

THE NAVY

**SPECIAL
EDITION**

THE MAGAZINE OF THE NAVY LEAGUE OF AUSTRALIA

VOL 72 No4

AMPHIBIOUS CLOSE AIR SUPPORT

**THE CANBERRA
CLASS LHDs**

**CARRIER-BORNE CLOSE
AIR SUPPORT HISTORY**

**CLOSE AIR SUPPORT
-THE NAVAL AVIATION**

**AN ORGANIC FIXED
WING CAPABILITY FOR
AUSTRALIA'S LHDs**



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The Anzac class frigate HMAS PERTH sporting her new active phased array ASMD (Anti-Ship Missile Defence) radar mast while still undergoing upgrade. Trials are expected early next year. (Ian Johnson)



The former HMAS VAMPIRE being towed down Sydney Harbour to her home at the National Maritime Museum after routine maintenance at Garden Island. (Chris Sattler, 14 July 2010)



Volume 72 No.4

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THE NAVY

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Front cover:

The Tarawa class LHD USS PELELIU arriving in Fremantle WA. (Ian Johnson)

WELCOME TO A SPECIAL EDITION OF THE NAVY

In this issue we have assembled some of the world's leading naval experts to discuss what appears to be a large hole in Australia's operational and capability planning for the new long range amphibious assault ships (LHDs) being delivered in four short years.

For some time the Navy League has been emphasising the need for on the spot and sustained CAS (Close Air Support) for troops when deployed from the new Canberra class LHDs. The last time we raised the issue (Vol 70 No. 3 – Jul 2008) it received a positive response from the national print media but not from the authorities or the many strategic "think tanks" in Canberra, giving the impression of a lack of concern at this gap in Australia's long-range deployment capability. In this regard Dr Norman Friedman points out in his article on page 23 'Close Air Support and Naval Aviation – The Natural Combination':

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

At the 2010 Sea Power conference in Sydney earlier this year (see *THE NAVY* Vol 72 No. 2) there was much emphasis on the impact that the LHDs are going to have on the ADF. However, none of the presenters at the conference addressed the most pressing requirement of CAS for long-range deployments. Experience in Afghanistan to date has shown time and again that despite the conflict being a low intensity counter-insurgency operation such support is still essential. Take the most recent tragic death of an Australian soldier. Details remain confused but what we have been told is that the three hour fire-fight in which he was killed was only concluded successfully when CAS was provided.

The Australian Army is attempting to understand this new means to deliver it to an enemy's front yard through a number of studies looking at the history of amphibious operations. However, Army should not be doing this, at least not in isolation, as amphibious operations are part of a sea control strategy and not a manoeuvre component of a land campaign. Navy should be taking the lead. To illustrate the point, the USMC (United States Marine Corps) - arguably the world's leading amphibious warfare experts - and other professional Marines Corps, describe amphibious operations as a means to "project naval power ashore", not land power as Army is suggesting.

Culturally this is perfectly understandable as armies think in land centric paradigms, which is not a fault but a feature of the way Armies have evolved. The USMC on the other hand are organised, trained and equipped to operate at and from the sea. "Soldiers from the sea" is their title, as opposed to 'soldiers transported on the sea'.

With many of the studies Army has published it tries to draw parallel comparisons with itself and the USMC. In particular, Army has been 'borrowing' ideas, theories and plans from the USMC's operating concepts of STOM (Ship to Objective Manoeuvre) and OMFTS (Operational Manoeuvre From The Sea). Paradoxically though, Army is selectively omitting all references to CAS, which the USMC considers essential for their operational concepts to succeed.

When a senior Army officer was asked recently what they are going to do about CAS for the embarked force on the LHD he said "We're taking a very joint approach to this. And Air Force is responsible for that". As

HMAS ANZAC firing her 5-inch gun at a shore target. No operator of LHDs and/or Marines believe the 5-inch gun is capable of supporting troops ashore. This is why LHD owning nations have organic fixed wing close air support. (RAN)

David Hobbs points out in his article on page 11 'Carrier-Borne Close Air Support – Historical and Contemporary Perspectives';

"Historically, Airforces have shown themselves to be the least joint of the armed services..."

To further illustrate the point he cites the RAAF's outright refusal to consider the STOVL (Short Take Off and Vertical Landing) F-35B JSF for use on the LHDs;

"The choice of future aircraft put forward by the RAAF (the land based version of the JSF) 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 USMC requirement to operate as CAS aircraft from US Navy LHDs."

This brings us to the RAAF's role in providing CAS for troops fighting from the LHDs. At the Maritime Conference at the beginning of the year, the Chief of Airforce declared that he could support Army anywhere as he now had air-air refuelling tanker aircraft.

The dilemma is that tanker aircraft only provide reach or sustainment, not both (unless one wanted to use the non-applicable measure of hours and not days). Thus they can support strike operations at range but not CAS at range as overhead persistence is the first basic requirement for providing CAS. Experience in the Falklands Conflict demonstrated that while the RAF, using tankers, could show the flag in the South Atlantic, their persistence was non-existent.

So Army, or more rightly Navy, needs to start thinking about the CAS hole in their sea control concept, which should see amphibious assault as a supporting concept. A mitigation theory put forward by some is that the ADF can rely on Navy's 5-inch guns on the Anzacs and quickly deploy its own artillery assets ashore to provide fire support. However, historical

evidence suggests that the standard 5-inch/127mm naval gun will be inadequate for the task. Also, the Army's artillery cannot be brought ashore quickly enough, in the numbers needed and be adequately supported. This is why the USMC insists on attack helicopters and fixed wing CAS on their LHDs. They also have the might of US Aircraft Carrier Battle Groups to call on for assistance.

Even the Spanish (who we have bought our new destroyers and LHDs from) have plans for two large specialist fire support ships to support their Marines fighting from their LHD (despite their LHD coming with organic CAS, plus their existing aircraft carrier). These ships will be fitted with at least two large calibre automatic gun systems as well as numerous land attack rocket systems with considerable ammunition supplies for the specific purpose of supporting troops ashore, as a complementary capability to their organic CAS.

For some reason Defence is quite sensitive to this issue. So much so that a borrowed cut away model of the Spanish LHD on display in Russell's Defence HQ has had the model Harriers torn off their glued spots on the flight deck and shoved into a dark corner of the hangar below.

At some stage the ADF's new amphibious capability will be used, and when used will mean the situation is a serious one requiring serious and decisive firepower. Landing uninvited in someone's country should not be done half hearted for at some stage the amphibious operation will be opposed, as the enemy is unlikely to allow it to build a foothold in their country. In a world where high technology weapons can be bought by anyone, our use of the new LHD capability without CAS could be more disastrous than our first experience of amphibious warfare at Gallipoli.

Leaders in Defence and/or Government need to start looking at this now as Australia will be the only military in the world with an LHD capability but with no organic CAS. Does that really make sense?

21 September 2010



NOTICE IS HEREBY GIVEN THAT THE

ANNUAL GENERAL MEETING OF THE NAVY LEAGUE OF AUSTRALIA



will be held at the Brassey Hotel, Belmore Gardens, Barton ACT **FRIDAY 29 OCTOBER 2010 AT 8.00 pm**

BUSINESS

- 1 To confirm the Minutes of the Annual General Meeting held in Canberra on Friday 30 October 2009
- 2 To receive the report of the Federal Council, and to consider matters arising
- 3 To receive the financial statements of the year ended 30 June 2010
- 4 To elect Office Bearers for the 2010-2011 years as follows:
 - Federal President
 - Federal Vice-President
 - Additional Vice-Presidents (3)

Nominations for these positions are to be lodged with the Honorary Secretary prior to the commencement of the meeting.

5 GENERAL BUSINESS:

- To deal with any matter notified in writing to the Honorary Secretary by 19 October 2010

ALL MEMBERS ARE WELCOME TO ATTEND

By order of the Federal Council

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Honorary Federal Secretary

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The Australian election has just concluded. At the time of writing this page it is not yet clear which party, or combination of parties, will form government.

While the outcome of the election is yet to become clear there are some things that may be drawn from the campaign which preceded the vote. Remarkably, during the whole election campaign almost nothing was said about foreign affairs or defence. There may have been some discussion on the periphery but in truth there was no real debate on foreign affairs or defence issues at all.

It may not be unfair to say that the nearest foreign relations came to being involved in the election contest concerned our relations with East Timor and Nauru. In reality this had more to do with asylum seekers, boat people and perhaps, the broader immigration issue.

Similarly, defence really only appeared when the Prime Minister and one of her back-benchers visited a patrol boat (asylum seekers, boat people and immigration again) and when the Prime Minister and Opposition Leader acknowledged losses of life in Afghanistan.

Readers of a magazine such as *THE NAVY* may have preferred to hear something more substantial from the parties as to their views on defence and in particular maritime defence.

May I put forward a positive interpretation on all this? It is my view that, apart from the manner in which the election campaign was conducted, the reason for the lack of debate on defence issues was because the major parties are largely in agreement.

Look at what has happened over the last three or four years. When the Rudd government came into office it was questioning the purchase of Super Hornets for the Air Force. After examination it confirmed the purchase. A similar evolution took place with the consideration of the

F-35 Joint Strike Fighter. The Defence White Paper stated the Rudd government's intention to acquire 100 of the strike fighters. It has subsequently placed an initial order for the Joint Strike Fighter.

So far as Navy is concerned, the building programme begun under the Howard government was taken forward and expanded by the Rudd government. The Defence White Paper added to the Air Warfare Destroyers and large amphibious ships a programme which includes frigates, a large strategic sealift ship, heavy landing craft, 20 Offshore Combatant Vessels, helicopters and 12 submarines. None of this seems to be in issue between the Labor Party and the Liberal National Coalition.

The White Paper rejected nuclear propulsion for the new submarines. It is well known that the Navy League believes that nuclear propulsion should at least be considered for the submarines. Even this, however, seems not to be an issue in the political arena. At least, not yet.

It is not just the Chiefs of Navy, Army and Air Force who agree on a Maritime Strategy. So too do the major political parties.

The absence of debate on defence issues may not be all bad. If it does indeed mean that the major parties are of one mind on these matters, the lack of any discussion during the campaign may prove the old adage - silence is golden.

One possible outcome from the election is some form of Labor - Green alliance. This may affect foreign affairs and defence policy. However, even if, for example, this led to an early withdrawal from Afghanistan, this should not alter either the present Maritime Strategy or the naval building programme.

A Labor - Green alliance would, no doubt, be opposed to nuclear propulsion for the submarines.

NAVY WEEK 2010 VICTORIA

The Victoria Division, with the support of the Royal Yacht Club of Victoria (RYCV), will hold the **30TH ANNUAL NAVY LEAGUE WEEK "Geoffrey Evans Trophy" Yacht Race** on

SATURDAY 23RD OCTOBER
at the RYCV for a 1400 start.

RAN personnel from HMAS CERBERUS will be hosted on RYCV yachts for this Navy Week race and the Trophy Presentation will be undertaken by a Senior Naval Officer at the conclusion of the race.

Additionally awards will be made by the Navy league to the first yacht across the line carrying RAN personnel and to the RAN personnel on that yacht.

All RAN personnel attending are hosted by the Navy League for the traditional RYCV "after race" BBQ.

CENTENARY CELEBRATION NAVY LEAGUE OF AUSTRALIA VICTORIA

The Victoria Division will celebrate the **CENTENARY OF THE ARRIVAL OF THE FIRST TWO WARSHIPS HMAS YARRA ~ HMAS PARRAMATTA** acquired since Federation.

Melbourne, then Australia's Capital City, turned out in style to welcome them on 10th December 1910.

A luncheon celebration will be held at
The Mercure Hotel
Spring Street, Melbourne
FRIDAY 10TH DECEMBER 2010

Limited edition First Day Covers and a range of Post Cards displaying specially designed label stamps including Australia Post's Cancellation Stamp will be available to those who pre-order.

For details of bookings and orders visit the Victoria Division's website at **www.netspace.net.au/~navyleag**

All are welcome to join in the celebration of the early days of Australia's Navy, the Commonwealth Naval Force (CNF), renamed Royal Australian Navy (RAN) in July 1911.

THE CANBERRA CLASS LHDs

The first of the new LHDs building for the RAN are expected to be in service around 2014. To enable the smooth introduction into service Army and Navy have established the Joint Amphibious Capability Implementation Team (JACIT). The two services' historical and studies centres are also busily publishing papers on Amphibious warfare and its challenges. The following are two Sea Power Centre Semaphore publications on the LHDs.

