

# Airpower projection in Australia

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*F-35 Joint Strike Fighter with open weapon bays. Note the characteristic hinged bomber style weapon bay doors.*

THE Australian Air Force is undergoing major changes across its force structure, some of which will improve its capabilities, and some demonstrably will not. The changes that will produce positive impacts are the introduction of the Wedgetail AEW&C, the A330-200 tanker and the P-8A Poseidon Long Range Maritime Patrol aircraft. The capability of the post-2010 RAAF force structure in a range of contemporary operation environments, and against common threat systems, will in the final analysis determine whether the changes have gone far enough.

## OPERATING IN UNCONTESTED AIRSPACE

Uncontested airspace is an environment in which military aircraft do not have to confront an opposing air force or opposing Integrated Air Defence System (IADS) armed with surface-to-air missile batteries, or both. The last air campaign fought by Western air forces in which the air environment was genuinely ‘opposed’ was the 1991 Desert Storm campaign. The bombardment of Serbia in 1999 saw little opposition by poorly maintained and obsolete Soviet Cold War period equipment, and the 2003 invasion of Saddam’s Iraq was virtually ‘unopposed’, other than intensive small arms fire at low altitudes. Most air operations conducted since ‘9/11’ have been in support of Counter-Insurgency Operations (COIN).

The ability of the Wedgetail AEW&C to act as a Command Control Communications node and airborne command post, as well as a highly mobile self contained air traffic control system with primary and secondary radar capabilities, is of high value in all air operations environments, as managing air traffic and operations even in a COIN environment is a demanding activity. This was true during the extensive COIN air activity of the Vietnam conflict during the 1960s and 1970s, and has been proven over and over again in the COIN air operations in Iraq and Afghanistan. During the Vietnam conflict, EC-121 AEW&C, EC-130 and EC-135 airborne

communications relays and command posts proved invaluable in managing such operations. The experience has been repeated since then, with E-3C Sentry AWACS, E-2C Hawkeye AEW&C continuing to be heavily used. The US Air Force E-8 JSTARS was often used in Iraq as an airborne command post and communications relay, its primary ground target search radar not being used. Close Air Support (CAIRS) and interdiction strike operations in a contemporary COIN environment depend heavily on the presence of airborne armed aircraft, orbiting on standby in proximity to an area of operations. If air support is to be responsive to ground force requests, the aircraft must be minutes away from the supported unit or units. The notion that an aircraft can be sitting on the ground waiting for a command to launch a sortie, and respond in minutes, is simply not feasible operationally. With the removal of the F-111 from the RAAF force structure on-station persistence of fighter aircraft has become an absolutely critical item, and one capable of seriously impairing combat effectiveness. For comparison, an F/A-18A/B Hornet has around 30 per cent of the ‘throw weight’ of the F-111 when loaded with smart munitions, and the F/A-18F Super Hornet around 40 per cent of the ‘throw weight’ of the F-111. As a result, both F/A-18 variants depend on tanker support.

The consequence of this is that even in an unopposed COIN oriented combat environment, RAAF KC-30A tankers would be a critical 'no-go' item for most fighter air operations. The number of available tankers will impose hard limits on the number of fighter sorties that could be flown at any one time. Subject to range and on station endurance, a practical limit of four available tankers at any time would constraint the RAAF to 16 to 32 fighters available for operations at any time.

The P-8A Poseidon has the potential to be a very useful asset in COIN operations, if its APY-10 radar delivers the promised surface search, imaging and ground/maritime target detection and tracking capabilities. With good persistence and a large surface coverage footprint, and the ability to track blue water shipping, littoral small vessel brown water shipping, and moving ground targets like vehicles, the P-8A can provide a very effective capability to support COIN operations with realtime or near-realtime ISR against the full spectrum of surface targets.

In summary, the planned RAAF force structure will be reasonably effective in an uncontested operational environment, but not necessarily efficient due to the heavy dependency of the fighter fleet on a limited tanker fleet.

## OPERATING IN CONTESTED AIRSPACE — COLD WAR ERA THREAT SYSTEMS

Contested airspace over the coming decade will fall into a number of distinct categories, depending primarily upon the force structure and thus capabilities of the opponent in question. Broadly, potential opponents globally can be divided into three basic categories: operators of Cold War era Soviet equipment, operators of basic post Cold War era equipment, and operators of state-of-the art Russian and Chinese equipment.

