

ADF capability review: Royal Australian Air Force  
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This ASPI *Policy Analysis* is number three in a series intended to inform the Defence White Paper debate by providing a snapshot of ADF capability. The previous releases in this series considered Navy and Army capabilities. The final release will cover C<sup>4</sup>ISR capabilities

### Capability overview

The Royal Australian Air Force (RAAF) operates around 100 fast jet fighter and strike aircraft and over 100 aircraft of other types, including airlift, tanker and maritime patrol aircraft and trainers. In terms of size, the air forces of Singapore and Thailand are comparable. The Japan Air Self Defense Force is larger, and India and China both operate much larger air arms.

The RAAF is in the business of delivering air power as part of the ADF's joint capabilities, and also as a strategic asset in its own right through the long-range strike and air combat roles. In the maritime domain, RAAF roles include broad area surveillance, and anti-submarine and anti-surface warfare. And the effectiveness and survivability of land forces is greatly enhanced by close air support and battlefield interdiction capabilities. Airlift is also an enabler of ADF deployments by allowing rapid deployment and/or resupply of ADF elements (albeit on a relatively small scale).

While the discussion that follows is somewhat platform and system-centric (which is in turn dictated by the way the Defence Capability Plan is structured), it is important to note that the focus of the RAAF today is on the delivery of air power as an integrated whole. In this model, enabling assets such as airbases, air control radars, support groups, sensors such as the JORN over the horizon radar and command and control systems are essential parts of the overall capability, along with the RAAF's education and training system.

In terms of hardware, the Air Force is about to undergo a transition, in which most of its front-line fleet will be replaced by 2020. (Table 1 shows the RAAF's current roles and aircraft types.) Some of the decisions on replacement types (and genuinely new capabilities in some instances) have already been made and acquisition projects are well underway. Other new additions to the RAAF's fleet will include the well-publicised Super Hornets, unmanned surveillance drones and sophisticated Airborne Early Warning and Control (AEW&C) aircraft.

The RAAF has seen its long-held regional qualitative lead in air combat capability eroded somewhat in recent years by regional nations acquisition of advanced aircraft, in some instances accompanied by AEW&C and air-to-air refuellers. Acquisition of twenty-four Boeing Super Hornets with advanced sensor and electronic warfare (EW) systems and the Wedgetail AEW&C will provide a capability boost that should see the RAAF able to meet all credible scenarios until fifth generation aircraft such as the Joint Strike Fighter are acquired. Fifth generation aircraft remain the most reliable guarantee of medium to long-term air combat superiority.

The RAAF's airlift capability has recently received a boost with the delivery of four C-17 Globemasters. These aircraft provide a global ability to move personnel and equipment and augment the fleet of smaller and slower Hercules aircraft. The airlift capability will receive a further boost when five air-to-air refuellers based on the Airbus A330 airliner (which also has impressive cargo carrying capability) are delivered.

A decision is expected soon on new maritime surveillance aircraft. Provided the number of aircraft acquired is commensurate with the size of the existing fleet, the new assets—most likely a mix of manned and unmanned aircraft—will be able to provide wide area surveillance and response over a much larger area than previously possible, noting that only the manned variant can provide a response option and an anti-submarine warfare capability.

If current plans deliver as promised, the RAAF will not have any notable platform capability shortfalls for some time to come.

Command, control and networking capabilities, particularly in a joint environment such as battlefield support, will require further development. (These will be discussed further in the final paper in this series on ADF C<sup>4</sup>ISR capabilities.)

Major considerations over the next few years will include:

- whether to proceed with acquisition of the JSF (and when)
- the types and numbers of maritime patrol aircraft to be acquired
- a replacement for the Caribou light tactical airlifter
- the transition to a number of new aircraft types and their associated weapons and sensor systems in a relatively short period
- the integration of command and control and sensor systems required to make the most of sophisticated capabilities in Super Hornet and JSF aircraft
- a review of training and education processes to ensure that Air Force people are prepared to exploit the very capable new systems it is procuring.