On 20 June 2007, the Australian Government announced plans for the RAN to acquire two amphibious assault ships based on the Spanish Navantia 'Strategic Projection Ship'. Designated as Landing Helicopter Dock (LHD) ships, they will be named CANBERRA and ADELAIDE and are expected to enter service in 2012 and 2014 respectively. They form part of Joint Project 2048 (Amphibious Deployment and Sustainment - ADAS), with a further 'sealift' capability - which is yet to be fully defined but indications in the last Defence White paper indicate a ship of approximately "15,000 tonnes, with landing spots for a number of helicopters and an ability to land vehicles and other cargo without requiring port infrastructure" - to be acquired under Phase 4C of the project. The Tenix Corporation was selected as the preferred tenderer to build the LHDs, now BAE Systems. The hulls will be

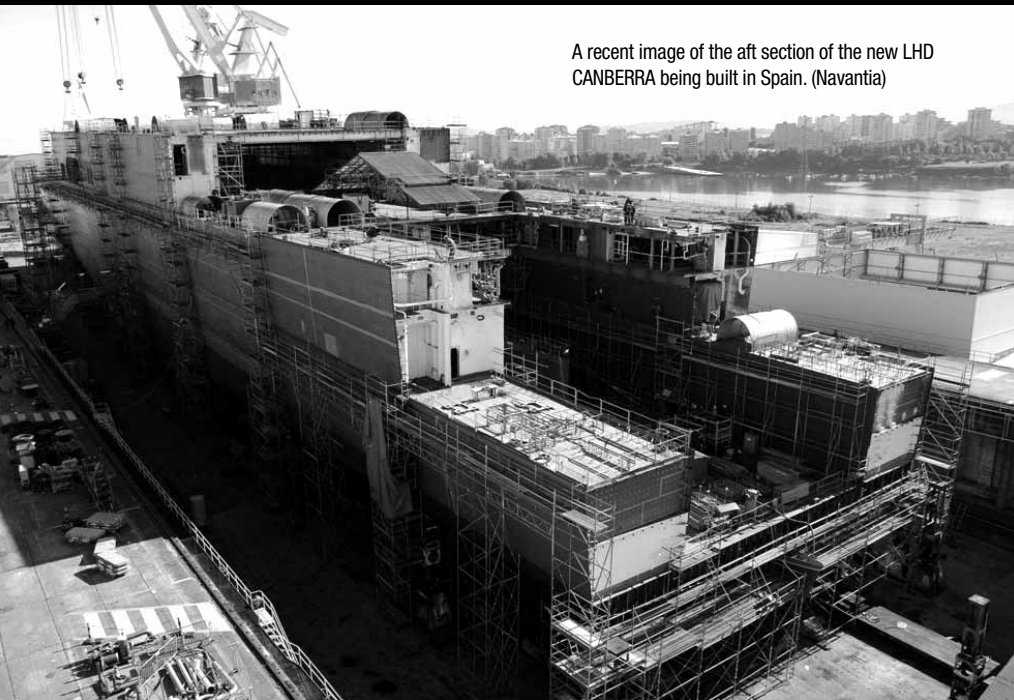
constructed in Spain, the equipment and island fit-out will be completed in Melbourne with the combat system integration occurring in Adelaide.

The LHDs will be amongst the largest ships to serve in the RAN. While some commentators have focused negatively on their size, the reality is that size brings flexibility - and flexibility is the key benefit that the ships will provide to an Australian government. In times of increased strategic uncertainty, the LHDs will be able to respond to a wide variety of situations across the span of maritime operations. They will form the core of Australia's response to natural disasters, humanitarian aid, evacuation operations, peacekeeping tasks and, where necessary, the projection of combat force ashore.

The Canberra class will be a major advance on the capabilities

A recent image of the forward section of the new LHD CANBERRA being built in Spain. Noticeable is the hangar and the foreword deck elevator recess pit. (Navantia)





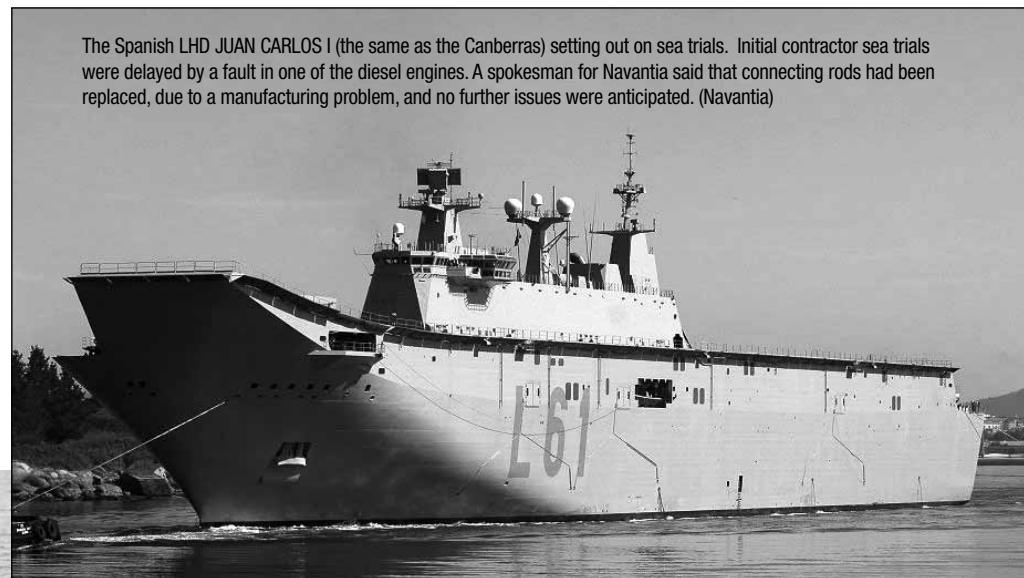
A recent image of the aft section of the new LHD CANBERRA being built in Spain. (Navantia)

provided by the current amphibious transports (LPA), HMA Ships KANIMBLA and MANOORA, ships that have proven versatility across a wide range of situations. These vessels have deployed to Iraq, acting as a sealift ship; command and control platform; a forward base for boarding operations (including embarking foreign navy boarding teams and boats); and provider of logistic support to smaller vessels - many of these roles simultaneously. The LPAs have also been deployed to the Solomon Islands, East Timor and Fiji to lead the ADF response in potential periods of instability as well as participating in humanitarian operations, including after the 2004 Boxing Day tsunami in South East Asia. KANIMBLA hosted the Sea Combat Commander and his staff during RIMPAC 2006, proving the ship's ability to support a coalition command staff during warfighting exercises and operations. The inherent flexibility in ships of this type means that they

are extremely adaptable, and despite not being built for the RAN (they were purchased second-hand from the United States Navy and were modified by Forgacs in Newcastle), KANIMBLA and MANOORA have become key components of the RAN's broad capability. The Canberra class will build significantly on this already flexible and adaptable capability.

As the 2007 Update to the Defence White Paper states, we must recognise that our interests must often be secured in places distant from Australia. Additionally, as an island nation, any Australian major military activity will need to be deployed across, and supported from, the sea. This reality has driven the need for ADAS and the ability to project land forces in support of Australia's national interests, wherever they may be.

Amphibious ships capitalise on all of the attributes of maritime forces, as articulated in Australian Maritime Doctrine. Without the need to negotiate basing and/or overflight rights with other countries, warships are often the only choice available to government to respond to a developing situation and the LHDs will provide unique response options. They will carry a substantial quantity of equipment, stores and personnel and will be fully operational as they enter an area of operations. They do not need any external support or approval to deploy and can physically operate wherever there is enough water to float. The LHDs will be flexible and able to undertake a large range of tasks while exploiting the attributes of Reach, Access, Flexibility, Poise and Persistence. One of the key roles of maritime forces is power



The Spanish LHD JUAN CARLOS I (the same as the Canberras) setting out on sea trials. Initial contractor sea trials were delayed by a fault in one of the diesel engines. A spokesman for Navantia said that connecting rods had been replaced, due to a manufacturing problem, and no further issues were anticipated. (Navantia)



The Spanish LHD JUAN CARLOS I on her recent sea trials. Her single GE LM-2500 gas turbine, two MAN 32-40 diesel engines and two Siemens Schottel podded propulsors were proven during the first week of trials in June, along with auxiliary items such as the NBC washdown system. The stern dock was flooded to test the ballasting sequence. (Navantia)

projection. In high-end combat operations, power projection is usually visualised as ordnance fired or dropped against land targets – Close Air Support (CAS) naval gunfire support (NGS), land attack missiles and the like. With the appropriate combat support land forces projected from ships have the advantage of being able to deploy, operate, and be extracted and re-deployed once their job is done. The ability to base and deploy land forces from the sea brings considerable advantages to operations. For example, sea basing reduces the logistics, command and administrative footprint ashore, and consequently the risk of attack against personnel and their equipment and the need for additional force protection personnel and equipment. At the other end of the operational spectrum - such as when providing disaster relief - sea basing means those deployed do not become a burden on an already damaged and fragile infrastructure. A good example of this was the deployment of a naval task group, led by the aircraft carrier HMAS MELBOURNE, to Darwin after Cyclone Tracy in 1974. The sailors deployed ashore provided critical assistance to the city, without drawing on Darwin's very limited relief supplies. The sailors' own needs, such as food and accommodation, were provided by their ships. For similar reasons, many nations sent predominantly maritime forces to assist countries in South East Asia after the Boxing Day 2004 tsunami. Maritime forces are often the only option to reach affected areas when land based infrastructure is destroyed.

While the LHDs will be useful across the full spectrum of operations, their utility derives from the capabilities necessary to conduct combat related amphibious operations. The ability to move forces by sea means that any adversary defending against a possible amphibious operation must spread their resources across their entire coast or concentrate on certain areas, leaving others undefended. The initiative is thus

with the maritime-based force that can easily manoeuvre to where the opposition is least.

Each of the Canberra class will be able to transport and support up to 1000 embarked forces, some of which can be landed ashore via a mix of embarked watercraft and aircraft, to conduct operations. Others will remain onboard the LHD providing command, aviation, medical and logistic support. The mix of those deployed ashore and remaining onboard will vary, depending on the circumstances.

Each ship will carry four LCM-1E landing craft that are transported in a well-dock, which can be flooded when they are required. The ship ballasts down to flood the well-dock, allowing the watercraft to float and extract from the dock. This can be done while underway and in conditions up to Sea State 4 - a significant increase on the RAN's current capability. The LHDs will also have six helicopter spots on a large flight deck that can support a range of helicopters. The ability to base aviation facilities afloat is a particular benefit, as it removes the need for maintenance, support facilities and personnel ashore, and allows the airbase to move to wherever it is required.

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 limited 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.

The LHDs will be significant national assets. While they will be capable of operating at the high-end of the conflict spectrum (if they embark CAS assets), their capabilities and inherent flexibility mean the ships can be used in a wide range of tasks in support of Australia's national interests. They will prove to be incredibly useful in a wide range of military, diplomatic and constabulary operations, and will form the backbone of the ADF's ability to deploy to meet the requirements of the Australian Government.

Whenever trouble arises in the region the first words uttered by the Prime Minister will be 'where are the LHDs'.



The well-dock/steel beach of the JUAN CARLOS I which will embark four LCM-1E landing craft, as in the Canberras. (Navantia)



HMAS KANIMBLA during the recent RIMPAC 2010. The LPA's have proven the value of having an amphibious warfare capability and thus set the scene for JP 2048 Ph 4 A/B. (RAN)

ROTARY WING OPERATIONS ON THE LHDs

To develop the full potential of its two new Canberra class LHDs Navy needs to develop sophisticated multi-spot flightdeck operating skills. These joint skills have not seen similar use in the ADF since the decommissioning of the fast troop transport HMAS SYDNEY (III) in 1973. Nevertheless, other operators of large, helicopter-capable amphibious ships, such as the USN and RN, have evolved techniques to launch heli-borne assaults and continuously refined them over the past fifty years. Australia is already leveraging off our allies' experience, and by establishing a number of loan postings seeks to generate the necessary expertise before the LHDs enter service. Key issues requiring attention range from the composition of the flightdeck crew, through to the use of non-naval helicopters, cross decking coalition fixed wing assets and the systems integration of unique army, navy and air force equipment and ordnance.

During operations the LHD's flightdeck will be a busy and dangerous place. Aircraft handlers and assault logistics specialists must work together to get troops and equipment ashore and back again in the most efficient and effective manner; in RN and USN/USMC amphibious ships, the latter group comprises dedicated marines. Without them, the RAN will need to develop its own unique solution, and planning for flightdeck manning is already well underway. The LHDs will have specialised departments for both air and amphibious operations, and likewise being developed is a concept of employment in areas such as flightdeck management and mission planning.

The number of helicopters needed for an initial assault is dictated by the size of the military force to be landed. Numbers of troops, known as 'sticks', carried by each helicopter will vary according to the fuel needed to fly to the landing zone (LZ) and return with a viable reserve. It is quicker to add fuel to an aircraft than to pump it out, so helicopters are usually ranged with pre-planned low fuel states and brought up to the required amount at the last minute before the assault to give greatest flexibility. A late planning change would be very difficult to implement and could cause chaos. Standardised stick sizes and fuel states give flexibility, but might be a limitation on longer ranged insertions if not carefully briefed. Ammunition, artillery, stores and vehicles have to be pre-positioned on the flightdeck or other concentration areas but kept clear of operating spots. Mechanical handling equipment must be placed ready to

move palletised loads at short notice. Each stick and each load will have an identity to allow the amphibious command to know what has been flown ashore, or taken ashore in landing craft. The order in which they are taken must be reactive at short notice; it is no good flying in ammunition according to a pre-arranged plan, for instance, if the military force urgently needs engineering equipment, barbed wire and water.