An operator of Cold War era Soviet equipment will be equipped with aircraft such as the first generation of exported MiG-29 Fulcrum and Su-27SK Flanker fighters, or earlier Soviet or Chinese built MiG-19S Farmer, MiG-21F/PF/PFM Fishbed or MiG-23 Flogger fighters, armed with basic 1980s missiles such as the basic R-27 or AA-10 Alamo, R-73 or AA-11 Archer, and R-60 or AA-8 Aphid, with aircraft fitted with rudimentary threat warning equipment, and no electronic countermeasures. IADS elements would include a range of analogue Soviet built radars including the P-14 Tall King, P-18 Spoon Rest, P-15/15M Flat Face/Squat Eye, P-37 Bar Lock and P-40 Long Track. SAM capabilities would include the analogue S-75 / SA-2 Guideline, S-125 / SA-3 Goa, 2K11 Krug / SA-4 Ganef, S-200 / SA-5 Gammon, 2K12 Kvadrat / SA-6 Gainful, 9M33 Romb / SA-8 Gecko and in some instances, early analogue command link variants of the S-300PS/PMU or SA-10B Grumble. These systems were mostly exported during the Cold War, or during the early 1990s global fire sale of ex-Soviet equipment.

Against an opponent armed with legacy Soviet Cold War era weapons, the RAAF's planned post-2010 force structure would be in most instances, highly effective. Superior ISR, superior guided weapons, and importantly, superior electronic countermeasures equipment would mostly degrade the effectiveness of the threat systems, especially missile guidance. The JASSM in particular is extremely difficult to engage by Soviet era

analogue SAM systems. Soviet era fighter aircraft have very limited radar capabilities, giving the RAAF a major advantage. Some genuine risk would arise for the RAAF with the S-200 / SA-5 Gammon and early S-300PS/PMU or SA-10B Grumble SAM systems, which are kinematically high performers, and despite their analogue design, have excellent resistance to electronic countermeasures. The SA-5 in particular was built to kill the E-3 AWACS, EF-111A Raven and KC-135R tanker from ranges of up to 160 nautical miles.

The difficulty Australia has to confront is that opponents in this category are very few, and in the Asia-Pacific confined to a small number of nations, including North Korea, Myanmar/Burma, Sri Lanka, Cambodia – and further afield, Iran, some Central Asian former Soviet Republics, and states in sub-Saharan Africa. The likelihood that the RAAF would be required to independently conduct an air campaign against any of these nations is nil.

## OPERATING IN CONTESTED AIRSPACE — POST COLD WAR THREAT SYSTEMS

An operator of post Cold War equipment, typically supplied between 1995 and 2010, presents a far more challenging opponent. Fighter aircraft operated by nations in this category include post Cold War configurations of the Su-27SK/SMK Flanker, the post Cold War developed Su-30MKK/MK2/MKV Flanker G, Su-30MKI/MKM Flanker H, armed with a wide spectrum of Precision Guided Munitions, including various cruise missiles, digital evolutions of the AA-11 Archer, and the digital R-77 / AA-12 Adder and Luoyang SD-10/PL-12 Sino-AMRAAM. IADS radars and SAM systems include post-Cold War digital evolutions of the S-300P, including the lethal and mobile S-300PMU1/PMU2 / SA-20A/B Gargoyle, potent point defence systems such as the 9M331 Tor M1 / SA-15C Gauntlet and 2S6M Tunguska M / SA-19 Grison. IADS elements are likely to include fully digital rebuilds of some Soviet era equipment, and the now exported Chinese HQ-9, similar to the S-300PMU1.

Against an opponent armed with post Cold War era weapons, the RAAF's planned post-2010 force structure would be, in most instances, of marginal effectiveness. Specific concerns arise with the effectiveness of weapons against the modern digital countermeasures and decoy systems typically used with this generation of equipment, and the effectiveness of RAAF countermeasures against sophisticated digital threats. A late model Flanker equipped with a Digital RF Memory self-protection jammer, integral Missile Approach Warning System (MAWS), and capable of 9G evasive manoeuvre will present a challenging long range target for any AIM-120 AMRAAM variant. The US cannot at this time even test the AMRAAM against this type of target, as it lacks aerodynamically representative target drones. While the combat record of the AMRAAM against Soviet era targets yields a ~50 per cent success rate, this figure will be wildly optimistic against electronically sophisticated and kinematically difficult targets.

