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RAAF capability review 2010

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This paper provides an overview of the capability of the Royal Australian Air Force (RAAF) and is an update of a 2008 ASPI paper. Other papers in the series will update the corresponding reports on Navy, Army and C⁴ISR capabilities

This update at a glance – RAAF capability since 2008

The RAAF is in the process of a major reworking of its force structure. Beginning this year, its entire air combat fleet embarks on a decade long process of renewal and augmentation. The F-111 long-range strike aircraft retires this year and the replacement *Super Hornets* have begun to arrive. The F-35 *Lightning II* Joint Strike Fighter is scheduled to be delivered progressively from 2014 to 2020 and the 'classic' *Hornet*s will be phased out over the same period. New air-to-air refuellers and *Wedgetail* Airborne Early Warning and Control (AEW&C) aircraft will provide a significant capability boost. These additions will ensure that the RAAF remains qualitatively at the forefront of regional air combat capabilities.

Since 2008, the strategic airlift capability has received a major upgrade in the form of the C-17A *Globemaster III*, which has quickly become a valuable asset. The tactical airlift capability has decreased with the retirement of the *Caribou*, which provided a short and rough field performance that will not be replaced before 2015. As an interim solution, Air Force has introduced B300 light twin-engined aircraft to undertake some of the roles provided by *Caribou*.

Since 2009, the RAAF has operated leased IAI *Heron* unmanned aerial vehicles (UAVs) based at Kandahar, Afghanistan. The UAVs provide real-time intelligence, surveillance and reconnaissance (ISR) capabilities for deployed Australian forces.

There is a potential for the RAAF's maritime patrol capability to be compromised in the short to medium term by the 2009 decision to defer the purchase of unmanned surveillance aircraft. Nineteen *Orions* will be replaced by eight new manned aircraft, which will not support as many simultaneous missions. The wide area surveillance capability of a long endurance high altitude unmanned aircraft would constitute an important component of the overall maritime patrol capability but will now not be acquired until some time after 2020.

Table 1: Significant capability changes since 2008

Capability	Change	Comments
Air combat	↑	Although very much a 'work in progress' the replacement of the F-111 with the *Super Hornet* and the imminent addition of AEW&C and new tankers represents an increase in capability across the board.
Strategic airlift	↑	The capacity and speed of the C-17A *Globemaster III* represents a quantum leap in capability over the C-130H and C-130J *Hercules*.
Tactical airlift	↓	Retirement of the *Caribou* means that the ability to operate from short and rough landing strips is limited. The *Hercules* fleet can operate from some rough strips but is not as versatile. The Army's *Chinook* medium-lift helicopter provides some capability in rough terrain but is limited by numbers, speed and range. The B300 *Super King Air* provides some capability but not to the extent of the *Caribou*.
Tactical ISR	↑	Provided via leased *Heron* unmanned aerial vehicles in support of ADF operations in Afghanistan.

The Defence White Paper

For the most part, the 2009 Defence White Paper and the preceding Air Combat Capability Review confirmed the air power plans of the previous government, including the acquisition of the *Super Hornet*, the F-35 (albeit on a deferred procurement schedule), the KC-30A tankers and new manned and unmanned maritime patrol aircraft (again on a deferred schedule, at least for the unmanned component). A genuinely new announcement was the decision to fit a cooperative engagement capability to the *Wedgetail* and Navy's *Hobart* class guided missile destroyers (DDGs) that will allow them to share targeting and tracking information.

Table 2: Major Air Force platform and system initiatives in the 2009 Defence White Paper

Project	Number	Comments
F-35 *Lightning II* JSF	'Around 100'	Fourteen aircraft are now confirmed orders. In 2011 government will consider the purchase of an additional fifty-eight. A final tranche of twenty-eight will be considered later.
(Manned) maritime patrol aircraft	8	To replace the AP-3C *Orion* fleet. Scheduled for delivery around 2018.
High-altitude long-endurance UAVs	Up to 7	Will supplement the manned maritime patrol aircraft in the maritime surveillance role, but will have overland capability as well.
Tactical transport aircraft	2	Additional C-130J *Hercules* to provide extra airlift capacity when the H-model *Hercules* is retired.
Tactical battlefield airlift	Up to 10	To replace the *Caribou* light fixed-wing tactical airlift capability, from 2015.
Cooperative engagement capability		For *Wedgetail* AEW&C aircraft allowing them to exchange targeting data with Navy's *Hobart* class DDGs.

Capability overview

The Air Force 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 compared to other Asia–Pacific states, the air forces of Singapore and Thailand are comparable. The Japan Air Self Defense Force is larger, and the air forces of India and China are larger still.