In other navies a primary assault technique is to range helicopters on the standard deck spots with extra fuel and launch them empty to orbit the ship at low level. Further helicopters, manned and with engines or auxiliary power units started are then towed onto the spots, spreading their rotors (something that has to be done manually with the Army's MRH-90 helicopters) and engaging them when in position. Once ready they are loaded and launched, but the process takes time. The

first aid firesuitmen would be spread thin between them as they start. The embarkation of helicopters that do not auto-fold may limit the first option but both methods have their basic merits and drawbacks and can form the basis of a plan to suit individual operations.

After the initial assault waves it is a judgement decision whether to break down to a continuous shuttle of individual helicopters or to continue to fly in tactical formations. The former keeps a stream of personnel and stores moving ashore and is more flexible in matching loads to aircraft quickly. The latter might be a better counter to enemy air and ground based opposition, but would need a larger number of marshallers to be available at any given time. The officer in charge of the flying control position (FLYCO) controls the deck and the movements of aircraft in the visual circuit. He or she has a considerable responsibility to ensure the efficient, safe

Two LCM-1E landing craft approaching the shore. Phase 3 of JP 2048 will purchase 10-12 of these ship to shore connectors for use in the LHD. (Navantia)



first group then lands on to pick up their loads and relaunch. Both groups join up and fly in tactical sections to the LZ inshore. An alternative technique packs helicopters into the available deck space, ranged as tightly as possible with minimum clearance between them, without using the painted spots. The result is a single group which would launch from aft to forward and set off immediately for the target. Getting sticks of troops into the helicopters and removing lashings would be more difficult and slower in the latter case but the overall effect would be a slightly faster first assault group, albeit with a smaller military force to land. The latter technique also needs more marshallers to control the start-up and launch of each helicopter and

operation of helicopters, many of which will be from Army Aviation with crews unaccustomed to regular flightdeck operations. Helicopters from coalition allies may also need to be assimilated carefully into the flightdeck's operation. FLYCO must liaise with the command to keep the LHD in the right place with enough wind over the deck to help heavy helicopters to lift off safely for many hours on end. He must ensure that the deck is able to deliver the number of helicopter sorties at the pace required by amphibious operations.

FLYCO's 'eyes, ears and strong right arm' on deck will be the Flightdeck Officer (FDO) and his handful of senior sailors. As well as moving helicopters on deck and marshalling them at take-off and

landing, the aircraft handlers must ensure that sticks of men are brought safely but quickly to them, past aircraft lashings and under turning rotor blades, only when cleared to do so by the pilots. The assault supply team work under the direction of the handlers to move bulk stores into helicopter cabins or hook them on as an external load. If 'break-bulk' stores have to be packed into the cabin, the assault suppliers must ensure that there are sufficient personnel available to do so quickly. The potential need in a non-benign environment to move quantities of fuel and water ashore can represent a considerable part of the assault supply requirement. Information is the key to assault flying. After the initial waves, FLYCO must know how many aircraft are needed to maintain support for the military force at the required level and match helicopters to reinforcement sticks and loads. They may return from shore low on fuel and a 'flop spot' kept clear with fuel line rigged is a very good idea.

The squadrons need to know for some hours ahead how many aircraft they need to have ready and when replacement crews will be needed. Surges such as those required to land a mobile air operations team, the military force commander and staff, or a field hospital need to be forecast and the extra aircraft prepared and moved to the flightdeck. As flying hours increase, maintenance and battle damage repair

will need management, and parts of the deck may be required for helicopters not immediately available for operational flying. Without maintenance time, the number of available helicopters will gradually diminish.

In many ways the operation of an LHD flightdeck is more complicated than that of a strike carrier. In the latter, launches and recoveries tend to happen in planned pulses of activity; in an LHD they can be non-stop and may continue for days, including at night and in adverse weather. This must be taken into account in the provision of manpower, with most tasks 'doubled up'. Yet even with the flightdeck party in two watches there will be occasions - such as the initial assault or the early stages of humanitarian relief operations - when both watches might be required simultaneously. Again the need to use both watches and for how long is a judgement decision.

The Australian LHDs will routinely operate both Fleet Air Arm and Army Aviation helicopters. The latter will need to spend sufficient time embarked to be familiar with deck operations. Thought needs to be given to the number of different types that might embark; these will include Army Chinooks and Tigers, Navy Seahawks and joint force MRH-90s. Chinooks provide a very significant load-lifting ability but take up a lot of deck and their blades cannot be easily folded. Good procedural knowledge will be essential, especially when instrument recoveries prove necessary at night, in adverse weather or sand-storms. To prepare for this, the ADF will need to emphasise a joint approach to getting full value from the LHD's flightdeck and flying patterns. It should not be assumed that someone from a non shiporientated background will slot into the deck operating technique immediately, but there is no reason why they should not do well once briefed and trained. In 1956 the first ever helicopter assault was conducted by the RN's 845 Squadron and the Joint RAF/Army Helicopter Development Unit. Joint operations work well when all participants accept the need for differing operational techniques to suit the environment from which they are flying.

In an example of the attention to detail required, the provision of assault life jackets (ALJ) may seem trivial, but their inadequate management can cause problems. They are worn by all troops

Wessex helicopters lined up on the deck of aircraft carrier HMAS MELBOURNE delivering much needed building materials to Darwin immediately after cyclone Tracey. The flexibility of aircraft carriers can never be over estimated. (RAN)



Five large USMC transport helicopters on a USN LHD's deck 'turning and burning'. In many ways helicopters are far more difficult to manage on a flight deck than fast fixed wing aircraft. The moral of the story, 'if you can do helicopters you can do fixed wing'. (USN)



and passengers in sticks that fly over water and are designed so that as the helicopter goes 'feet dry' over land the wearer can remove a locking pin in the ALJ straps to slide out of them as they leave the seat to disembark. The aircrew must ensure that ALJs come back to the ship with the helicopter; otherwise if they are taken ashore by troops and discarded, later serials might be limited by the low numbers available on board until sufficient are collected and brought back. Good ALJ discipline is one of the hallmarks of good amphibious operations.

Recovering a military force from shore resembles the assault phase functions in reverse, with slightly differing priorities. A stream of helicopters returning at short intervals is more easily assimilated than groups flying in tactical formation. Each shore-bound helicopter needs sufficient ALJs for any stick it might have to lift, and guides must be ready on the flightdeck to lead sticks to concentration areas for the removal of unused ammunition and its return to the magazines. They will then lead them back down the assault routes to the domestic areas where they can shower. Again the command needs to know what sticks and serials of equipment have been recovered. For troops who have been ashore for days, fresh water requirements will be significant. Plans for feeding and de-briefing will also need to be flexible.

The two preceding Sea Power Centre Semaphores have been updated and slightly amended to meet THE NAVY's special issue focus and strictly speaking should not be read as Sea Power Centre position.

SPECIFICATIONS: CANBERRA CLASS LHD

COMPLEMENT	243 (36 additional Task Force Command team)
EMBARKED FORCES	978 (+146 additional HQ Staff)
LENGTH OVERALL	230.8 metres
MAXIMUM BEAM	32 metres
FULL LOAD DISPLACEMENT	27,800 tonnes
MAXIMUM SPEED	20.5 knots
RANGE	8,000 nm at 15 kt 9,250 nm at 12 kt
PROPULSION TYPE	Electric drive
PROPULSION PODS	2 x 11 MW
POWER SOURCE	Combined diesel and gas turbine (CODAG)
GAS TURBINES	1 x GE LM 2500 (17.4 MW)
DIESEL ENGINES	2 x 7.2 MW diesels
VEHICLE CAPACITY:	830 lane metres (3290 m ²) Heavy vehicle deck: 1410 m ² Light vehicle deck: 1889 m ² Helo hanger capacity: 990 m ² Can conduct landing craft operations in Sea State 4
AVIATION:	Up to 20 aircraft
MEDICAL CAPACITY:	2 operating theatres 55 high/medium/low dependency hospital beds

(From left to right) The Spanish aircraft carrier PRINCIPE DE ASTURIAS and the LHD JUAN CARLOS I. Note the ski jump on the LHD as the Spanish intend to use fixed wing CAS from the ship. The ski jump features in the design of the Canberra class. (Navantia)



CARRIER-BORNE CLOSE AIR SUPPORT

HISTORICAL AND CONTEMPORARY PERSPECTIVES

By CDR David Hobbs MBE, RN (Rtd)

Former International Aerospace Journalist of the Year, RN Fleet Air Arm Pilot, Curator of the RN Fleet Air Arm Museum and noted historian, CDR David Hobbs, mounts the case for Close Air Support (CAS) for Australia's LHDs by taking a look at the history of CAS from small carriers.

The unexpected German invasion of Norway forced the Royal Navy to develop expertise based on harsh experience in action since little priority had been given to amphibious warfare. The brief Norwegian Campaign of 1940 saw many things being done for the first time, not least among them the critical need for carrier-borne aircraft to provide close air support (CAS) for troops ashore. The 'independent' RAF proved both doctrinally and technically unable to provide air support on the scale required and it fell to the unsuitable Skuas and Swordfish embarked in the carriers ARK ROYAL, FURIOUS and GLORIOUS to provide local air superiority and support troops on the ground. Considering their lack of training, unsuitable aircraft, weapons and even a lack of maps with contours, their improvisations provided lessons upon which both British and American forces drew later in the conflict. Amphibious assault enabled the Western Allies to carry the fight to the enemy, all relied on air superiority over the landing zones provided in the majority of cases by carrier-borne aircraft. Even Normandy, where the short distances allowed land-based aircraft to predominate, carrier aircraft played a part by 'closing the flanks' at either end of the English Channel. In the Pacific there was no other

way of providing close air support and US Navy and Marine Corps fighter units specialised in the role. As they became available in large numbers the small 'jeep' escort carriers formed task forces alongside the gunfire support ships to back up the landing force. Typically, fleet fighters such as the Corsair and Hellcat flew CAS missions but the less powerful Wildcat remained in service with the USN and RN because of its capacity for CAS. Weapons ranged from machine guns and cannon to small bombs, unguided rockets and napalm; the latter particularly effective against troops dug-in behind defences. Tactics involved operating over the forward edge of the battle area (FEBA) as 'airborne artillery' supporting the troops below. Knowledge of, and affinity with, troop tactics was essential as was constant practice with forward air control (FAC) officers in the front line on the ground. Good briefing, rapid response and short transit times were, and are, important and give carrier-borne aircraft a distinct advantage as the ships can be positioned to minimise transit times and allow aircraft to be re-fuelled, re-armed and back on task as quickly as possible. Time on task is not necessarily a bonus in 'hot' operations as there is little point in keeping aircraft on task once they have fired-out



An RAF GR-3 Harrier returning empty for a CAS mission over the Falklands Islands in 1982. The CAS contribution to the campaign was vital to the success of the forces ashore.

their ammunition. Carrier-basing allows the minimum number of aircraft to fly the maximum number of sorties. In contrast, land-basing when it is possible often 'loses' a large number of aircraft in long transits.

The development of 'vertical envelopment', using helicopters to move marines and their supporting logistics at relatively high speed from ships to the objectives ashore allowed a smaller number of ships to be spread across a wider assault area and allowed ships to

British and French Navies could deploy power from the sea. Helicopters of 845 Naval Air Squadron and the Joint Army/RAF Helicopter Development Unit landed men of 45 Royal Marines Commando in minutes; supplied them with ammunition and evacuated the wounded. Both ships had been employed as semi-operational training ships six weeks earlier and the helicopters had been based ashore but the concept was proved. CAS was provided by aircraft from three British and two

French aircraft carriers and their contribution

Sandys, the British Defence Secretary who carried out a draconian Defence Review in 1957. Whilst the number of aircraft projects and operational squadrons in the RAF were reduced, the RN carrier force was retained with funding for modernisation and advanced aircraft projects. Funds were also provided for two 'surplus' light fleet carriers, BULWARK and ALBION to be converted into Landing Platforms (Helicopter), LPH, or 'Commando Carriers'. Specialist assault helicopter squadrons, manned by both RN and RM aircrew were formed and RM Commandos



A WW II RN Corsair. The Corsair was an excellent carrier borne fighter but also quite an accomplished CAS aircraft with the RN and USMC. Weapons ranged from machine guns and cannon to small bombs, unguided rockets and napalm. Tactics involved operating over the forward edge of the battle area (FEBA) as 'airborne artillery' supporting the troops below.

remain under way rather than at anchor. It followed that the CAS carriers fitted neatly into this new concept. Vertical envelopment soon showed many other advantages and was developed into operational capability by the US and Royal Navies in the 1950s. Both were 'three-dimensional' organisations with marines and naval air arms capable of flying a variety of offensive and defensive fighter and close air support missions from the deck. Thus, both the USN and RN were able to see the relative importance of the various interlocking aspects of amphibious warfare through expert eyes, strengthened by their specialised components. In the mid 1950s both had men with extensive wartime experience and, as important in an age of austerity, small aircraft carriers that were surplus to other naval requirements and available for experiment. Nations that relied on air forces for the provision of air power had to accept enforced doctrinal 'blindness' and were unable to adopt this flexible approach.

