

Are the F-111s

really stuffed?

Don Middleton

New air combat capability

The frontline elements of Australia's current air combat capability comprise various weapons platforms, missiles, bombs, tanker aircraft and ground-based radar, control and reporting elements. The principal weapons platforms are the F-111 bomber (in service since 1971) and the FA-18 Hornet fighter (in service since 1985), although the Hawk-127 lead-in fighter-trainer (in service since 2001) has some tactical utility for close air support of ground and maritime forces.

The New Air Combat Capability (NACC) project is currently based on a plan to retire the F-111 fleet in 2010 and use some updated Hornets as an interim strike capability until the F-35 Lightning II Joint Strike Fighter (JSF) is scheduled to enter squadron service in the 2014-2018 period (but probably later). The wider modernised air combat capability is also to include new tanker aircraft (Airbus A330s) and the introduction of Wedgetail airborne early warning and control (AEW&C) aircraft based on the Boeing 737-700 airframe.

In practical terms our current strike and fighter aircraft are effectively third-generation technology updated with some fourth-generation avionic systems. Both are twin-engined. The decision to replace both of them with a common platform is controversial in itself. The choice of the single-engined, developmental F-35 as this common platform is even more controversial. The professed justification for doing so is principally based on the claimed engine reliability technology (ignoring the perpetual threats from bird strike or foreign object damage), stealth characteristics and advanced electronic systems of the F-35 as a fifth-generation aircraft.

The F-35 has a much shorter range than the F-111, a lower dash speed and around half the payload capacity to carry weaponry (largely because it carries them internally for stealth reasons). These apparent deficiencies are supposedly cancelled out because the non-stealth characteristics of the F-111 mean it is increasingly vulnerable to long-range air-defence missiles, and it will soon need fighter escorts anyway. Any accompanying fighters would incur the same airborne tanking support and speed limitations as the F-35 brings.

The first prototype F-35 only flew in December 2006 and the Hornet upgrade program, one of the six capability projects that needed to be done before the F-111 was to be retired, has run into difficulties. There is thus a high likelihood that the

JSF program will be further delayed and that the upgraded Hornets will not be sufficient as an interim option over the longer fleet transition period involved.

A tangled web

There are also widespread concerns that the published costings of the JSF program are overly optimistic and that the Department of Defence's confidence in this regard is ill-founded. The choice of the F-35 was essentially a political decision by the Government and was taken before any robust capability development analyses and comparison studies were completed. The public justification for this short-cut decision was primarily based on the belief that, by the time it was developed and operational, the F-35 would be technologically superior to all the alternatives – even though it has been designed to a price first and then the military requirements.

This view has been widely challenged to varying degrees by a range of aerospace experts and military strategists. This criticism has not been effectively answered or refuted and much of the counter-argument from Defence could only be described as bluster. The Department of Defence and the RAAF have appeared most reluctant to honestly debate their critics, and the number of the latter is growing across military professional, scientific, academic and parliamentary disciplines.

The decision to drop the comparative studies and opt for the F-35 alone was also heavily based on the belief it would be cheaper than other alternatives, such as the F-22 Raptor. The F-22 is a fifth-generation aircraft with high agility and supercruise capability, and is already in USAF squadron service. It was also designed to meet military requirements first and only then price. The USAF cannot, at this stage, spend any money marketing, selling or licensing it to foreign air forces due to the Obey Amendment 'earmark' on the US Defence budget appropriation bill.

Given US political developments and the problems of the JSF program, there are well-founded fears that the cost differential between the F-35 and its competitors, even the F-22, might be only marginal by the time the F-35 would be finally available for operational service in Australia. Some expect the F-35 might end up costing as much as the F-22, and perhaps even more, particularly if the numbers of F-35s

to be purchased by the USAF and USN are cut substantially for future budgetary reasons. The reader should note that the AIR 6000 study was never completed and normal acquisition processes were not followed, therefore no real set of requirements have been levied on the new multi-role aircraft.

The final three arguments advanced against the F-22 are that they are not for sale, that even if they were for sale it would be an inferior export version, and that it is not as multi-role an aircraft as the F-35. The sale argument is largely a straw-man one. Until we formally ask the US we do not really know one way or the other. There is little validity to the role comparison point. The F-35 might be marginally better in some strike roles but is much less survivable than the F-22 in all of them – and will also be an inferior export variant to those in US service. No-one seriously denies that the F-22 is much superior in the air defence role and probably as capable if not better in the battlefield support one. Many of the systems on both aircraft will be similar technology because improvements emerging from the JSF program will be retro-fitted to the F-22.