A major concern is that neither Hornet variant is aerodynamically competitive against the late or early model Flankers, which thus gain the initiative in aerial engagements. With much larger operational payloads of AMRAAM class missiles, and a large altitude and speed advantage, in the classical 'high noon' missile shootout, the

kinematic advantage of the Sukhois would mostly yield an advantage in missile range for the first shot. Mixed active radar, infrared, passive anti-radiation and dual mode seekers in the R-77 and PL-12 respectively, present a genuine risk of high RAAF loss rates in aerial engagements – Russian doctrine exported with their fighters is to shoot multiple round salvos of missiles with mixed seeker types.

The oft cited RAAF 'situational awareness advantage' presumes opponents with rudimentary threat warning receivers and inferior radars, no longer true of later digital Flankers, moreso if supported by AEW&C aircraft, which most air forces in Asia are acquiring.

A key concern for the RAAF will lie in dealing with the new Russian 200 nautical mile range R-172 'Anti-AWACS' missile, intended for all of the later digital Flankers. Designed for export as an 'equaliser for small air forces' this new weapon would allow an opponent to target the Wedgetail and KC-30A from outside the defensive perimeter of Hornet or Super Hornet Combat Air Patrols. Even if this missile does not perform as well as advertised, it would force very careful deployment of the Wedgetails and tankers, and rapid withdrawal if a launch is detected, severely disrupting operations.

At a strategic planning level a major concern for the RAAF will be the regional proliferation of air and submarine launched cruise missiles, in the Tomahawk class. As RAAF basing lacks any credible hardening, and the Rapier is not a credible weapon against such threats, significant fighter and Wedgetail operating hours would be consumed in an attempt to keep RAAF basing operational, and aircraft from being destroyed on the ground.

Advanced SAM systems like the SA-20 present a capability which the US Air Force Association has publicly labelled as 'impenetrable' to aircraft other than the B-2A and F-22A, an observation supported by careful study of their design. While the JASSM will have a respectable ability to penetrate such defences, the RAAF lacks any survivable means of realtime or near-realtime targeting in such an IADS environment, and would be severely limited in what it could engage with the weapon.

## OPERATING IN CONTESTED AIRSPACE — STATE-OF-THE-ART THREAT SYSTEMS

An operator of state-of-the-art Russian and Chinese equipment such as the Su-35S Flanker, the T-50 PAK-FA or the Chinese J-20, likely operating the S-400 / SA-21 SAM system and/or growth variants of the HQ-9, would soundly defeat the RAAF's planned post-2010 force structure, with or without the F-35 Joint Strike Fighter. These Russian and Chinese systems are weapons developed specifically to compete against the F-22A Raptor.

In conclusion, the RAAF will confront a major challenge within this decade, which is remaining viable in combat within a region which has become the primary global market for advanced Russian, and more recently Chinese, military technology.



Wedgetail AEW&C.



KC-30A MRTT.



Boeing P-8A Poseidon.

## RAAF FORCE STRUCTURE COMPONENT SUMMARY

### AIR5077 WEDGETAIL AEW&C

The AIR5077 Wedgetail project has experienced controversy since its inception. While the need for this capability was widely acknowledged and accepted since the early 1980s the program was almost killed off at launch when a senior bureaucrat in the Howard government objected to the modest cost of the program, given the capability being acquired. Genuine problems emerged during the development of the system over the last decade, as a result of overly optimistic development risk assessments by the contractor team and a failure to manage risk by Australia's acquisition bureaucracy.

The principal difficulties which emerged during development centred on the unusual and innovative 'top hat' cavity endfire active phased array antenna for nose and tail coverage, but also the close physical placement of the sidelooking MESA primary active phased array antennas, which resulted in unexpected interactions between the antenna and airframe. This style of antenna system had never been constructed before, and its electrical behaviour was not well understood. While workable fixes have been introduced, the expectation is that the final product will not deliver its full potential in radar performance.