The landings at Inchon in the Korean War used the equipment and techniques of the Second World War but the Royal Navy carried out the first vertical assault under fire in November 1956 during the Suez Intervention. Whilst the decision to use force was long drawn out and proved to be politically inept, Operation 'Musketeer' demonstrated how effectively the

was pivotal. Jet fighters such as the Sea Hawk and Sea Venom had replaced the piston-engined fighters in the RN but the French still used Corsairs. Weapons and tactics were similar to those used in the Pacific in 1945. Two thirds of the combat aircraft allocated to the campaign were provided by the RAF and French Air Force from bases in Malta and Cyprus but their weapon loads, times on task and ability to react to urgent calls for fire were severely restricted by the distance of their bases from the scene of action. Most of the CAS aircraft spent most of their time in long transits which made for poor employment of the number of aircraft available. The carriers, being much nearer, could maintain fighters in CAS 'cab ranks' able to respond immediately to calls for air support. Statistics show that although the carriers deployed only one third of the Allies' tactical aircraft, they flew over two thirds of the CAS missions. Even this favourable statistic, however, fails to emphasise the greater effectiveness of the carrier-borne sorties which arrived on task quickly, well briefed and were more heavily armed.

The effectiveness of helicopter assault and carrier-borne CAS was not lost on Duncan



Sea Hawk fighters on the carrier HMS CENTAUR. During the Anglo/French Suez Operation carrier borne aircraft such as the Sea Hawk amounted to only one third of the CAS air capability, yet provided over two thirds of CAS missions due to their proximity to the battle.

spent longer period embarked to exercise the assault role. CAS was provided by the fighter squadrons embarked in the fleet aircraft carriers and formed an important part of their training. The task forces thus formed were seen to be the best method of containing 'Brush-Fire' conflict with a minimal amount of force available quickly and formed the basis of the RN's Far East Fleet in the 1960s. Larger forces would take time to mobilise or deploy and, politically, represented a move toward high-intensity conflict. The amphibious task force with its conventional carrier and LPH thus represented the optimal peace-time investment; small in size but capable of projecting power quickly at the time and place chosen by Government for maximum effect. The USN built specialised LPH as well as other amphibious ships capable of landing Fleet Marine Forces of brigade size with a range of weapons including tanks, helicopters and tactical aircraft. The USN expanded the concept in the last years of the Cold War to include potential assault from the sea on the flanks of NATO, tying down a disproportionate effort by the Communist Bloc to counter the threat.

The British investment in a 'rapid reaction force' capable of deploying a significant amount of power from sea to land at short notice was demonstrated early in the LPH BULWARK's first deployment east of Suez. She was visiting Karachi with 42 Royal Marines' Commando and 848 Naval Air Squadron (NAS) embarked when the Iraqi dictator Brigadier Kassem laid claim to Kuwait and threatened invasion if his demands were not met. The Admiralty ordered BULWARK to proceed to Kuwait 'with despatch' on 28 June 1961 when the Chiefs of Staff implemented Operation 'Vantage' the contingency plan for the defence of Kuwait. The Emir of Kuwait formally requested British protection on 30 June and within 24 hours men of 42

The aircraft carrier VICTORIOUS and her battle group had been on passage between Singapore and Hong Kong and arrived in the Gulf on 9 July. She made an immediate difference and assumed the duties of air defence, CAS and air traffic control for the area with the immediate advantages of having her own operations room, workshops, briefing facilities and ammunition supplies with RFAs nearby to replenish her. The RAF Hunters returned to Bahrain where they could operate on a more long-term, if distant, basis. The heat limited the weight at which fighters could be launched and the Scimitars used for CAS had to operate without fuel in their drop-tanks limiting their endurance to about 40 minutes at low level but, given the carrier's ability to position itself where transit times

assault), withdrawal and feints. Kuwait was an example of the first, albeit one in which the enemy was deterred from his original, offensive intent. The use of 45 RM Commando embarked in HMS CENTAUR to quell the East African Army mutinies in 1964 is an effective example of a raid in which the carrier deployed both the marines and the fighters that would have supported them ashore if necessary. Whilst not strictly a feint, the presence of both British LPH and the strike carriers EAGLE, ARK ROYAL and VICTORIOUS during the Confrontation against Indonesia provided that country with a latent it could not ignore or counter. The feint by a USMC brigade off Iraq during the 1991 Gulf War had strategic effect and is another excellent example. The withdrawal of British forces from Aden under the CAS 'umbrella' provided by the strike carriers EAGLE and HERMES



An RAF Hunter. A squadron was flown from Bahrain to Kuwait in July 1961 to support 42 RM Commando which had been landed by HMS BULWARK to ward off an Iraqi invasion. However, their operations were hampered by a lack of logistic support at Kuwait airport. BULWARK actually provided vital radar coverage, tactical picture compilation and air traffic control to the RAF's contingent.

Commando were landed in tactical positions near the border by Whirlwinds of 848 NAS. By the evening of 1 July, an Iraqi invasion was no longer a question of seizing a weak neighbour but now involved taking on the British backed by the rule of international law. On the evening of 1 July RAF Hunters flew in from Bahrain to provide CAS, followed by more the next day but their operations were hampered by the lack of support facilities at Kuwait airport; maintenance personnel spares and ammunition had to be airlifted from Bahrain using scarce transport aircraft which could not, therefore, fly in fighting troops or their equipment and ammunition. The Hunters relied on BULWARK to provide air traffic control, tactical picture compilation and radar coverage; a lesson that led to ALBION, the second LPH conversion, being fitted with more sophisticated air warning radar and plot compilation equipment. BULWARK had been pre-positioned in the Middle East by the Admiralty against just such a contingency and her presence was due to good intelligence and judgement rather than luck.

would be shortest, this was sufficient. The key elements of the British operation were the concentration of assets at the focus of action, the speed with which it was mounted and the professional capability of the forces immediately available. Although land-based fighters arrived quickly, they did so without ammunition or support and were of little value; the carrier proved the quickest way of delivering a complete 'package' capable of extended operation. VICTORIOUS' Scimitar fighters were equipped with 'Bullpup' air-to-surface guided missiles, introducing the era of precision-guided munitions (PGM) which were to make a radical difference to CAS operations.

Subsequent operations have illustrated the four intrinsic capabilities of a balanced amphibious task force; these include assault on a large scale, raiding (or smaller scale



HMS CENTAUR. The use of 45 RM Commando embarked in HMS CENTAUR to quell the East African Army mutinies in 1964 is an excellent example of a carrier deploying both Marines and their vehicles and the helicopters and the fighters that would have supported them ashore.

gives an example of the fourth capability. More recently, in 2000, the deployment of British forces to Sierra Leone at short notice when the Revolutionary United Front appeared likely to over-run and massacre UN peace-keeping forces provided a 'text-book' example of how a well-handled amphibious force can contain 'brush-fire' conflict. The new LPH OCEAN provided the means of inserting and supporting troops ashore backed up by reconnaissance and potential CAS by Sea Harriers from ILLUSTRIOUS.

The rapid insertion of Australian forces into East Timor as part of the UN INTERFET Mission in 1999 provided a similar deterrent

A prototype Hawker P 1127 ground attack aircraft (later to be known as the Harrier) embarked in HMS BULWARK 1966 for trials.



effect but the troops ashore had to rely on the RAAF for CAS sorties which had to be flown from distant bases with airborne tanker support. The operation led to a resurgence of Australian interest in an amphibious capability which had once included the former aircraft carrier SYDNEY converted into an LPH with a capability similar to the British light fleet carrier conversions. Her use was limited mainly to voyages as a troopship/transport to support operations in Vietnam, however, in line with contemporary defence policy. She had potential and the aircraft carrier MELBOURNE was ideally placed to provide CAS with her A-4 Skyhawk attack aircraft. It may be that many in the ADF imagine the Canberra class LHDs to be 'troopships' like SYDNEY and have little idea of their full capabilities. It is important that these very capable ships are fully understood and used, when necessary, to their full potential in the national interest.

There is considerable international interest in littoral power projection from the sea with a number of significant navies including, in addition to the USA and UK, France, Spain, Italy, Japan and South Korea which have built or are building amphibious helicopter carriers with large flight decks. Russia is considering the purchase of ships to a French design. All of these, except that of Japan, which does not intend to use its ships offensively, plan to provide CAS with embarked aircraft as part of the amphibious 'package' although South Korea has yet to translate this ambition into an order for suitable aircraft. In the USA, UK, France and Italy CAS aircraft would operate from aircraft carriers and in the USA, Spain and Italy STOVL fighters can operate from LPH/LHD decks themselves alongside the assault helicopters. It is a concern that Australia has neither articulated a requirement for such an embarked CAS aircraft nor encouraged discussion about it.

A major breakthrough in the provision of CAS aircraft was pioneered by the RN in 1966 when prototype Hawker P 1127 ground attack aircraft were embarked in BULWARK to see how they operated alongside Wessex assault helicopters on deck. The P 1127 was seen at the time as a lightweight CAS aircraft unsuitable for use in the NATO area but viable for CAS in the Far East; in other words a lightweight counter-insurgency aircraft. Subsequent development has taken it way beyond its humble origins. The trial was most successful but, coming soon after the cancellation of the CVA 01 fleet carrier project, the latent capability, although highly recommended by Fleet Staff, was described by the new First Sea Lord who was opposed to carrier aviation as being "too much like that of an aircraft carrier" and not taken forward at first. The USMC immediately saw the potential,

however, and ordered the aircraft as the AV-8 for CAS operations from its own LHAs and LHDs as part of a composite air group, a technique now emulated by Spain and Italy. The RN eventually ordered its own Sea Harrier variant of the P 1127 and the Harrier family has evolved into a highly capable CAS aircraft. The UK could not have recovered the Falkland Islands in 1982 without embarked Sea Harriers operating in the fighter, strike and CAS roles.

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

An early USMC AV-8A Harrier preparing to take off. The USMC were quick to see the CAS potential of the Harrier and embarked them on the USN's LPH/Ds as soon as possible. (USN)



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. The British developed limited-capability

'colonial' combat aircraft to operate against insurgents in India and Iraq in the 1920s and 30s. As the cost of turbojet-powered transonic fighters soared during the 'Vietnam era' in the 1960s the US Navy/Marine Corps and Air Force issued a requirement for a Light Armed Reconnaissance Aircraft (LARA) capable of CAS, reconnaissance, forward air control (FAC) and helicopter escort. The result was the very successful OV-10 Bronco which was only withdrawn from service in the 1990s. A two-seat, high-winged, STOL, twin-turboprop aircraft, it was capable of operating from small aircraft carrier decks without catapults or arrestor wires and from roads or unprepared strips ashore. Interestingly, the high cost of fighters such as the F-22 and F-35 and their unsuitability for some missions over Afghanistan has led the US armed forces to look again at 'cheap', lightweight counter-insurgency or 'COIN' aircraft. The mnemonic has changed to LAAR for Light Attack and Armed Reconnaissance but the requirement is so closely similar to that of forty years ago that Boeing is considering resurrecting the basic OV-10 design and modernising its avionics for a new production version.

There is some reluctance in the USA to consider a specialised, 'new' type, however, and a version of the Hawker Beechcraft T-6

reduces the cost of ownership. Another possibility is to use an unmanned combat air vehicle (UCAV). Thousands of hours are being flown by unmanned aircraft over Afghanistan by the US and its coalition partners, some of which have combat capability. In 2011 the USN plans to demonstrate carrier operations with the Northrop-Grumman X-47 but this is a big, 60,000lb, aircraft intended for reconnaissance, electronic attack and deep-penetration strike rather than CAS. The USN has a requirement to deploy a small number of UCAV, which may turn out to be derivatives of the X-47, to a carrier air wing by 2018. It may well be that a UCAV such as a navalised Predator B represents the best long-term option for the RAN to provide CAS or tactical strike missions from an LHD deck but none is immediately available. Should CAS be given the recognition its importance deserves, it is probable that Australia would be best served by procuring a 'military off-the-shelf' design which would not incur unique development costs. It will be interesting to see how many other nations show an interest in a carrier-borne LAAR aircraft or UCAV in the near future.

The developments of networked information exchange and precision-guided munitions have reduced the number of aircraft needed

have the advantage that they can be released from relatively unsophisticated aircraft and stand-off weapons mean that aircraft do not need to pass directly over the target, again allowing unsophisticated aircraft to maintain an 'edge' in low-intensity conflict. It is, however, essential that any CAS aircraft is fitted with network-enabling communications and sophisticated infra-red and optical target indication and weapon guidance systems at least as good as the A-10C 'warthog' ground-attack aircraft. These could be fitted in a modernised OV-10 design.

Some thought must also be given to how best to man a CAS unit capable of operation from an LHD or ashore. It should not be a 'given' that such a unit would form part of the RAAF simply 'because it flies'. That would fail to recognise the key elements in its operations which would be support for the men under fire on the ground ashore and operation from ships at sea in any weather. Rather than limiting operations to those specified by a remote air headquarters, the men and women in the aircraft should be trained to give their best shot at providing the tactical commander with close air support against what might be considerable odds. The Commando Concept, developed in Britain from 1940 to deliver maximum effect from the minimum number of highly motivated volunteer service personnel, provides a role model worthy of consideration. Rather than being a 'Joint' unit lacking in focus, a CAS Commando unit could recruit volunteers from all three services and produce an elite force tasked with, capable of and anxious to take their aircraft wherever necessary to get the job done, ashore or afloat. Discussion of the need for such aircraft and the best way to deploy them should be encouraged as a matter of urgency.