Table 1: Current RAAF aircraft types and roles

Type	Role
F-111 Mach 2+ long-range strike aircraft (17)	Long-range strike against land or maritime targets with bombs and/or missiles
RF-111 photo reconnaissance version of the F-111 (4)	Photographic reconnaissance and battle damage assessment
F/A-18 Hornet strike/fighter (71)	Air-to-air combat, tactical air support to land forces, land and maritime strike
BAE Hawk trainer(33)	Lead-in fighter training, limited air-to-air and land strike capability
Pilatus PC-9/A (64)	Basic training aircraft (60) and ADF Joint Terminal Attack Controllers (4)
P-3 Orion maritime patrol (19)	Maritime surveillance and reconnaissance, anti-surface and anti-submarine search and engagement, search and survivor supply
C-130 Hercules (24) and C-17 Globemaster (4)	Troop lift, transport of materiel and medical evacuation, parachute operations.
Boeing 707 (1)	Air-to-air refuelling (the remaining aircraft will be retired mid-2008)
Boeing 737 (2) and CL 604 Challenger (3)	VIP transport
Beech Super King Air (7)	Navigation training and transport

### **Air combat—tactical aircraft**

Air combat capability is not simply measured by the performance of its tactical fighter and strike aircraft—as important as individual aircraft performance is. Modern air combat is complex and the net capability emerges from the interplay of a variety of systems, including sensors, electronic warfare, weapons fit and networking capabilities of the tactical aircraft and the support provided by other types, such as AEW&C aircraft and tankers. And, as with all advanced military capability, the development and retention of adequate numbers of skilled personnel is critical to getting the best from the assets at hand.

The 2000 White Paper identified a number of air combat roles for the RAAF. While the relative emphasis may change, those roles are likely to be enduring ones:

- to defeat any credible air attack on Australia or in our approaches
- to deploy an air combat capability to support a regional coalition
- to have the capacity to mount sustained precision strike campaigns against a significant number of (militarily significant) targets.

At the moment, Australia's air combat capability continues to be provided by 1960s vintage F-111 strike aircraft and multi-role F/A-18 Hornets that were built in the 1980s, supported by a single Boeing 707 tanker. In 2002, the government decided to buy into the Joint Strike Fighter (JSF) program,

which is expected to deliver aircraft from 2013 onwards. In order to maintain capability until the JSF is available for front-line use, the RAAF will progressively upgrade the Hornet fleet and augment them with new AEW&C and air-to-air refuelling aircraft. The Hornet upgrades include structural, communication and sensor systems and weapons upgrades, including integration of the Joint Air to Surface Standoff Missile (JASSM).

Only the air-to-air refuelling acquisition has run smoothly since contract signature. (And it should be noted that getting to contract was a very protracted process, with the project appearing in the 'unapproved projects' list for almost a decade.) The 'Wedgetail' AEW&C project has been subject to delays due to integration difficulties and is delayed by several years. The Hornet upgrade has also encountered problems, most notably the failure of the initial choice of radar warning receiver to meet specifications and ongoing difficulties with the JASSM (the future of which has been under a cloud in the US, though recent trials have been successful). As well, the JSF program struggled to meet deadlines over the years 2002–2006 and has been the subject of criticism within the US Government oversight system, as recently as March this year. The flight testing program began in late 2006 but the sole current test aircraft was grounded for most of the second half of 2006 due to a systems problem. Initial quantities to be acquired by US forces have been cut in recent budget requests (though the total number remains, at least for the time being, unchanged), raising the prospect of a higher cost aircraft for Australia.

It was in this context that the decision to acquire a squadron of F/A-18F Super Hornet Block II aircraft was made. The Super Hornets will certainly provide extra capability in the short term. Compared to the classic Hornets, they carry more powerful radar, electronic warfare and networking capabilities and can carry a greater weapons load over a longer range. They also have a degree of low-observability built in, especially in the forward aspect. Parallel acquisition of the US Navy's Joint Stand-Off Weapon (JSOW) will provide a stand-off strike capability.

On balance, it seems that the Super Hornet and legacy Hornet, especially when combined with AEW&C and air-to-air refuelling, will fulfil the 2000 White Paper's aims for Australia's air combat capability for at least the next five years. The longer-term prospect is less clear. The strength of the Super Hornet is in its sensor and EW systems and history shows that EW advantages tend to be ephemeral. It is therefore likely that acquisition of the advanced capabilities promised by 'fifth generation' aircraft like the JSF or F-22 will be critical for the RAAF in future—the main question being the timeframe.

