fleet does not even include the Type 075 amphibious assault ship, which is being built by Hudong-Zhonghua Shipbuilding in Shanghai.

Ultimately, Tokyo and Seoul are pursuing more limited plans than Beijing is — whose collection of carriers will resemble a smaller version of the U.S. fleet — because Japan and South Korea have fewer resources to allocate to their smaller navies. Once Japan's Izumo-class and South Korea's Dokdo-class warships undergo modifications to reinforce and heat-proof the decks to withstand the exhaust produced by the F-35B jets' vertical takeoffs and landings, the vessels will have the capability of transporting more than 12 F-35Bs each. In contrast, China's Type 001 and Type 001A carriers will be capable of transporting about three dozen fighter jets each, while the Type 002 will hold even more. The latter will also possess electromagnetic catapult launch systems, enabling it to carry key support and force multiplier aircraft, such as airborne early-warning aircraft and aerial refueling aircraft.

Whatever the size of Tokyo's and Seoul's proposed carrier fleets, their plans remain a significant development, because the modified vessels will host F-35B aircraft that will allow their navies to better defend their sea lanes, to conduct strikes on distant land targets and to bolster air defense for their fleets. In sum, modernizing the carriers will greatly enhance the options for these East Asian neighbors to address the numerous threats emerging in the region — an area where maritime competition is likely to grow only fiercer.

[https://worldview.stratfor.com/
article/japan-and-south-korea-
consider-carrier-options](https://worldview.stratfor.com/article/japan-and-south-korea-consider-carrier-options)

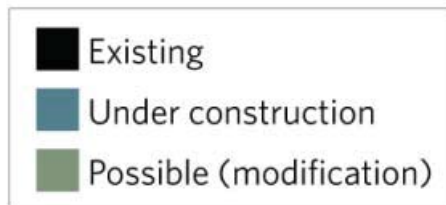


USS Nimitz (United States)

85 airplanes and helicopters, plus support aircraft

1,092 feet long

Displacement: 100,000 tons



Type 002 (China)

55 airplanes and helicopters, plus support aircraft

1,050 feet long

Displacement: 80,000 tons

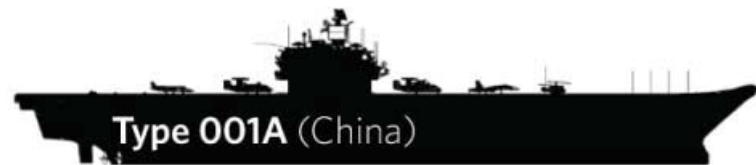


Izumo (Japan)

20 airplanes and helicopters

813 feet long

Displacement: 19,500 tons



Type 001A (China)

45 airplanes and helicopters

1,033 feet long

Displacement: 65,000 tons



Dokdo (S. Korea)

15 airplanes and helicopters

650 feet long

Displacement: 14,340 tons

LDP to propose introducing F-35B fighters 20 Mar 2018

NHK World https://www3.nhk.or.jp/nhkworld/en/news/20180320_26/

“Japan's main governing Liberal Democratic Party plans to propose introducing F-35B fighter jets and a multi-purpose aircraft carrier to be operated under the country's defense-only stance.

The government is to review the National Defense Program Guidelines this year for the first time in 5 years. On Tuesday, the LDP panel on national security compiled a set of proposals to be considered.

The panel stressed the need to enhance Japan's defense capabilities both in quality and quantity. It said North Korea's nuclear and missile development and China's military buildup and growing maritime presence are creating a security crisis.

The panel will call for procuring a multi-purpose aircraft carrier that can also serve as a hospital ship. It will be operated solely for defense purposes. Retrofitting of the Maritime Self-Defense Force's destroyer Izumo is to be listed as an option.

The panel also wants the Defense Ministry to acquire advanced F-35B stealth planes, which can take off from short runways.

Panel chair Gen Nakatani suggested Japan must become able to hit back at enemy bases. The LDP plans to submit the proposals to the government for discussion in late May.”

Japan Set to Procure F-35B STOVL Aircraft for JMSDF Izumo-class 'helicopter destroyer'

26 NOVEMBER 2018

<https://www.navyrecognition.com/index.php/news/defence-news/2018/november-2018-navy-naval-defense-news/6689-japan-set-to-procure-f-35b-stovl-aircraft-for-jmsdf-izumo-class-helicopter-destroyer.html>

The Japanese government has decided to procure the F35B short take-off and vertical-landing (STOVL) stealth fighter aircraft as part of the new defense plan to be outlined next month. This information was reported by Japanese media Nippon News Network (NNN).