Air Force 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, its 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 movements and/or resupply of ADF elements (albeit on a relatively small scale—sealift remains the most viable method for delivering large quantities of materiel).

While the discussion that follows is somewhat platform and system-centric (which is 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 Air Force education and training system—like all the services, the most significant enabler for Air Force is their people.

In terms of hardware, the Air Force has begun a period of transition, in which most of its front-line fleet will be replaced by 2020 or shortly thereafter. (Table 3 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 deliveries and acquisition projects are underway. The first tranche of five *Super Hornet* strike fighters was delivered in March 2010, with nineteen others to follow. The *Wedgetail* AEW&C aircraft appears to have overcome a protracted development period with the first aircraft being accepted into service in May 2010. *Wedgetail* represents a major new capability for Air Force's air combat capability and for the ADF more generally.

The delivery of *Wedgetail* and the *Super Hornet* represents the arrest of a slow decline in the RAAF's long-held regional qualitative lead in air combat capability. Australia's capability, based as it was on the 1980s vintage F/A-18 *Hornet* was eroded somewhat in recent years by regional nations' acquisition of advanced aircraft, in some instances accompanied by AEW&C and air-to-air refuellers. The *Super Hornet's* advanced sensor and electronic warfare (EW) systems operating in conjunction with *Wedgetail* will see the RAAF able to meet the Defence White Paper requirements for air superiority and maritime strike in Australia's immediate environs to at least 2020. Strategic strike is somewhat more problematic, due to the relatively short range of the *Super Hornet*. (This is further discussed in the air combat section that follows). The further transition to the stealthy and sophisticated F-35 will provide for medium to long-term air combat superiority.

The RAAF's airlift capability received a boost with the smooth introduction to service of four C-17A *Globemaster III* aircraft. These aircraft provide a capability of true global reach 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 KC-30A air-to-air refuellers based on the Airbus A330 airliner (which also has significant cargo and passenger carrying capability) are delivered—although delivery appears to have been further delayed (see below).

Table 3: Current RAAF aircraft types and roles

Type	Role
F-111C long-range strike aircraft (15)*	Long-range strike against land or maritime targets with bombs and/or missiles
RF-111 photo reconnaissance (2)*	Photographic reconnaissance and battle damage assessment
F/A-18F *Super Hornet* (5)** F/A-18 A/B *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)
AP-3C *Orion* maritime patrol (19)	Maritime surveillance and reconnaissance, anti-surface and anti-submarine search and engagement, search and survivor supply
C-130 H *Hercules* (12) C-130 J *Hercules* (12) and C-17A *Globemaster III* (4)	Troop lift, transport of materiel and medical evacuation, parachute operations
Boeing 737 (2) and CL 604 *Challenger* (3)	VIP transport
Beech B300 *Super King Air* (16)	Light utility transport (8) and training aircraft (8)
IAI Heron UAV	An RAAF detachment operates leased aircraft in support of ADF operations in Afghanistan. The contract arrangement does not specify a number of aircraft, but a number of monthly flying hours.

* The F-111 numbers are indicative and, as the type will retire late in 2010, numbers are expected to run down over the course of the year.

** Initial delivery in March 2010—the total will be twenty-four, with the first ten being delivered in 2010.

The Defence White Paper decision on the future maritime surveillance aircraft—manned and unmanned—will result in a fleet fractionally smaller than the current nineteen AP-3C *Orions*. Ultimately, however, its capability will be significantly greater for many tasks due to the speed and extended range of the likely manned aircraft, the Boeing 737-based P-8 *Poseidon* and the long endurance of unmanned aircraft under consideration. This will allow for quicker response and wide area surveillance over a much larger area than previously possible. As discussed later, the timing of the two acquisitions may prove problematic in terms of overall interim capability.

Command, control and networking capabilities, particularly in a joint environment such as battlefield support, will require further development but *Wedgetail* and the *Super Hornets* (the latter with advanced networking 'off the shelf' courtesy of its US Navy heritage) will make excellent contributions to the networked force. (ADF C^{4}ISR capabilities will be discussed further in the final paper in this series.)

Major decisions and issues over the next few years will include:

- whether to proceed with acquisition of further F-35 aircraft (and when)
- the timing and types 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 development of doctrine and tactics to make best use of the capabilities provided by new air combat capabilities, especially *Wedgetail*
- the continued development of training and education processes to ensure that Air Force people are prepared to exploit the very capable new systems it is procuring.