In terms of support to land operations, both the Super Hornet and the JSF will be capable of close air support and battlefield interdiction. The JSF would be able to do so at lower risk due to its low observability, and should also have a greater loiter time over the battlefield. Either aircraft would be superior in this role to the F-22, which has a limited capability against moving targets. Given the limitations of Army's ground based air defence (as highlighted in the previous release in this series) and joint command and control systems, the ADF has some way to go before it could field an effective and coordinated battlefield air defence system that can operate against the full range of land and air threats to deployed forces. Looking to the future, an armed unmanned aerial vehicle might be necessary to provide the level of persistence required in this role.

At the moment the promised capabilities of the JSF are based on modelled performance and many are yet to be demonstrated in hardware. The second-pass consideration of the JSF purchase will be informed by the results of flight testing conducted from December 2006 onwards, but the flight test program will still have several years to run. The risk in cost, schedule and capability of the JSF will all decrease with time as the project matures. Now that the decision to acquire Super Hornets has been confirmed, the RAAF should have some breathing space in which to make a more measured assessment. (A separate ASPI publication will look at the options for further development of the tactical air combat fleet.)

### **Air combat—AEW&C**

The six Wedgetail AEW&C aircraft being acquired under Project Air 5077 are designed to track multiple targets while continuously searching for new contacts. The situational awareness provided by those aircraft will act as a 'force multiplier' for the capabilities of tactical aircraft such as Hornets, Super Hornets and later the F-35 Joint Strike Fighters.

Wedgetail also has the potential to enable new joint warfighting techniques for the ADF. For example (as discussed in the Navy Capability summary released earlier), a Wedgetail aircraft operating in concert with an air warfare destroyer could greatly extend the engagement horizon of the latter.

Given the importance of this program, the serious delays experienced by Wedgetail—at least two and a half years to date—are a cause for concern. Further delays could see the RAAF entering the next decade with much less capability than was planned. (The sensor and networking fit of the 'interim' Super Hornet aircraft from 2010 will provide a measure of capability that can be used to augment the capability of the older Hornets, but not to the same level as Wedgetail.)

It is not surprising that the program has run into technical difficulties. The sensor and mission systems for the Wedgetail aircraft have many innovative features, and the overall package is quite different to other AEW&C systems on the world market. Once full-scale testing began, significant problems arose in the radar, Electronic Support Measures (ESM) and communications data link systems—all novel features of this new design.

The problems identified in the testing program resulted in the delays currently being experienced. Reportedly, progress against the revised schedule has been good and delivery in 2009 should be achievable. (However, we should remember that the current delay became public knowledge just a few months before the planned late-2006 delivery and after a positive report on the project from the Australian National Audit Office.) There is certainly strong motivation for the manufacturer to succeed. Follow-on sales to South Korea and Turkey are already on the books, and other nations may follow.

It is difficult to assess the risk remaining in the Wedgetail program. Progress reports are positive, but there are precedents for AEW&C programs running into insurmountable problems. For example, the British Nimrod AEW.3 program in the 1980s was abandoned after four years of flight testing when system integration (and other) issues proved to be prohibitively expensive to fix.



## **Air-to-air refuelling**

Five KC-30B air-to-air refuelling aircraft (based on the Airbus A330 airliner) are being acquired. These aircraft will replace the four Boeing-707 tankers until recently in service. They will effectively increase the range and endurance of all of the tactical aircraft in service or planned. Unlike the Boeing 707s, they will also be able to refuel the C-17 airlifters, the Wedgetail AEW&C and other KC-30Bs, making them versatile assets that will also be well-suited to make contributions to coalition operations.

Because the Airbus airframe carries a large amount of fuel in its wing tanks, it can provide air-to-air refuelling services without carrying fuel in the fuselage, making a large amount of space available for airlift. In this configuration, a single KC-30B would be able to refuel six Hornets in a non-stop flight from Darwin to Butterworth in Malaysia while carrying the detachment's ground crew, support equipment and spares.

The \$1.8 billion contract with Spanish contractor EADS CASA is scheduled to deliver aircraft to the RAAF in 2009, allowing them to support the short-ranged Hornets and Super Hornets when the F-111 is retired. Schedule slippages obviously have the potential to lessen the reach and presence of the air combat capability. Working in the RAAF's favour is the multi-billion dollar air-to-air refuelling competition underway for the US Air Force that will acquire hundreds of aircraft. EADS CASA is also tendering in that process, in competition with a 'home grown' solution from Boeing, and will want to demonstrate its ability to deliver capability on time and budget.