The carrier-borne aircraft would be procured to be deployed from the Japan Maritime Self-Defense Force (JMSDF) two Izumo-class helicopter destroyers, JS Izumo and JS Kaga. The two vessels, the largest in the JMSDF fleet with a displacement of 27,000 tons (full load) and a length of 248 meters would be modified in order to accommodate the aircraft.

The first ship in the class, Izumo was launched on 6 August 2013. The ship was commissioned on 25 March 2015. Kaga was commissioned on 22 March 2017. The F35B is a derivative of the F35-A already operated by the Japan Air Self Defense Force.

JS Izumo (DDH-183). JMSDF



According to the NNN report, the Japanese government decision to introduce the F-35B is related to China strengthening its expansion into the ocean. Japan aims to strengthen the defense capabilities of the Southwestern islands including the Senkaku Islands.

The Japanese government will incorporate its decision in the Defense Outline that will be announced next month after showing these policies to both Liberal Democratic Party (LDP) and Komei parties.

In February 2018, the Yomiuri Shimbun reported that Japan was planning to acquire 40 vertical takeoff and landing F-35Bs, which could be operated from these ships with some alterations. In March this year, the ruling LDP called upon the Japanese government to develop its own aircraft carriers and operate F-35B aircraft, which has been thought to include refitting the Izumo class.

Kongsberg plans JSM flight tests in 2015 JSM carries out airborne launch test

25 SEP 2014 DOMINIC PERRY

<https://www.flightglobal.com/news/articles/kongsberg-plans-jsm-flight-tests-in-2015-404147/>

Kongsberg will next year begin flight testing its new Joint Strike Missile (JSM) aboard a Lockheed Martin F-16 as it aims to complete the development of the munition by 2017.

The company is developing the long-range JSM, which can attack targets on land and at sea, to equip the fleet of 52 conventional take-off and landing F-35As that will be operated by the Royal Norwegian Air Force.

Fit checks have been performed on the Joint Strike Fighter, on the external hard points on all three variants and in the internal weapons bay on the A- and C-models.

Harald Ännestad, president of Kongsberg Defence Systems, speaking at an Oslo media briefing, said that the missile had been developed in parallel with the design of the weapons bay on the stealthy type.

It uses "every cubic inch" of space available, he says. "It is not possible to make a better weapon that fits inside the bomb bay and maintains the stealth characteristics of the F-35."

Initial operational capability is expected in 2021, in line with the release of the Block 4 software load on the JSF, says Ännestad, and further "integration and risk-reduction work" is ongoing in conjunction with Lockheed.

The company has received "quite large interest" from other countries potentially interested in acquiring the weapon, he adds, both F-35 customers and those operating other types.

Fit checks have also been conducted on the Boeing F-15 and F-18, but Kongsberg has previously said no integration work will be carried out without a confirmed customer.

In July this year, Oslo's Defence Logistics Organisation awarded Kongsberg a Nkr1.1 billion (\$177 million) Phase III contract to complete the development and integration of the JSM onto the F-35.

10 NOV 2015 BETH STEVENSON

<https://www.flightglobal.com/news/articles/jsm-carries-out-airborne-launch-test-418913/>

Kongsberg has carried out an airborne launch test of the Lockheed Martin F-35's future Joint Strike Missile in the lead up to the 2017 qualification target for the weapon.

During the October test the missile was launched at 22,000ft over the Utah Test and Training Range from an Edwards AFB, California-based Lockheed Martin F-16, the aircraft that the Royal Norwegian Air Force F-35As will be replacing.

The medium-range anti-ship and land-attack JSM is being developed with Raytheon and the Norwegian ministry of defence. It can fit inside the weapons bay of the conventional take-off and landing F-35A, but can also be adapted to other aircraft; in November 2013 Kongsberg completed a fit check on a Boeing F/A-18F Super Hornet's hardpoints.

In July 2014 the Norwegian Defence Logistics Organisation awarded Kongsberg a Nkr1.1 billion (\$177 million) Phase III contract to complete the development and integration of JSM on the F-35, ready for the introduction of the first Norwegian F-35 in 2017.

The missile flight-test programme began earlier in 2015, and the success of this test, plus previous captive carry tests on an F-35, are all contributing towards Kongsberg meeting this target, it says.

"This is a major accomplishment for the JSM programme, and in addition several critical capabilities beyond the scope of the test were verified," Harald Ännestad, president of Kongsberg Defence

Systems, said. "The test demonstrates that we are on track with the qualification of JSM, which brings critical capability to F-35 and the warfighter."

Oslo reaffirmed its commitment to the purchase of 52 F-35As during a budget proposal for 2016 that was released in October that would see a near-doubling of funding for the Lockheed Martin F-35, plus an authorisation request for six more to be delivered in 2020. The Norwegian parliament had already authorised the procurement of 22 of the 52 F-35s that Norway plans to procure, covering deliveries up to and including 2019.