Provided that all of the current plans deliver the promised capability, the RAAF will not have any notable platform capability shortfalls in the longer term. However, in the short to medium term there are several potential capability gaps:

- air-to-air refuelling—no current capability, but expected to be rectified in the near-term through delivery of five KC-30A tanker aircraft.
- tactical airlift—following retirement of the *Caribou*, short/rough field airlift cannot be provided with current types. New aircraft expected from around 2015 will provide the desired capability.
- maritime surveillance—the deferral of the unmanned component of the future maritime patrol capability to beyond 2019 could result in a reduced ability to conduct concurrent patrol operations.

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 2009 Defence White Paper identified a number of fundamental military strategies. The basic air combat roles are:

- air superiority
- maritime strike
- long-range strategic strike
- offensive air support
- close air support.

At the moment, Australia's air combat capability is provided primarily by 1980s vintage multi-role F/A-18A/B *Hornets*, soon to be augmented by the F/A-18F *Super Hornet*, the first five of which arrived in March 2010. The 1960s vintage F-111 strike and reconnaissance aircraft are in the process of being phased out, but will provide some capability for the remainder of 2010.[1] The F-35 *Lightning II* Joint Strike Fighter project is expected to deliver aircraft from 2014 onwards, with the first squadron—drawn from the initial purchase of fourteen aircraft—expected to be declared operational in 2018. Government will consider acquisition of another fifty-eight F-35s in 2011–12—allowing for three squadrons to be equipped with the type.

The publicly stated capability goal is to maintain four operational squadrons at all times (around 100 aircraft). To achieve that goal, the twenty-four *Super Hornets* will replace a similar number of F-111s and will supplement the now upgraded *Hornet* fleet. The *Hornets* will be progressively replaced by F-35s, while the *Super Hornets* may be replaced in turn sometime after 2020, although this is not yet decided.

The *Super Hornets* have proven to be the star performers of the air combat capability in terms of delivering agreed capability on time—the consequence of being an in-series production known quantity when ordered. The other components of the air combat capability have proved much more problematic. Since the corresponding 2008 brief, the acquisition of five new KC-30A air-to-air refuelling aircraft has run into some problems, and a delay of well over a year has resulted. The first of five aircraft should be delivered later in 2010. Worse, the *Wedgetail* AEW&C project is over four years late, though recent developments suggest that the worst problems are now behind the project, and it is hoped that the Final Acceptance milestone for the first aircraft will occur in December of this year. The F-35 program in the United States had a relatively poor couple of years—2008–2010. Cost growth and schedule delays (due in turn to delays in the delivery of test aircraft and thus to the test flight program) have seen the program make headlines for the wrong reasons. However, recent progress has been much improved and it is hoped that the program is back on track to meet its revised milestones.[2]

Given the problems with the rest of the air combat capability plan, the decision to acquire a squadron of F/A-18F *Super Hornet* Block II aircraft (which this author criticised at the time of announcement) now looks prescient. While it is true that they will add another set of fixed costs to the support budget, they 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.

The *Super Hornets* will give the RAAF a capability on a par with the US Navy. As well, the decision to have twelve of the aircraft configured on the production line to the 'F+' standard—meaning that they are fitted for but not with the systems required to convert the aircraft to the EA-18G *Growler* electronic warfare variant—gives additional future flexibility. At the moment the plan is for the *Super Hornets* to operate until 2023. At that point they may be replaced by the fourth squadron of F-35s, though no decision will be made in the lifetime of the current DCP.

On balance, it seems that the *Super Hornet* and 'legacy' *Hornet*, when combined with *Wedgetail* and air-to-air refuelling, will fulfil the 2009 White Paper's aims for Australia's air combat capability for the remainder of this decade. The number and capability of Australia's air combat aircraft will overmatch the piecemeal and less well supported fleets of nearby nations (the exception being Singapore—hardly likely to feature as an adversary in any case). As well, in any defence of Australia scenario, the geographic advantages of operating from home bases means that the RAAF should be able to establish local air superiority and conduct sea denial operations even against a major power adversary. If there is cause for concern, it is that the strength of the *Super Hornet* is in its sensor and EW systems and history shows that EW advantages tend to be ephemeral. However, the USN plans to retain the *Super Hornet* in inventory well beyond 2020, meaning that there is a capability growth path and the possibility of fitting the F+ aircraft as *Growlers* means that there is further scope to enhance the fleet's EW capability if required.

And the acquisition of the F-35 will result in a further capability boost from 2018 onwards. Despite the aforementioned cost and schedule problems, none of the various reviews of the program have identified any shortcomings in the warfighting capabilities to be delivered. In ASPI's 2008 capability review, we observed that the

F-35 performance metrics were largely based on modelled performance and were yet to be demonstrated in hardware. Today the first mission capable aircraft is flying and the all-important software suite has performed well.