## **Air lift**

Australia's airlift capability will be much improved in the near future. ADF deployments in the Middle East and elsewhere have resulted in heavy tasking of the fleet of Hercules aircraft to provide regular airlifts of supplies. In response, the government announced the purchase of four C-17 airlifters 'off the shelf' from the United States. Faster, longer-ranged and able to carry more than three times the payload of the Hercules, the C-17 will be able to provide the long-haul airlift capacity required in far fewer sorties. The acquisition of these aircraft was very well managed and an example of how rapid acquisitions of off the shelf equipment can be.

As discussed above, the KC-30B refuellers will also have a significant airlift capability as well as their primary role.

These two new aircraft types will provide a global rapid deployment capability for small numbers of personnel and materiel. However, the small fleet sizes mean that deployments will necessarily be limited in size to sub-battalion level. Larger deployments will still require multiple airlifts, possibly augmented by commercial charter aircraft, or sealift for the bulk of their supplies.

The remaining element of the airlift capability is at the tactical level. Currently the capability resides in fourteen Caribou aircraft, due for replacement mid next decade. The decision on a replacement type has already been deferred at least once, requiring life of type extension work on the Caribou fleet. Given that the short take off and landing and rough field capabilities of the Caribou cannot be matched by the aircraft on the world market, some compromises will have to be made in the new type. One option could be to acquire more medium lift CH-47 Chinook helicopters rather than a fixed wing type.

## Maritime patrol

The RAAF's maritime patrol capability will be replaced over the next decade. Replacement of the current fleet of nineteen AP-3C Orion aircraft will be a two step process. Phase 1B of Project AIR 7000 will acquire high-altitude long-endurance unmanned aerial vehicles (UAVs) that are suited for surveillance and reconnaissance tasks over land and water. Phase 2B will acquire manned aircraft that will be capable of carrying out response tasks such as search and rescue, anti-shipping and anti-submarine missions and will also perform surveillance and reconnaissance roles. The Boeing P-8 Poseidon (based on the Boeing 737 airliner) will be a strong contender for the manned aircraft.

The US has selected the Global Hawk UAV and the P-8 for its Broad Area Maritime Surveillance (BAMS) capability. The Australian Government had awaited the outcome of the US process, and may make a decision to follow suit in the near future (though that cannot be guaranteed with a White paper process underway.)

Provided the number of aircraft acquired is similar to the existing fleet size, the maritime patrol capability of the RAAF will markedly increase in most areas with the new fleet. In particular, the area surveillance capability will improve due to the increased sensor capability of both platforms and the 24+ hour endurance of the unmanned aircraft and the greater operating altitude (and hence greater field of view) of the P-8. According to Northrop Grumman figures, a single day long Global Hawk sortie can provide broad area surveillance over ten million square kilometers. That is approximately ten times the area coverage of a P-3 surveillance mission.

Similarly, the range and speed of the P-8 would give it greater effectiveness in the response role. It should be a capable anti-surface warfare (ASuW) platform when armed with stand-off anti-shipping missiles. One role that may prove problematic is anti-submarine warfare (ASW) weapons delivery. The higher speed of the P-8 is not compatible with existing lightweight torpedo delivery mechanisms, though presumably a solution is being developed.

## Deployed operations

The RAAF has two *expeditionary combat support wings* that are enablers for deployed operations. They are responsible for a wide range of services required for the operation of aircraft from forward bases, including the bare bases in the north of Australia. The roles include command and control, airbase security and defence, local airspace management, supply and flightline services. The level of support required will vary with the size and nature of deployments, but Air Force plans for operating from one main operating base and one forward deployment simultaneously. Greater levels of concurrency would require expansion of the support wings.

The RAAF also has a number of deployable tactical air defence and air traffic control radars. These allow the Air Force to support deployments of their own aircraft, or those of coalition partners. For example, 75 RAAF personnel currently man the control and reporting centre (CRC) at Kandahar Air Field in Afghanistan. The CRC uses internet connectivity for battlespace management and is equipped with the Lockheed Martin TPS-177 tactical radar unit—the first operational deployment of this equipment. Operational since August 2007, the CRC has primacy for the whole Afghanistan theatre, and is responsible for the de-confliction of some 12,000 aircraft movements a month, including UAVs and tanker aircraft.

## About the Author

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