Finally, to cover the likely widening gap between the retirement of the F-111s in 2010 and an operational JSF capability later the following decade, the government is apparently considering an interim option. The normal acquisition processes, and the requirements of the AIR 6000 project, are not being followed for a second time. This interim option is based on the lease or purchase of 24 F/A-18F Super Hornets and cancellation or scaling back of the Hornet upgrade program. The Super Hornet (a late third-generation aircraft with some early fourth-generation capabilities) is already in service with the US Navy and still in production. A number of USN Super Hornets have apparently already been earmarked for Australia under US contingency plans, with the resultant USN shortfalls to be backfilled from an extended production run. It should also be noted that the USAF does not consider the F/A-18F, or indeed the F-35, to be replacement aircraft in the strategic strike role.

Nub of the debate

The various NACC plans have attracted considerable criticism and the most recent mooted plan concerning Super Hornets has brought another wave of objections. In summary, several alternative solutions have been suggested, often in various combinations. These really boil down to three broad options:

- retain the F-111s until the F-35s can fully replace this strategic strike capability (probably somewhere around 2018-2020);
- do not buy F-35s at all, update the F-111s and retain them in the strike role until the mid to late 2020s, and buy the F-22 for the air defence and battlefield support roles (if the US would sell us the Raptor and we could afford it in sufficient numbers);
- continue with the plan to scrap the F-111s but only after the introduction of a mixed fleet of F-22s and F-35s (over the 2012-2020 period) with the F-35s replacing the F-111s somewhere around 2018-2020.

All these options depend on the continued tactical and airworthiness viability of the F-111, either updated or not. Settling this point is therefore the nub of the debate.

The leadership of the RAAF have regularly maintained that the F-111 is nearing the end of its life and that the operational, safety and financial risks of continuing to operate the aircraft mean it should be retired sooner rather than later. But is this fact or just spin? This is important as the processes followed appear somewhat unorthodox to say the least and some \$A4 billion is at stake.

Just as importantly, what might the early retirement of the F-111 really mean for the ADF's overall aerospace technological capacity and for Australian aerospace industry capabilities generally?

Six prerequisites for retirement

In 2004, the then Chief of Air Force (now CDF) set six prerequisites to be achieved before the F-111 could be retired:

- **Hornet Upgrade.** This is unlikely to be completed by 2009 as the EW aspects have encountered significant delays due to the cancellation of the ALR 2002 project.
- **A330 Tanker.** There will probably be delays but this aircraft might be in service by 2010. The F/A-18F has an insignificant increase in range over the F/A-18A/B so the interim option does not offset this requirement. Buddy tanking between Super Hornets does not address this either. With the outer wing pylons holding weapons, the range is very similar and creates the same tanking problems as with the FA-18A/B (ie. need for safe diversion).
- **Wedgetail AEW&C Aircraft.** The RAAF has admitted this aircraft will not meet initial operational capability until mid 2010 at the earliest and the F/A-18F does not offset this requirement.
- **Joint Direct Attack Munition (JDAM) GPS-aided Bombs.** This is already on the F/A-18F and is likely to be completed for the F/A-18A/B, but will also be available on the F-111 before the end of 2007. More importantly, the F-111 will be able to deliver more of these weapons to a greater range due to its larger payload radius.
- **Joint Air-to-Surface Stand-Off Missile (JASSM) on the F/A-18A/B.** This is unlikely to have met initial operational capability by 2010 as it is a difficult integration. The F/A-18F does not offset this requirement and the aircraft is yet to have the weapon integrated. This weapon has a difficulty in deployment which the AGM-142 Stand-Off Weapon (SOW) on the F-111s does not, although the JASSM has greater range. The AGM-142 also provides proof of hit which reduces the need for bomb damage assessment or further reconnaissance missions.
- **JASSM for the P3C Maritime Patrol Aircraft.** This program has already been cancelled as it was very difficult to do in the first place and is of questionable combat utility anyway.

Many of these stated essential goals are unlikely to be met by the time a full commitment to the retirement of the F-111 will be made. Furthermore, despite significant expenditure,

Australia now faces the serious prospect that by retiring the F-111s prematurely we risk destroying the knowledge base needed to solve such problems in the future.

Moreover, the F/A-18F interim option does not appear to satisfy most of the six prerequisites to any greater degree than the current Hornet upgrade program does.