The RN's LPH HMS OCEAN. While OCEAN has no CAS capability, other than British Army Apache attack helicopters, the RN still have two medium sized aircraft carriers with CAS aircraft to support OCEAN's operations ashore. As was demonstrated off Sierra Leone in 2000. (RN)

training aircraft is being evaluated, designated the AT-6. This is fitted with the avionics from the A-10C CAS aircraft to enable it join the network-enabled battle-space, release precision-guided weapons and transmit target data to FACs but is a single-engined turboprop with a low wing that is not stressed for operations from a flight deck. It does, however, retain 90% commonality with the basic trainer version which is in widespread service with the US Navy and Air Force which

for strike and CAS missions. Thirty years ago a dozen aircraft, each carrying several 'dumb' weapons were needed to achieve a hit on a specified target; today a single aircraft can hit a number of precise targets if necessary in a single sortie. Precision is essential in counter-insurgency operations to prevent civilian casualties from collateral damage that alienate the population the Allies are trying to protect. Precision-guided weapons also



USAF 'Reaper' UCAV preparing to take off on a mission over Afghanistan. It's armed with a greater offensive warload than the Australian Army's Tiger attack helicopter could ever hope for, and in a cheap, reliable, long range, persistent aircraft. UCAVs may be the way of the future for the ADF to support its troops ashore. (USAF)



01 ADF SHINES AT RIMPAC

The largest Military exercise of its kind in the world has drawn to a close, with Australian participants receiving high praise from their Commander.

Rim of the Pacific Exercise (RIMPAC) 2010 has seen more than 1,200 Australian Defence Force (ADF) personnel involved in a massive Maritime operation off the coast of Hawaii.

The highlights for the ADF contingent included missile firings, complex submarine hunting and a major multinational amphibious assault, planned and coordinated by an Australian command team.

The head of Australia's contingent, Commodore Stuart Mayer says this has been the most successful RIMPAC for the ADF since the exercise began in the early 1970s.

"It is a common cliché to say that every exercise is the best one ever. But in this instance it is very likely true," CDRE Mayer said.

Amongst these successes include commanding the exercise's Expeditionary Strike Group, which comprised of three amphibious ships, up to 15 cruisers and destroyers and a US Marine Corps Taskforce - a total force of almost 1,000 men and women. The exercise also saw the world's first combined joint Harpoon Block II missile firing from HMAS WARRAMUNGA involving an RAAF AP-3C Orion and ships from Canada and the US. The RAN also completed the successful firing of surface to air missiles demonstrating the capability of HMAS WARRAMUNGA and HMAS NEWCASTLE against complex threats.

"Whether it was the coordinated Harpoon firing from WARRAMUNGA in combination with the RAAF P3 Orions; the first splash of Amphibious Assault Vehicles from HMAS KANIMBLA; 2 RAR operating alongside US

Marines or our divers raising a sunken tug from the bottom, all our soldiers, sailors and airmen have performed at an impressive level."

"We have conducted complex war fighting in a challenging multi-national environment. We have definitely got our money's worth out of RIMPAC."

Approximately 1,200 ADF personnel from the Royal Australian Navy, Army and Royal Australian Air Force attended the 14 nation strong exercise in the waters off Hawaii. The next RIMPAC will be held in 2012.

CUSTOMS TO REPLACE BAY CLASS

The Australian Customs and Border Protection Service is to replace its eight 38m Bay-class patrol vessels with a new class of significantly larger and more capable ships on a one-for-one basis.

The existing craft, built by Austal in 1999 and 2000, are nearing the end of their useful lives. The Bay Class Replacement Vessels (BCRVs) are expected to enter service from 2013 and have a service life of 20 years.

The new vessels are intended to operate primarily in waters off northern Australia. They will have an overall length of up to 60m and displace up to 400 tonnes. Key features include a comprehensive sensor suite and austere accommodation for up to 50 detainees.

According to the BCRV System Specification document, the new design will have a beam of no more than 11m and a maximum draft of 3m. The ship will be able to maintain a speed of at least 25 kt in Sea State 3 (SS3) at 90 per cent maximum continuous rating. Range will be 4,000nm at 12kts in SS4 while endurance (with 22 embarked personnel on board) will be 28 days. The vessel will be able to survive in SS8.

There will be an electro-optical surveillance suite and a radio/radar detection system, and industry is also being asked to provide costings for a retractable 3-D depth sounder/navigation sensor/profiler. Shipboard sensors will be linked to the Australian Maritime Identification System server in Canberra. A civilian satellite communications system will be provided and space reserved for a military-specification Wideband Global Satcom system.

On the contentious issue of weapons, armament will consist of two 12.7mm (.50-cal) machine guns with additional space allocated for a remote controlled Mini Typhoon stabilised machine gun system (to be fitted at a later stage). A water cannon with a range of at least 50m is required for use as a non-lethal weapon and for firefighting and pollution dispersal.

Each BCRV will have two embarked 6.4m aluminium boats - with foam-filled collars - for use in boarding, search-and-rescue, inshore and riverine and personnel and cargo transfer.

02 CANADIAN HALIFAX-CLASS FRIGATES COMPLETE DESIGN REVIEW

The combat system of the Royal Canadian Navy's (RCN's) Halifax-Class Modernisation/Frigate Life Extension (HCM/FELEX) programme has completed a navy-led critical design review.

Lockheed Martin Canada, the systems integrator for the 12-ship HCM/FELEX programme, said on 11 August that the proposed shipboard systems and shore-based trainer had all satisfied the RCN's requirements, paving the way for the first frigate to enter refit later this year.

Featuring a commercial off-the-shelf interface, the new combat management system will integrate with a Thales Smart-S Mk II 3-D

01 HMAS NEWCASTLE firing an SM-2 anti-air missile during RIMPAC 2010. (RAN).



radar, Telephonics identification friend-or-foe Mode S/5 radar, Raytheon Pathfinder Mk II navigation radar, modified Saab Sea Giraffe SG-150 (HC) 2-D radar and Ceros fire-control system radar, Elisra electronic support measures suite and Frontier Electronics radar distribution and video switching system, Lockheed Martin said.

The first ship to undergo the HCM/FELEX programme will be HMCS HALIFAX (FFH-330), which will commence an 18-month refit at Irving Shipbuilding's yard in Halifax, Nova Scotia, on 1 October, Digan said.

The refits are projected to cost a combined US\$856 million and will be undertaken at Irving's Atlantic coast facility and at Victoria Shipyards in British Columbia on the Pacific coast.

SKI JUMP TESTS FOR JSF

'Ski jump' trials of the Lockheed Martin F-35B Lightning II Joint Strike Fighter are expected to take place in 2011 at US Naval Air Station (NAS) Patuxent River in Maryland.

The tests will confirm if the F-35B can fly from the take-off ramps to be fitted to the RN's two new Queen Elizabeth-class future aircraft carriers (CVF).

A ski-jump has been built in Manchester in the UK and shipped to NAS Patuxent River for the JSF trials. Some 25 British personnel from BAE Systems and the UK Ministry of Defence (MoD) are working at NAS Patuxent River in the JSF flight test and development effort.

Other nations also stand to benefit from the ski jump trials such as Italy and Spain who are expected to order the STOVL version of the F-35 JSF.

In other JSF news, the Pratt & Whitney F135 propulsion system has powered the Short Takeoff and Vertical Landing (STOVL)

variant through another major programme achievement, with the first supersonic flight of the STOVL F-35B aircraft.

"This is truly a historic accomplishment, not just for Pratt & Whitney and the F135 team, but really for all of military aviation," said Bennett Croswell, Vice President of F135 and F119 Engine Programmes. "This is the first time ever, in the history of aviation that a production ready, stealthy, short take-off vertical landing capable aircraft has flown supersonic."

Piloting the aircraft (BF-2) was US Marine Corps Lt. Col. Matt Kelly, who climbed to 30,000 feet and accelerated to Mach 1.07 in the off-shore supersonic test track near Naval Air Station Patuxent River. BF-2 is the third F-35 to fly supersonic. Two F-35A conventional takeoff and landing variants also achieved supersonic speeds.

SEA VIPER MISSILE SUCCESS

A successful salvo firing of the Sea Viper anti-air/missile missile from the UK's guided weapons barge 'Longbow' has given the missile manufacturer MBDA and the UK Ministry of Defence (MoD) greater confidence that the missile failures that marred earlier trials of the Royal Navy's (RN's) new Sea Viper anti-air guided weapon system have been resolved.

The test was conducted in mid-June at the Centre d'Essais de Lancement des Missiles (CELM) test range in the south of France and sets the scene for a first at sea firing from an RN Type 45 destroyer this year.

Constituting the primary weapon system of the six new Type 45 destroyers, Sea Viper is the UK-customised variant of the Principal Anti-Air Missile System (PAAMS) developed by MBDA to meet the naval area air defence requirements of France, Italy and the UK. The

Franco-Italian PAAMS(E) variant, equipping the new Horizon frigates of both countries, was qualified in 2007. This version uses the Aster 15 and Aster 30 active radar homing anti-air missiles, the SYLVER A50 vertical launcher system (VLS), a command and control (C2) system and the EMPAR G-band multifunction radar (MFR).

A key element of Sea Viper's capability is the sophisticated, Sampson E/F-band active phased array radar, which has a range of 400 kilometres. Its onboard position about 30 metres above the water widens its horizon at sea level to enable the system to react to high-speed, very low-level, anti-ship missiles.

Sampson, which was designed to the Royal Navy's specific requirements in the UK by BAE Systems, sends a target location update to the missile during its flight which then uses thrusters powerful enough to shift the missile sideways several metres to bring the warhead into range of even manoeuvring targets.

The successful missile test is the latest in a string of recent milestones for the Type 45 project which saw the second ship in the class, HMS DAUNTLESS, commissioned into the Royal Navy in June, and the fourth ship, DIAMOND, complete its latest set of sea trials. The landmark launch of the final ship of the class, DUNCAN, is due before the end of the year.

Sea Viper shares the same munitions and VLS as PAAMS(E), but employs the BAE Systems MFR and a UK-developed C2 system to meet a more stressing performance requirement.

Problems affecting the Aster 30 munition emerged last year after the Sea Viper system installed on 'Longbow' experienced consecutive failures in firing tests conducted at the CELM range in May and November 2009. Both events involved a salvo firing of

02 The RCN Halifax class frigate HMCS CHARLOTTETOWN. The 12 frigates of the Halifax class will undergo a Modernisation/Frigate Life Extension (HCM/FELEX) programme which will see a considerable improvement to their surveillance and radar tracking capabilities. (USN)





two Aster 30 missiles against a manoeuvring Mirach 100/5 target flying a stressing profile to exercise the higher end of the Sea Viper performance envelope.

Analysis of both firings showed that the Sea Viper C2 and MFR performed in line with expectations, proving the performance of the ship system. Instead, telemetry pointed to problems with the Aster munition.

The subsequent investigation traced the cause to what the MoD terms "production weaknesses" in the most recent batches of the Aster missile. It added that these "are being corrected through minor redesign work".

INDONESIAN SCRAPING OLD WARSHIPS AND AIRCRAFT

The Indonesian Navy is said to be scraping at least 12 ageing warships and 16 aircraft in the 2010-14 timeframe, according to local reports.

Chief of Staff Admiral Agus Suhartono was quoted on 18 June as saying that four landing ship tank (LST) vessels, dating from the 1940s, would initially be taken out of service as it was too costly to maintain them in operational condition.

Seven LSTs of the 1-511 and 512-1152 classes are currently in service, but most, if not all, are thought to be in reserve. Displacing 4,080 tons, they were built in the US during the Second World War and transferred to Indonesia in the 1960s and 1970s.

Three new 11,400-ton landing platform docks built in South Korea have recently entered service to reinforce the navy's amphibious transport capability, and two further ships of the class have been built indigenously at PAL Indonesia's Surabaya yard.

Rear-Adm Suhartono added that just five of the navy's 21 Australian-built Nomad B/L

short-range maritime patrol aircraft (MPA) would be kept in service, for training purposes. The aircraft will be replaced by six Indonesian-made CN-235 MPAs.

03 ZUMWALT DESTROYERS LOSE SPY-4

The US Department of Defence has delayed initial operational capability (IOC) for the first of the USN's Zumwalt-class (DDG-1000) destroyers by a year and scrapped plans to equip them with Dual Band Radar (DBR) following a programme review triggered by cost overruns.

Lockheed Martin's SPY-4 Volume Search Radar (VSR) S-band array - one of two key elements of the DBR suite - is being removed from the destroyer, which will now retain only the Raytheon AN/SPY-3 Multi-Function Radar (MFR) X-band system.

The Zumwalt programme was recertified after breaching the US Nunn-McCurdy statute in the 'Defense Authorization Act', which requires military equipment programmes with significant increases in unit cost to undergo a review and certification process.

"As part of the Nunn-McCurdy certification process, the VSR was identified as an acceptable opportunity for cost reduction while still meeting key performance parameters," navy spokesman Commander Victor Chen said. "The remaining MFR will provide both air search and target tracking capability for DDG-1000."

The USN is building three Zumwalt-class destroyers for a total cost of US\$22.1 billion: an average procurement unit cost (APUC) increase of 86%. The review concluded that the APUC increase stemmed from an earlier decision to cut the number of ships from 10 to three, but added that there were no other cost-effective options to fulfil the service's naval fire

support requirement.

