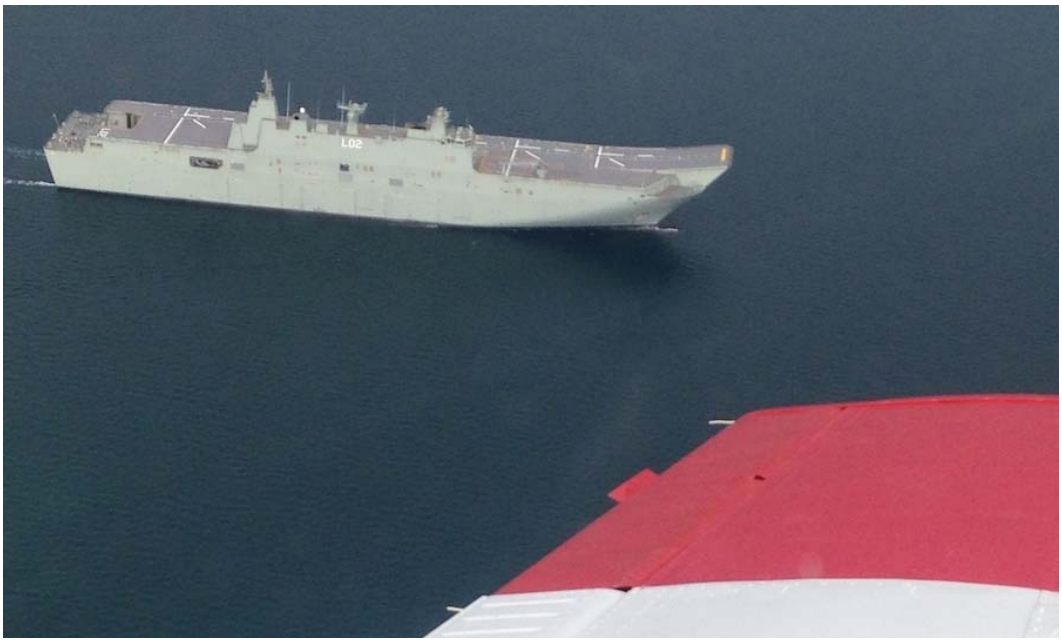
2015 Defence White Paper Submission

PROXIMITY MEANS CAPABILITY

Operating F-35Bs from the Canberra-class LHDs



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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.

INTRODUCTION

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.

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[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/

STRATEGIC AND MILITARY ISSUES

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 Australian[5] 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 American[6] 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

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[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 Capability[7].

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 develop[8].

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.

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[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 forces[10]. 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

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[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 capability[11]. 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.

Utility of Embarked Air Power

[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

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-class[12]. 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 stowages[13]. It is understood these key aviation spaces have been retained for the Canberra-class[14]. 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 coatings,[15]. 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.

Embarked Air Power – Benefits

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[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 maintenance[16], 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 generation[17].

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 engine[18].

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 capability[19]. The F-35B can carry 2000-pound weapons externally if required.

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[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 reconfigure[20] 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' role[22], 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.

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[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.

MAKING SEA BASED AIR POWER WORK

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 required[24].

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' knowledge[26]. 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.

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[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',

CONCLUSIONS AND RECOMMENDATIONS

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.

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END