Nevertheless, the Wedgetail will provide a valuable capability to the ADF, and is a competitive modern AEW&C system, with a genuine active phased array capability absent in the US E-3C AWACS and the new E-2D Hawkeye variant, and a comprehensive C3 and very good passive radio-frequency surveillance capability.

Six aircraft have been procured, three short of the number required for robust coverage of the northern continental arc. The aircraft will be operated by the reformed 2 Squadron based at RAAF Williamtown in New South Wales.

### AIR5402 KC-30A MULTI-ROLE TANKER TRANSPORT

Australia's replacement AIR5402 tanker fleet will be based upon the Airbus Military A330-200 tanker, initially selected by the Royal Air Force, and later selected in the second abortive round of bids for the US Air Force KC-X program, intended to replace the KC-135R Stratotanker. The A330-200 MRTT is a genuine dual-role tanker-transport, although the initial contract did not include the full freighter conversion for the aircraft passenger deck, limiting airlift capacity to lower deck payloads.

In assessing the KC-30A, the aircraft offers fuel offload capability between "medium tankers" but below "heavy tankers", making it very competitive against legacy tankers like the KC-135R, B-707-320, Il-78 Midas and A310-MRTT. Its principal weakness is a very large ground footprint, a result of which it has the lowest ratio of fuel offload performance to ground tarmac footprint of any tanker design built to date.

The program is currently running 18 to 24 months behind contracted schedule, but this predates the in-flight accident in January 2011 during which a portion of the aerial refuelling boom broke off while refuelling an F-16 aircraft.

The five aircraft to be acquired are estimated at around 25 per cent of the tanker capacity needed to support the RAAF fighter fleet. The aircraft are to be operated by 33 Squadron from RAAF Amberley in Queensland.

### AIR7000 P-8A POSEIDON

In April, 2009, Australia signed a Memorandum of Understanding with the United States to join the P-8A Spiral 1 cooperative development program. Defence has publicly stated an intent to seek government approval for acquisition in 2011, with the intention of procuring eight aircraft for deployment in 2018 to replace the AP-3C Orion fleet. The AP-3C is flown by 10 Squadron and 11 Squadron, forming 92 Wing at Edinburgh in South Australia.

The P-8A is the intended replacement for the US Navy P-3C fleet, and is based upon the Boeing 737 airframe, with a new and significantly more capable mission suite than its predecessor.

The P-8A is a conventional LRMP aircraft with nine crew stations, an AN/APY-10 radar with robust overland imaging capabilities, a USQ-78B acoustic processor capable of supporting more sonobuoys than legacy P-3 systems, and a very modern Emitter Locating System based on the AN/ALQ-218(V)2 developed for the EA-18G Growler. US Navy P-8As will not be fitted with a MAD sensor, which will be available for export aircraft. Weapons capabilities include a heated aft fuselage internal bay with five hardpoints for torpedoes or mines, and four outboard wing hardpoints for AGM-84 Harpoon/SLAM missiles, bombs or mines.

The number of P-8A aircraft intended to be procured may be sufficient for surface search roles but in roles with a high proportion of time spent at very low altitudes prosecuting submarines a number closer to the current AP-3C inventory would be a much safer choice.



Boeing F/A-18A HUG Hornet.



Boeing F/A-18F Super Hornet.

### THE RAAF FIGHTER FLEET

While Defence has made a commitment to procure the F-35 Joint Strike Fighter as a single type replacement for all RAAF fast jets, ongoing uncertainties, delays and cost increases in this program indicate that the earliest a mature and nominally operational capability could be introduced would be at the end of this decade, or the start of the next decade.

Until planning for the future RAAF fighter fleet is changed, or F-35 Joint Strike Fighter aircraft delivered, the RAAF fighter fleet will comprise the remainder of the existing fleet of F/A-18A 'Classic' Hornets, subjected to the HUG upgrades, and the 24 F/A-18F Block II Super Hornets procured under the Bridging Air Combat Capability program.

The primary standoff weapon being procured for the fighter fleet is the potent AGM-158 JASSM stealthy cruise missile, which has been delayed due to difficulties in development, test and early production.