The recertification process means the first ship will not join the fleet for a further year. "The previous IOC date of 2015 was included as part of the Approved Programme Baseline based on a 10-ship programme in 2005. The revised IOC date of 2016 more closely aligns with the current DDG-1000 schedule," said Cdr Chen.

The Pentagon justified retaining the three Zumwalt hulls to fulfil a joint service requirement for sea-based fire support with its Advanced Gun System and Long Range Land Attack Projectile, which has a range of 63 n miles.

04 KILOS DOUBLE

It has been reported that Vietnam's proposed purchase of Kilo-class (Project 636) diesel-electric submarines (SSKs) from Russia (see *THE NAVY* Vol 72 No 2 p17) is expected to cost more than US\$3.2 billion, making it the largest naval export agreement ever secured by Moscow. The contract was signed in December 2009 during the visit of Vietnamese Prime Minister Nguyen Tan Dung to Russia.

Construction of the six boats will cost US\$2.1 billion while armaments, infrastructure and other equipment costs will add US\$1.1 billion to the programme, according to a report on 3 June by Russia's state-run news agency, RIA Novosti.

These latest figures are far in excess of the US\$1.8 billion price tag quoted when the contract was signed and put the cost of each submarine at about US\$350 million.

It is unclear how Hanoi will be able to afford all six SSKs; a bartering arrangement may have to be put in place.

The new boats are due to be built by Admiralty Shipyards in St Petersburg and delivered

03 A computer generated image of the new DDG-1000 Zumwalt class destroyer, which is to lose its SPY-4 radar system due to cost blow outs. The Pentagon justified retaining the three Zumwalt hulls to fulfil a joint service requirement for sea-based fire support with its Advanced Gun System and Long Range Land Attack Projectile, which has a range of 63 n miles.

04 A Russian Navy Kilo class SSK on the surface. The Kilo class has been a successful export for Russia with Vietnam being the latest customer. (Russian Navy)



annually. The 636 model is 1.2 m longer than existing Kilo variants and possesses improved stealth characteristics with the removal of flooding ports from the forward section and treatment of the hull with multilayer anechoic rubber tiles.

Vietnam's decision to acquire a full-size submarine fleet (the country currently operates two Yugo-class midget subs) follows efforts by neighbouring countries in Southeast Asia to enhance their subsurface capabilities.

Malaysia has achieved initial operating capability for the first of its two French-built Scorpene submarines and Singapore is buying two modernised Vastergotland-class (A 17) submarines - with air-independent propulsion - from Sweden. Indonesia has plans to replace its ageing Cakra-class (Type 209) SSKs and Thailand is considering buying a pair of second-hand submarines.

05 CANADA ANNOUNCES AOR REPLACEMENT

The Canadian Government has announced it is moving forward with procurement of new Joint Support Ships (JSS) to be built in Canada.

Canada will acquire two support ships, with the option to procure a third. The JSS project represents a total investment by the Government of Canada of approximately CA\$2.6 billion. The presence of a JSS will increase the range and endurance of the Canadian Navy, permitting it to remain at sea for significant periods of time without going to shore.

The primary role of the JSS will include supply of fuel, ammunition, spare parts, food, and water. The JSS will also provide a home base for the maintenance and operation of helicopters, a limited sealift capability, and logistics support to forces deployed ashore.

This first step in the replacement of the RCN's current Auxiliary Oiler Replenishment vessels, known as the definition phase, will involve the assessment of both new and existing designs. Existing ship designs are those already built, operating, and meet key specific Canadian requirements.

A new ship design is being developed by government and industry officials working side-by-side. The selected ship design will be based on the best value in terms of capability and affordability, ensuring the successful delivery of the JSS. The design is expected to be available in approximately two years, at which time a Canadian shipyard, selected as part of the National Shipbuilding Procurement Strategy, will be engaged to complete the design of and build the Joint Support Ships.

BRAZIL TO RECEIVE MK-48 TORPEDOES

US company Raytheon will shortly begin deliveries of 26 Mk-48 Mod 6AT heavyweight torpedoes to Brazil after securing a single source production contract from US Naval Sea Systems Command (NAVSEA) earlier this year.

Brazil is receiving 30 Mod 6AT torpedoes from the US under a Foreign Military Sales (FMS) agreement confirmed in April 2007. An initial four weapons are being supplied from existing US Navy stocks.

It is understood that the Brazilian Navy Type 209/1400 submarine TUPI has already completed in-water firings of a Mod 6AT exercise torpedo. These were performed as a risk reduction activity to prove the swim-out weapon discharge system.

Alongside the torpedo acquisition, Brazil is upgrading the four Tupi-class submarines and its single Tikuna-class boat with a Lockheed Martin Integrated Combat System (ICS) under a separate US\$35 million FMS deal.

According to Lockheed Martin, the ICS backfit provides the sonar, command and control and weapon-control functionality, together with the associated physical hardware, software and support resources.

06 ISRAEL TO DEPLOY SUBMARINES WITH N-MISSILES IN PERSIAN GULF

Israel is to deploy three submarines equipped with nuclear cruise missiles to the Persian Gulf, amid fears that ballistic missiles developed by Iran could be used to hit strategic sites in the Jewish state, an Israeli newspaper report said.

The newspaper was quoted by local media as saying that one of the submarines has been sent over Israeli fears that ballistic missiles developed by Iran, and in the possession of Syria and Hezbollah, could be used to hit strategic sites in the Jewish state, including air bases and missile launchers.

DOLPHIN, TEKUMA, and LEVIATHAN, all submarines of the 7th navy Flotilla, have been reported to be frequenting the Gulf.

However, according to the newspaper report, this new deployment is meant to ensure a permanent naval presence near the Iranian coastline.

A flotilla officer told a British newspaper that the deployed submarines were meant to act as a deterrent, gather intelligence and potentially to land Mossad agents in the region.

"We're a solid base for collecting sensitive information, as we can stay for a long time in one place," the officer said.

The flotilla's commander, identified only as Colonel O, was quoted by the paper as saying that the submarine force was "an underwater assault force".

"We're operating deep and far, very far, from our borders," he reportedly said.

05 The RCN support ship HMCS PROTECTEUR. PROTECTEUR and sister ship PRESERVER are to be replaced with a multi-mission Joint Support Ship to be built in Canada. (USN)

06 The Israeli Navy's submarine DOLPHIN (seen here) of the 7th navy Flotilla has been reported to be frequenting the Persian Gulf with nuclear armed cruise missiles as a deterrent/avenge weapon to Iranian nuclear and ballistic missile threats.





The submarines could be used if Iran continues with its nuclear programme to produce a bomb.

"The 1,500 km range of the submarines cruise missiles can reach any target in Iran," a navy officer told the newspaper.

US NAVY AWARDS \$368M IN CONTRACTS FOR SM-6

The USN has awarded Raytheon contracts totalling US\$368 million with potential modifications for low rate initial production to manufacture of the Standard Missile-6 systems over a three-year period.

The contracts include the production of missiles, spare parts, and system and design engineering efforts. Raytheon will deliver the first missiles in early 2011.

"Low rate initial production begins our process of delivering this integral weapon system to the warfighter," said Frank Wyatt, vice president of Raytheon's Air and Missile Defence Systems product line. "Standard Missile-6 remains on schedule, and we brought in the first three years of production well under the US Navy's budget."

SM-6 is being developed to meet the USN's requirement for an extended-range anti-air warfare missile. The system will provide a defensive capability against fixed- and rotary-wing aircraft, unmanned aerial vehicles and anti-ship cruise missiles.

"Standard Missile-6 is in development testing now and will go into operational testing in fiscal year 2011, with initial operational capability by March 2011," said Wyatt. "SM-6 is capable of over-the-horizon air defence and takes full advantage of the kinematics available to the Standard Missile family, allowing the use of both active and semiactive modes and advanced fusing techniques."

SM-6 featured in Australia's last Defence White Paper for fitting to the new Hobart class destroyers.

INDIAN SUBMARINES TO LAY MINES

The Indian Navy (IN) is planning to buy Submarine Mine Laying Equipment (SMILE) to augment the existing capabilities of its conventional fleet. It has issued a Request for Information (RFI) to vendors and manufacturers seeking details in this regard.

The IN at present has a fleet of 16 conventional submarines, but is in the process of adding a more when the Scorpene submarines, currently being built by Mazagon Docks, are ready for service.

The SMILE, according to the RFI, should be capable of laying 24 ground mines and withstand the maximum underwater speed of the submarine.

The RFI said the basic design of the SMILE should comprise components and sub-systems such as two independent magazines capable of housing at least 12 mines each.

RUSSIAN NAVY TO BASE WARSHIPS AT SYRIAN PORT AFTER 2012

Russia's naval supply and maintenance site near Syria's Mediterranean port of Tartus will be modernised to accommodate heavy warships after 2012, Russia's Navy chief said on in August.

"Tartus will be developed as a naval base. The first stage of development and modernisation will be completed in 2012," Adm. Vladimir Vysotsky said, adding it could then serve as a base for guided-missile cruisers and even aircraft carriers.

The Soviet-era facility is operated under a 1971 agreement by Russian personnel.

Since 1992 the port has been in disrepair, with

only one of its three floating piers operational. According to Navy experts, the facility is being renovated to serve as a foothold for a permanent Russian naval presence in the Mediterranean.

Russian President Dmitry Medvedev said in November 2009 Russia would increase its naval presence in the world's oceans.

Moscow announced in 2007 that its Navy had resumed and would build up a constant presence throughout the world's oceans. Once one of the world's most powerful forces, the Russian Navy now has few ships regularly deployed on the open seas.

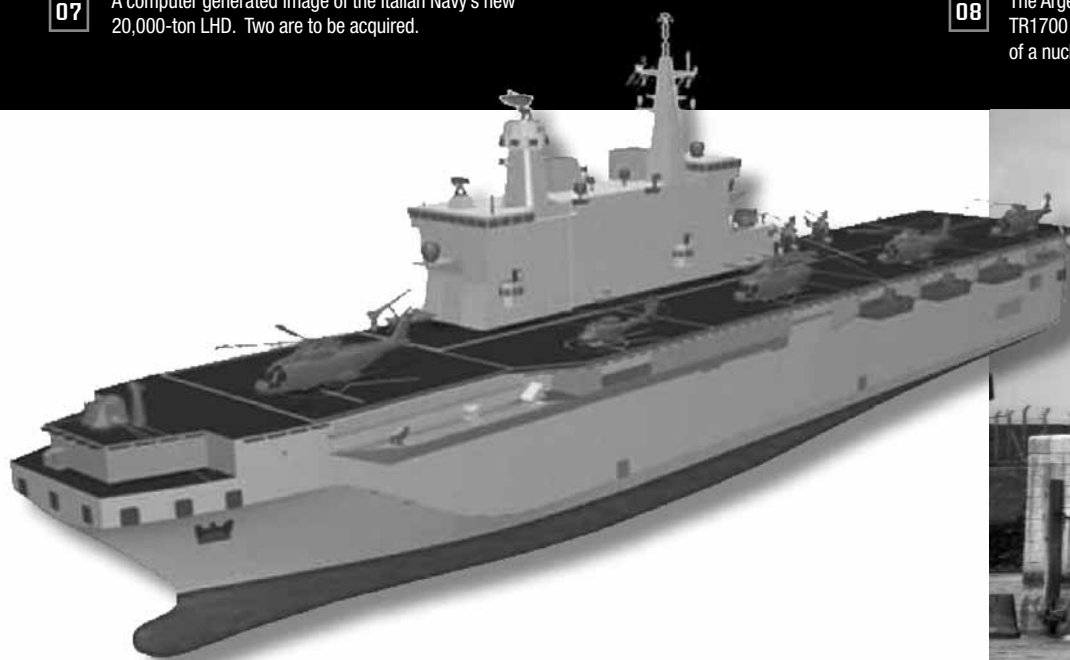
07 ITALIAN LHDs GET GO AHEAD

The Italian Navy has received approval to procure two 20,000-ton Amphibious Assault Ships (LHDs). The agreement includes an option for a third unit that will be configured with extensive aviation facilities. The initial funding of €50M (US\$67M) for the project definition phase has been approved and will run through early 2011. Assuming that the funding line continues on schedule, a construction contract could be in place by early 2012 with the Italian Navy taking delivery of the first unit in late 2014 or early 2015.

The funding for this programme is being provided through the Ministry of Industry and will help support the nation's shipbuilding industry, more specifically their largest builder Fincantieri. Fincantieri and other Italian builders have been hurt with declining order books in the cruise and commercial shipbuilding sectors. The large LHDs are what is needed to help support the industry during the recession.

In contrast, the Italian Government will be cancelling the later units of the Bergamini class (FREMM) frigates scheduled for after 2013. It is important to note that the new

07 A computer generated image of the Italian Navy's new 20,000-ton LHD. Two are to be acquired.



08 The Argentine TR1700 SSK ARA SAN JUAN. An incomplete TR1700 is thought to be the candidate vessel for the fitting of a nuclear reactor for Argentina's first SSN.



LHDs are around half the price (US\$369M) of the frigates (US\$670M) and are needed now to help sustain the shipbuilding industry. The four final units of the Bergamini class were not scheduled to be funded and start construction until after 2013 and 2015.