In short, the RAAF's air combat capability remains in a state of transition, but the imminent delivery of several key components of the end-to-end system bodes well for the future.

Air combat – joint operations

The ability of the RAAF to participate in joint and/or coalition operations is also improving. In terms of support to land operations, both the *Super Hornet* and the F-35 will be capable of close air support and battlefield interdiction. The F-35 will be able to do so at lower risk due to its low observability (stealth), and should also have a greater loiter time over the battlefield. Even so, the major limitation in such roles will be reach and persistence if forward airfields are not available for whatever reason. Given the extent of the geographical area identified as the ADF's primary operating environment in the White Paper, maintaining air cover in some of the more distant locations will stretch the RAAF's capacity.[3] Combined with the limitations of Army's ground based air defence (as discussed in the Army capability review paper in this series) and joint command and control systems, this means that 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.

Delivery of the *Super Hornet*, with its advanced sensors and data links will improve the RAAF's ability to interoperate with the Navy. The *Super Hornets* will be able to collect ISR data and exchange it in real time with surface units. (The *Hornets* have similar, though less extensive, capabilities.) As well, the DDGs will be fitted with systems that will interoperate with the air combat capability (see next section).

Air combat - AEW&C[4]

The six *Wedgetail* AEW&C aircraft being acquired under project AIR 5077 are designed to track multiple targets while continuously searching for new contacts. This paper's 2008 predecessor described the *Wedgetail* program as beset by a number of technical problems and having an uncertain future. Happily, most of those issues have now been resolved and a powerful capability is emerging.

On Exercise *Arnhem Thunder* in 2009, the *Wedgetail* showed both its ultimate potential and some solid, useable performances. It switched from the 'blue' to 'red' forces on an ad hoc basis to test or demonstrate different elements of its capability, including—importantly—its ability to share its radar picture and other tactical information with the RAAF's upgraded *Hornets*. Whenever it was withdrawn from the exercise, the side it had been supporting immediately felt the lack and suffered in tactical terms.

One of the features of *Wedgetail* which makes it so effective is its communications suite. Formerly the cause of considerable concern, this is maturing into a stable networking capability. As well as the normal radios and satellite links, *Wedgetail* incorporates the Link 16 Tactical Data Link, which enables similarly equipped aircraft, ships and ground stations to exchange considerable volumes of very complex data in real time. In particular, Link 16 carries radar and EW data. It sends the *Wedgetail's* radar data down to the *Vigilare* ground control station where it is fused with data from warship and ground based radars and integrated into the so-called Recognised Air Picture (RAP). Via Link 16, this is then shared in real time with the *Wedgetail* which passes it on to the tactical aircraft. This constantly

updated situational awareness—combined with the effectiveness of the sensor systems producing the data—bestows a massive combat advantage on the air combat fleet.

Wedgetail will also enable new joint warfighting techniques for the ADF. The White Paper flagged the fitting of a cooperative engagement capability (CEC) on the *Hobart* class DDGs which will allow them to exchange tracking and targeting data with *Wedgetail*. This will allow the targets identified at long range by the aircraft (well beyond the DDG's radar horizon) to be engaged with the ship's 375 km range Standard Missile SM-6 missile. The DDGs are scheduled for delivery from 2014, although full capability including the CEC and SM-6 will be some time later.

On EX *Arnhem Thunder* the *Wedgetail* was able to share the RAP with the RAAF's upgraded *Hornets* using Link 16 (this capability was part of the *Hornet* upgrade). Also last year, Boeing initiated the first Link 16 data exchanges between *Wedgetail* and the *Vigilare* ground station. Still to come are demonstrations of Link 16 connectivity with the RAAF's new Boeing *Super Hornets* and the RAN's recently upgraded FFG frigates.

Air-to-air refuelling

Five KC-30A air-to-air refuelling aircraft (based on the Airbus A330 airliner) are being acquired. They will replace the four Boeing-707 tankers retired in 2008 and 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-17A airlifters, the *Wedgetail* AEW&C and other KC-30As, 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-30A would be able to refuel six *Super 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 was 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. However, the delivery schedule is running late and, for the time being, this lessens the reach and persistence of the air combat capability. Revised plans have the first aircraft being delivered in the second half of this year.