The first two LHDs will replace the first two San Giorgio class LPDs commissioned in the late 1980s and the third modified unit with extensive aviation facilities will replace the GARIBALDI aircraft carrier. The new LHDs will be considerably larger than their predecessors, 200 metres long and displacing 20,000 tons. The first two will feature a flight deck for six helicopters, and a well deck for six landing craft. The third unit will feature a flight deck and hangar in order to carry a larger number of fixed wing aircraft and helicopters rather than being oriented for amphibious operations.

Fincantieri will be the lead builder of the three ships with work possibly being split between the Muggiano and Riva Trigoso yards. This was done with both the Cavour class aircraft carrier programme and the Andrea Doria (Horizon) class destroyers in the recent past. Both of these yards are in need of work as the CAVOUR was commissioned in 2009 and the second and final Andrea Doria will be commissioned this year. The new LHD programme will go a long way in helping both yards maintain their work forces in the interim until decisions can be made after 2013 for other programmes such as the Bergamini frigates.

08 ARGENTINA PLANS NUCLEAR SUBS

In mid-July 2010, the Argentine Minister of Defence, Mr Nilda Garre, announced an initiative to develop nuclear propulsion for its Navy's submarines. This statement apparently marks the first formal Government of Argentina confirmation of a nuclear submarine development programme in

the country, which could see the first unit in service as early as 2015. The Minister acknowledged that the programme is already underway and has the support of the President and Ministry of Foreign Affairs. He added that the announcement was intended to make the programme publicly known.

The Defence Minister also acknowledged that the project would be based on a reactor developed by INVAP and that it would be installed in a TR1700 Submarine for testing by 2013 and completed by 2015. INVAP is an Argentine high technology company that designs and builds nuclear research reactors, radioisotope production plants, nuclear fuel manufacturing plants, uranium enrichment facilities, neutron beam transport systems, radiation protection instrumentation and reactor protection systems. It has built nuclear reactors for Argentina, Algeria, Egypt, Peru and Australia. Currently there are two Santa Cruz class (TR1700) class submarines in service with the Argentine Navy. Both were built by German company HDW and commissioned in 1984 and 1985.

Four additional TR1700 units have been in various stages of construction at Argentina's Astilleros Domecq Garcia shipyard in Buenos Aires. Construction of the locally-built submarines halted in 2004 due to funding issues. At the time, two of the four units under construction at Astilleros Domecq Garcia were 70% complete.

If the Argentine nuclear propulsion programme continues to move forward, one of these incomplete TR1700 units will likely be modified to handle a medium-sized reactor. This would be a less costly alternative to ordering a new hull from either a local or foreign builder.

For the reactor design, the defence ministry has indicated that a Central Argentina Modular

Elements (CAREM) reactor prototype would be built and modified as a naval reactor. The CAREM is a modular 100MW simplified pressurized water reactor with integral steam generators designed to be used for electricity generation. It can be used for electricity, generating 27 MW, or as a research reactor at up to 100 MW. It can also be used for water desalination with 8 MW in power cogeneration.

Recent studies have explored scaling the design up to 300 MW. The CAREM reactor has its entire primary coolant system within the reactor pressure vessel, self-pressurized and relying entirely on convection. Fuel is standard 3.4% enriched PWR fuel, with burnable poison, and requires refuelling annually.

The Defence Minister's recent statement appears to be a clear reaction to Brazil's recent moves to establish an indigenous nuclear submarine programme. Argentina's nuclear infrastructure is more than sufficient to support a naval nuclear programme, although the schedule is highly aggressive and optimistic considering the funding constraints that have plagued the Argentine armed forces for the past decade. The engineering and integration challenges of adapting a nuclear power plant to an existing conventional submarine design are also formidable.

09 HMS GLOUCESTER DEPLOYS TO FALKLANDS

HMS GLOUCESTER set sail for the South Atlantic on 20 August where for the next seven months she will take part in maritime security patrols and exercise with South American navies.

The Type 42 destroyer, based at Portsmouth, will take over from Devonport-based HMS

09 HMS GLOUCESTER sails past the Spinnaker Tower, leaving Portsmouth for a seven-month deployment to the South Atlantic. (RN)





PORTLAND, and is to spend the majority of her deployment patrolling the waters around the British South Atlantic islands, namely the Falkland Islands and South Georgia.

She will also make official visits to various South American countries, including Brazil and Chile.

A highlight of the deployment will be the chance to represent the UK at an exhibition of defence technology in Chile in November called the Expo Naval. But HMS GLOUCESTER's main concern will be providing security and assurance to the people of the Falkland islands.

250 miles (400km) away from mainland South America at their nearest point, the islands are dominated by the surrounding seas, and dependent on them for their livelihood.

GLOUCESTER's Commanding Officer, Commander David George, said: "GLOUCESTER will be providing British citizens in the South Atlantic with the reassurance of knowing that the RN is looking out for their interests.

"But while we are down there, we are also policing the seas and ensuring that they are safe for all to use and pass through."

With the ship away until March next year many families made alternative arrangements for celebrations such as birthdays and Christmas. Some have even celebrated Christmas already.

RUSSIA TO MODERNISE FIFTH INDIAN SUBMARINE

A fifth Indian Kilo class diesel-electric submarine has arrived to Russia's Zvezdochka shipyard for an overhaul under a recent contract, the shipyard company said during August.

Russia has built ten Kilo class submarines for India and has already overhauled four of them at the Zvezdochka shipyard in the north of the country.

INS SINDHURAKSHAK is being upgraded under a contract between the Zvezdochka shipyard and the Indian defence ministry, signed on June 4, 2010.

The upgrade programme includes a complete overhaul of the submarine, including its hull structures, as well as improved control systems, sonar, electronic warfare systems, and an integrated weapon control system. The upgrade is reported to cost around US\$80 million.

10 USN TO INACTIVATE 11 SHIPS

Eleven USN vessels face inactivation in the upcoming months, according to an administrative message released in July.

The Los Angeles-class USS MEMPHIS fast-attack submarine will be inactivated

in March 2011, which will lead to its decommissioning, according to the message signed by Vice Adm. J.T. Blake, deputy chief of naval operations.

The frigate USS HAWES will be inactivated later this year and will be used as a logistic support asset for remaining Perry class FFG frigates. Two other frigates, the USS DOYLE and USS JARRETT, will be sold to foreign militaries after inactivation next year.

The amphibious assault ship USS NASSAU's fate will be determined following a service life extension review, according to the message. If decommissioned, the ship will remain in reserve.

The amphibious transport docks USS DUBUQUE and USS CLEVELAND will be decommissioned and enter reserve status, while the transport tankers USNS *Samuel L. Cobb* and USNS *Richard G. Matthiesen* will be inactivated and transferred to the US Maritime Administration.

The Military Sealift Command's USNS *Shasta* and USNS *Kiska* will be dismantled next year, according to the message.

10

The amphibious assault ship USS NASSAU. Her fate will be determined following a service life extension review. (USN)



CLOSE AIR SUPPORT AND NAVAL AVIATION

THE NATURAL COMBINATION

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

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



seems reasonable. Australia has invested in tankers 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 Cobras 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 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

don't solve the problem of the numbers needed to provide enough continuous support, or the problem of pilot fatigue. To imagine otherwise is folly — and, in human terms in wartime, unacceptably expensive folly.

The U.S. Marines understand. In their STOVL Harriers they have something as close as possible to the earlier kind of air support which can operate from close to the battle. However, they also understand that it will often be impossible to create any sort of air base near the battle, even if their aircraft can easily take off and land. Their solution has been to provide space on board their big amphibious ships for their close-support aircraft. Why ships? Because a ship provides the space for what amounts to an air base, exactly the thing that land-based air forces cannot quickly set up far from home. The Marines are also well aware that during the Kosovo war ships in the Adriatic, carrying only a fraction of the numbers NATO had on land, provided most of the sorties, because they could move to evade weather restrictions.

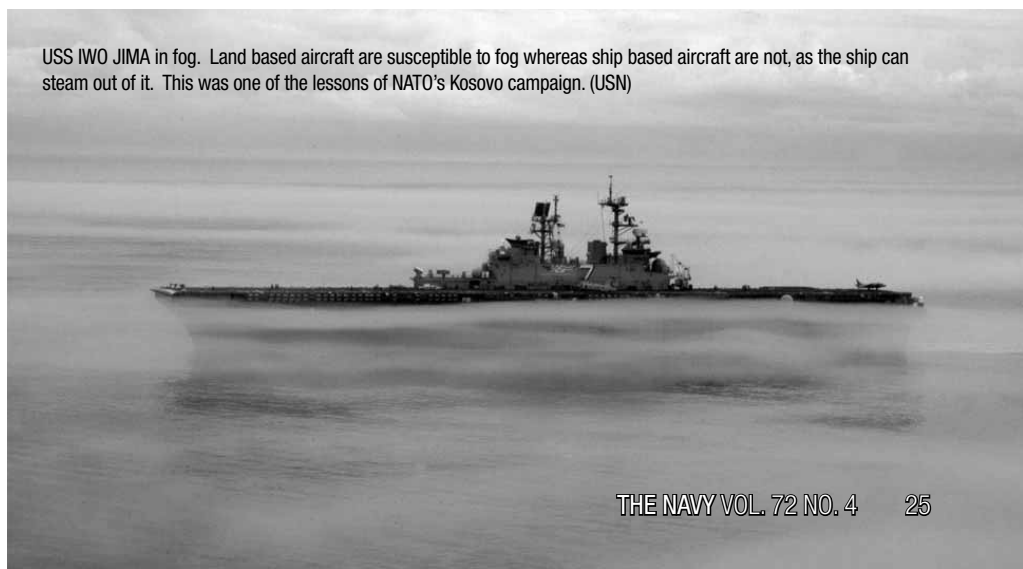
The points about duration and availability are

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

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)



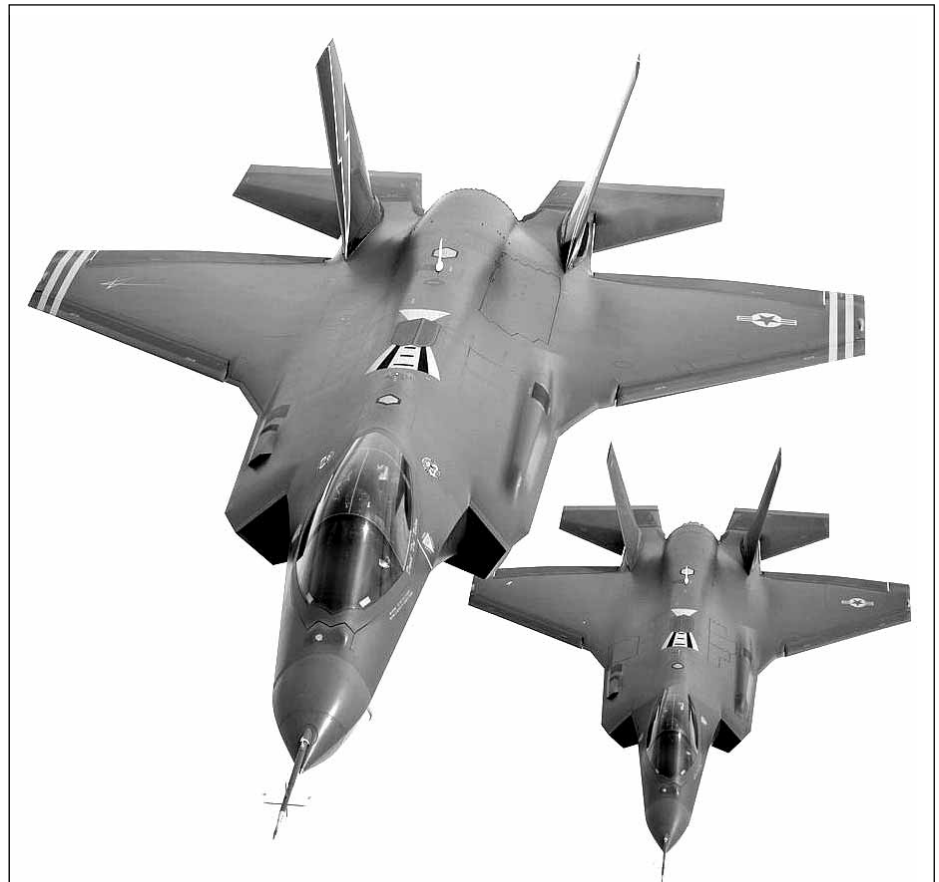
not fly any faster. The pilot understood. When the U-boats surfaced, he conducted dummy attacks, as though he still had weapons. At first the U-boat commanders did not realise what was happening, so they submerged to avoid being hit. Unfortunately it did not take long for them to understand that the 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.

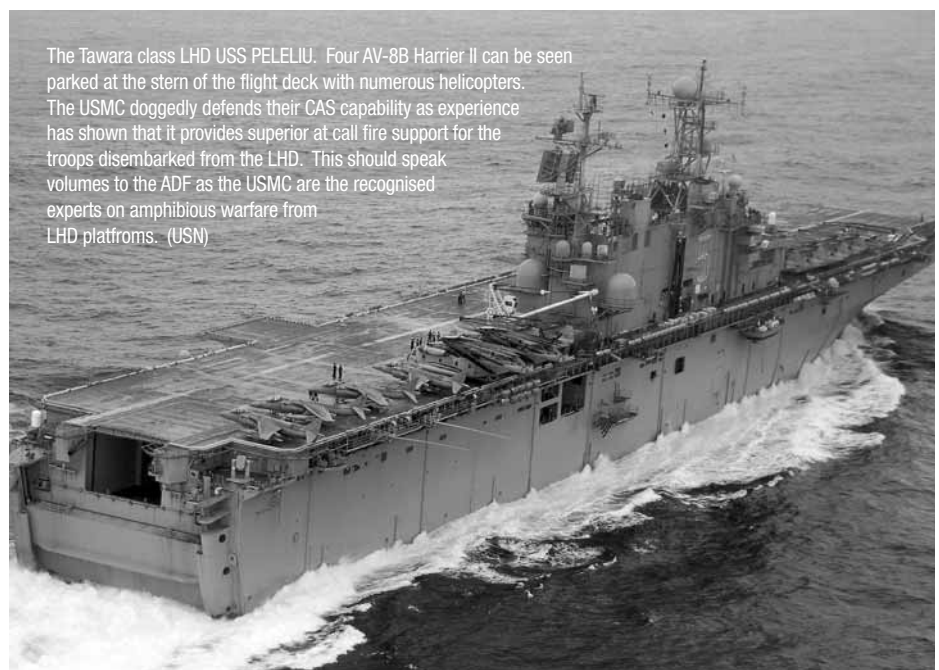
Both the historical record and the basic logic of the situation, then, suggest that it is the grossest folly to imagine that a limited number of long-range land-based fighter-bombers are an adequate substitute for a small number of fighter-bombers near the scene of an operation. Advocates of land-based 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 project a first-class army without providing that army with real air cover?

All 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.



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)

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.

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.

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)



An Australian Army Tiger reconnaissance helicopter. The Tiger's limited range and weapon load, plus its un-marinated 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.

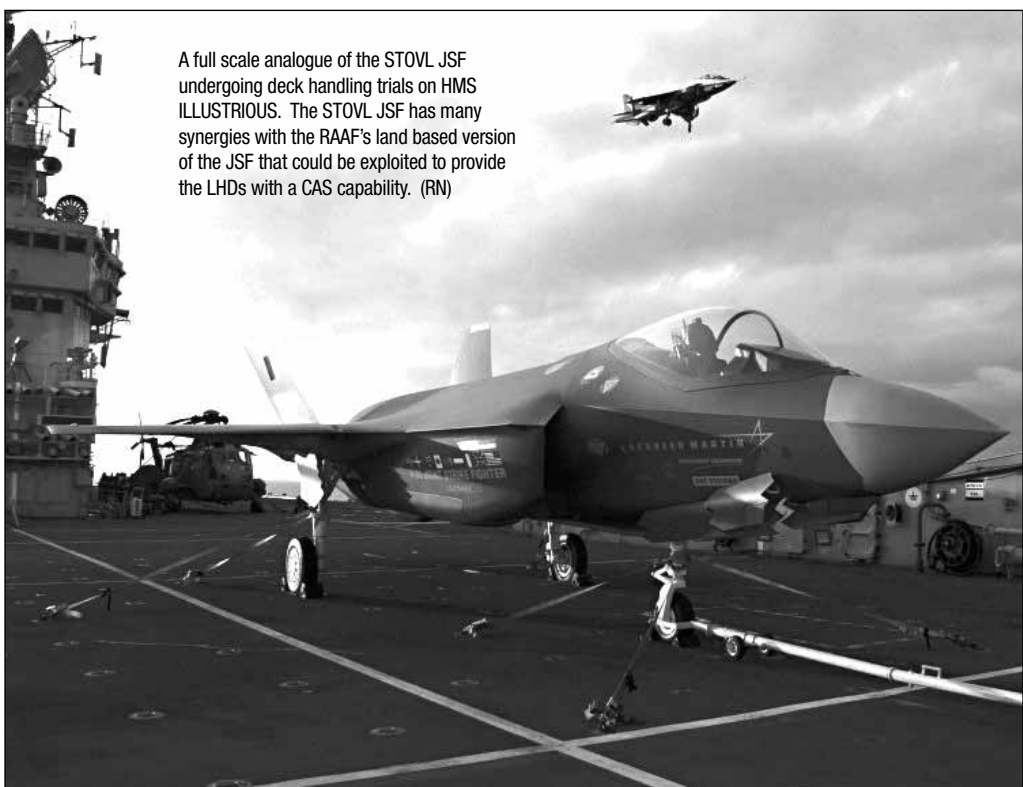
For ease of discussion, and to remain true to the Minister's request, I will assume that the required primary role is for a fixed wing land attack air capability in close support of amphibious and associated deployed forces. Given today's mobile forces and the inherently remote nature of amphibious operations, 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 know aircraft currently employed. Long range naval gunfire and missile systems, long range land based air systems including UCAVs (uninhabited Combat Aerial Vehicles), and the increasingly lethal weapons within the amphibious force itself will eventually

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

predessor, 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 unserviceability prior to launch. Depending on the criticality of the planned mission, the "spare" may be manned or their 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 and 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)



These locations may be either runways, landing pads, or combination of both. Whilst STOVL jets have excellent operating characteristics from surprising short runways, landing pads entailing vertical take off and landing have constraining limits. The operational usefulness of pads is highly dependant on the vertical lift capability of the aircraft. The lift capability is determined by overall aircraft weight, air temperature, and pad material/design. When equipped with weapons and fuel, both the AV-8B and JSF have severe limitations when taking off vertically. These limitations disappear rapidly with even the shortest of runways and therefore disembarked operations should normally be regarded as only achievable from runways - albeit from runways much shorter than may be required from conventional jets. But a far more problematic issue limits disembarked operations in tactical theatres. The support requirements for the aircraft include people, fuel, weapons, maintenance equipment, domestic accommodation...and so on. Unless provided fully or in large proportion by the disembarked location, all this will need to come from the aircraft's normal operating location, the LHD! For the sake of this discussion that is limited to amphibious operations support, the aircraft and their support will most likely be a permanent presence on the ship with at best, occasional diversions to shore locations should they be available.

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 useage 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 useage 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. Stowage incompatibility between weapon types based on characteristics such as explosive content, propellant type and "cook off" times will

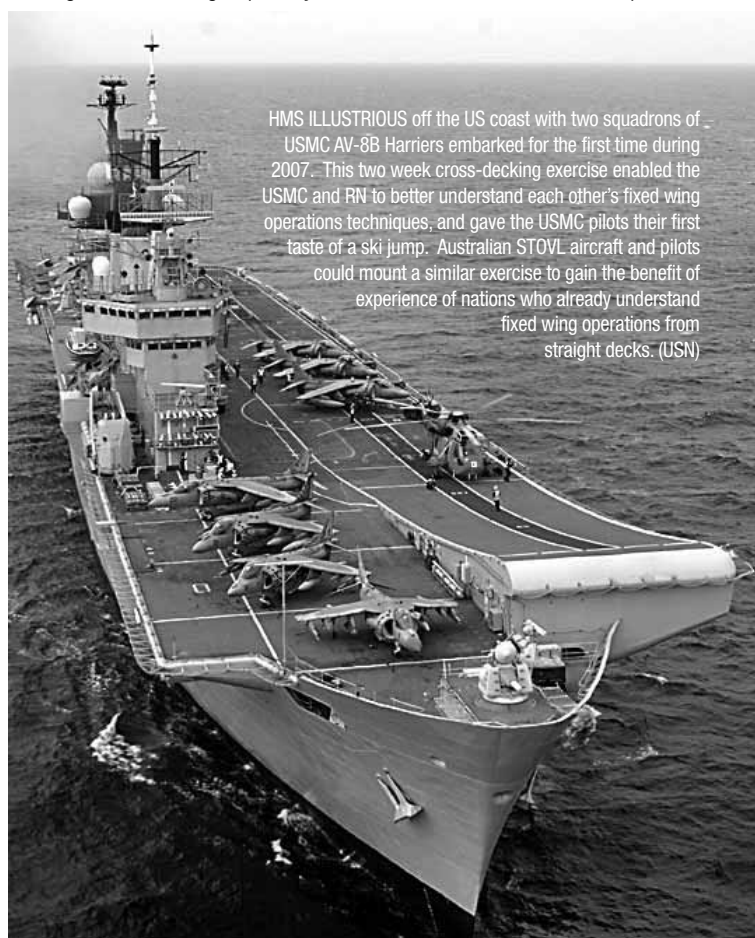
also complicate the number and types of magazine required. Weapons stowage requirements can be very difficult or even impossible to restore to an existing design unless they were taken into account at final design acceptance. Whilst some examples can be recalled of seriously compromised weapons stowage due to unexpected operational demands – the on deck stowage 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 stowage 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 is 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)

complete with required air systems support personnel. Within the limited environment 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 RN/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 fast jet force, such a change would be highly dramatic and it might be unrealistic to expect that the RAAF shoulder could 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, Techniques and Procedures 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?"

Mark Boast is a former naval aviator of 23 years experience in both the RAN and RN. 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.

The strategic background to Australia's security has changed in recent decades and in some respects become more uncertain. The League believes it is essential that Australia develops the capability to defend itself, paying particular attention to maritime defence. Australia is, of geographical necessity, a maritime nation whose prosperity strength and safety depend to a great extent on the security of the surrounding ocean and island areas, and on seaborne trade.

The Navy League:

- Believes Australia can be defended against attack by other than a super or major maritime power and that the prime requirement of our defence is an evident ability to control the sea and air space around us and to contribute to defending essential lines of sea and air communication to our allies.
- Supports the ANZUS Treaty and the future reintegration of New Zealand as a full partner.
- Urges close relationships with the nearer ASEAN countries, PNG and South Pacific Island States.
- Advocates the acquisition of the most modern armaments, surveillance systems and sensors to ensure that the Australian Defence Force (ADF) maintains some technological advantages over forces in our general area.
- Believes there must be a significant deterrent element in the ADF capable of powerful retaliation at considerable distances from Australia.
- Believes the ADF must have the capability to protect essential shipping at considerable distances from Australia, as well as in coastal waters.
- Supports the concept of a strong modern Air Force and a highly mobile well-equipped Army, capable of island and jungle warfare as well as the defence of Northern Australia and its role in combatting terrorism.
- Endorses the control of Coastal Surveillance by the defence force and the development of the capability for patrol and surveillance of the ocean areas all around the Australian coast and island territories, including the Southern Ocean.
- Advocates measures to foster a build-up of Australian-owned shipping to support the ADF and to ensure the carriage of essential cargoes to and from Australia in time of conflict.

As to the RAN, the League:

- Supports the concept of a Navy capable of effective action off both East and West coasts simultaneously and advocates a gradual build up of the Fleet and its afloat support ships to ensure that, in conjunction with the RAAF, this can be achieved against any force which could be deployed in our general area.

- Believes that the level of both the offensive and defensive capability of the RAN should be increased and welcomes the Government's decisions to acquire 12 new Future Submarines; to continue building the 3 Air Warfare Destroyers (AWDs) and the two landing ships (LHDs); and to acquire 8 new Future Frigates, a large Strategic Sealift Ship, 20 Offshore Combatant Vessels, 24 Naval Combatant Helicopters, and 6 Heavy Landing Craft.
- Noting the deterrent value and the huge operational advantages of nuclear-powered submarines in most threat situations, recommends that some of the proposed Future Submarines should be nuclear-powered.
- Noting the considerable increase in foreign maritime power now taking place in our general area, advocates increasing the order for Air Warfare Destroyers to at least 4 vessels.
- Welcomes the decisions to increase the strength and capabilities of the Army and Air Force and to greatly improve the weaponry, and the intelligence, surveillance, reconnaissance, cyberspace, and electronic warfare capabilities of the ADF.
- Advocates that a proportion of the projected new F35 fighters for the ADF be of the short-takeoff and vertical-landing (STOVL) version to enable operation from small airfields and suitable ships in order to support overseas deployments where access to secure major airfields may not be available.
- Supports the acquisition of unmanned surface and sub-surface vessels and aircraft.
- Advocates that all warships be equipped with some form of defence against missiles.
- Supports the development of Australia's defence industry, including strong research and design organisations capable of constructing and maintaining all needed types of warships and support vessels.
- Advocates the retention in a Reserve Fleet of Naval vessels of potential value in defence emergency.
- Supports the maintenance of a strong Naval Reserve to help crew vessels and aircraft and for specialised tasks in time of defence emergency.
- Supports the maintenance of a strong Australian Navy Cadets organisation.

The League:

- Calls for a bipartisan political approach to national defence with a commitment to a steady long-term build-up in our national defence capability including the required industrial infrastructure.
- While recognising budgetary constraints, believes that, given leadership by successive governments, Australia can defend itself in the longer term within acceptable financial, economic and manpower parameters.



The Collins class submarines HMA Ships DECHAINEUX and WALLER on the surface in the early morning light off WA. (RAN)



Two of the West's most versatile warships, from left to right, the Type 22 Batch 3 frigate HMS CUMBERLAND, and the Arleigh Burke Flight IIA class destroyer USS WINSTON S. CHURCHILL (named after British Prime Minister Winston Churchill) off the coast of England (USN)

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