Air lift

Australia's strategic airlift capability has been much improved by the delivery of the C-17A *Globemaster III*. In part to alleviate the heavy tasking of the *Hercules* fleet resulting from ADF deployments in the Middle East and elsewhere, the previous government bought four C-17As through a Foreign Military Sales purchase from the United States. Faster, longer-ranged and able to carry more than three times the payload of the *Hercules*, the C-17A is 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.

The C-17A is already a much-used asset. In the 2008–09 reporting year, the four aircraft flew a total of 3,367 flying hours (albeit against a budgeted 5,000 hours)—or over 840 hours per aircraft. The shortfall against the budget figures was due to the immaturity of training and support services for the new type, and to down-time

required to fit new countermeasure systems for operations in areas where infra-red seeking missiles constitute a threat. But, even so, the rate of effort compares favourably to the *Hercules* fleet; the C-130J fleet flew 600 hours per aircraft and the –H models a little over 280 hours each. These numbers may in part reflect the revised role of the *Hercules* fleet—flying the short-haul intra-theatre missions while the C-17As shoulder the long-distance transport—but the manpower resources available to fly the C-130H were also reduced when the C-17A was delivered.

As discussed above, the KC-30A refuellers will also have a significant airlift capability as well as their primary role. With the C-17A, 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 less than battalion level. Larger deployments will still require multiple airlifts, possibly augmented by commercial charter aircraft, or sealift for the bulk of their supplies.

With the retirement of the fourteen *Caribou* aircraft, there is currently a capability gap at the tactical airlift level. Some light airlift capability is provided by Beech *Super King Air* aircraft (some of them were formerly Army aircraft) and Army's CH-47 *Chinook* helicopters provide vertical landing and take-off capability for short-range battlefield airlift. The decision on a replacement type has been deferred at least once, and is now planned for somewhere between 2012 and 2015. The world market offers a number of credible contenders, albeit none of which match the short take off and landing and rough field capabilities of the *Caribou*. The replacement type will nonetheless provide better short and rough field capability than the *Hercules* or C-17A can provide.

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 under project AIR 7000, although the planned order of the steps has reversed since the 2008 ASPI capability snapshot was published. Formerly, the plan was to first acquire high-altitude long-endurance UAVs capable of maritime and overland ISR roles and Electronic Support (ES) and, subsequently, a manned aircraft capable of carrying out tasks such as search and rescue, anti-surface, anti-submarine and ISR missions.

The United States has selected the *Global Hawk* UAV and the P-8 *Poseidon* (based on the Boeing 737 airliner) for its Broad Area Maritime Surveillance (BAMS) capability and Australia is expected to follow suit. Recent decisions have seen this order reversed and the manned aircraft will now come first, with the UAV to follow sometime 'beyond 2019'. The RAAF argues that the workload required to transition to two new types concurrently and the slips to availability of the UAV precludes an early adoption of the UAV.

However, there is a potential for maritime patrol capability to be compromised in the short to medium term by this approach. The plan is to replace the current fleet of nineteen AP-3C *Orion* aircraft with eight new maritime patrol aircraft. It is true that the range and speed of the P-8 will give it greater effectiveness in the response role and it should be a capable warfighting platform. But concurrency is important for surveillance operations, and eight aircraft will simply not support as many simultaneous missions as nineteen. The wide area surveillance capability of a UAV like *Global Hawk*, with its 24+ hour endurance and greater operating altitude (and hence greater field of view), would constitute an important component of the overall maritime patrol capability. (A future ASPI paper will look at the case for introducing the unmanned aircraft sooner than the current plan, which could provide a more robust maritime surveillance capability for both Defence and for the wider security community.)

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 two forward deployments 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, RAAF personnel operated the control and reporting centre (CRC) at Kandahar Air Field in Afghanistan from August 2007 until August 2009. This deployment had organic connectivity for battlespace management and deployed its own tactical radar units. It had primacy for the whole Afghanistan theatre, and was responsible for the de-confliction of some 12,000 aircraft movements a month, including UAVs and tanker aircraft.

Endnotes

1 The ASPI *Cost of Defence* annual budget brief for 2010–11 contains a valedictory essay on the F-111 which reviews the aircraft's contribution to Australian defence and discusses the reasons for its retirement.

2 The ASPI *Cost of Defence* annual budget brief for 2010–11 contains project summaries for the F-35 and *Wedgetail*. The 2009–10 *Cost of Defence* includes a KC-30A project summary.

3 This point is explored in much more detail in a forthcoming ASPI report *Middle power projection*: *Australia's expeditionary capability and strategic ambitions*.

4 Much of the material in this section is excerpted from the project report by Gregor Ferguson in the 2010–11 ASPI *Cost of Defence* referenced in note 2.

About the Author

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