Hornet trap beckoning

The F/A-18F at best provides a substitute aircraft for those F/A-18A/Bs that may be grounded while they undergo life extension modifications and upgrades to get them through to 2015. The F/A-18F cannot plug the capability gap created by premature F-111 retirement. In real capability terms, it takes about three F/A-18Fs to produce the combat effect of one F-111.

Other difficulties also arise. Weapon clearances will need to be redone to accommodate different usage in Australia. The deep access Australia currently has to the F-111 electronic warfare system disappears with the F/A-18F. This would make Australia vulnerable to delays at the US end in reconfiguring the equipment to deal with new threats, and Australian aircrew would be vulnerable to not knowing the limitations in the equipment. The lack of significant commonality between the F/A-18 variants will require a unique logistical arrangement which, in itself, engenders risk and cost.

The procurement of some F/A-18Fs as an interim option brings its own problems, not least the additional expense (upwards of \$A3bn for a buy), and the risk that if the JSF program fails to deliver Australia might be stuck with the Super Hornet as our new fighter and strike aircraft for a generation. This would mean entrenching air inferiority for the first time since this disastrous policy was last enforced in the 1930s and thoroughly disproved in World War II.

Some critics of the F/A-18F interim option have expressed the concern that its manufacturer (Boeing) and the US Navy have a mutual interest in Australia retiring the F-111 and acquiring the F-18F aircraft. This would reduce the overall unit price to the US Navy so they can buy more aircraft. A side benefit would be the US Navy has another potential logistics base that is paid for by someone else. The benefit to Boeing would be increased sales, with the potential to even oust the JSF if that program continues to run into difficulties.

The other big strategic issue is that the maintenance strategy associated with the F/A-18F option has all the engineering capability being provided overseas – as with the C-17 heavy airlifter. This effectively destroys all the indigenous engineering capacities that the Commonwealth and industry have worked so hard at creating over the last 15 years through the contracting out of Air Force deeper-level maintenance capabilities. Furthermore, as the F/A-18F ages, its modifications and software upgrades (including special-to-Australia requirements) will have to fit into the US Navy upgrade cycle. Based on F/A-18A/B results, this is 3-4 years.

The F-111 capability

The current Chief of Air Force has portrayed the F-111 as an age-deteriorated aircraft subjected to constant rumour of retirement and with too many unknown technological risks in its future. But, like the USAF's B-52 bombers, nothing could be further from the truth. The F-111 continues to fly well in excess of planned hours, and has participated strongly in Exercises Red Flag, Northern Challenge and Pitch Black, among its other duties. In excess of the required F-111 hours were flown in 2006, which was only bettered in the mid 1980s when many more people and more money were involved.

On Exercise Red Flag the F-111s were deployed to the United States without the need for tanker support, demonstrating their ability to undertake tanker-less operations. Over five weeks around 98 per cent of planned sorties (approximately 140) were flown on time. A successful EW trial against advanced systems was conducted and practice usage of simulated AGM -142 SOW in an international environment was undertaken.

During Exercise Northern Challenge all objectives were met and no engineering maintenance support was requested.

On Exercise Pitch Black, the F-111s deployed flew over 100 hours more than planned and over 500 hours in total over three weeks. The deployed fleet availability overall was better than 90 per cent.

The F-111 continues to have many operational advantages due to its large simultaneous weapon payload of 22,000



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pounds and fuel load of 32,000 pounds, all of which have been successfully maintained or enhanced through Australian scientific, engineering and maintenance activities. All of this will not be possible with the F/A-18F as you can have either weapons or fuel but not both, and the engineering will be done in the United States.

Australian industry has continued to improve the F-111s since 1990. Various electronic kneepad devices are now in operational use and a night vision cockpit capability has been installed. The most significant (software and hardware) modification is the AGM-142 SOW, which has been cleared into full operational service, with its capability demonstrated through successful test firings and exercises such as Red Flag.

Australian industry has made the F-111 fully compliant with the new Military Standard 1760 (the weapons system interface standard). The aircraft can use a wide range of munitions from dumb bombs through to 'smart' laser-designated and J-series bombs, anti-ship missiles and stand-off weapons. It is expected that the JDAM GPS-aided 'smart' bomb will be operational on the F-111 by mid 2007.

Improved target identification has been successfully demonstrated in ground-based trials of a new sensor for the F-111 Pave Tack targeting pod, which will provide enhanced-quality infrared (IR) target imaging. Australian Industry has also successfully demonstrated a very inexpensive Link-16 solution recently on the F-111 which, in combination with the electronic knee pads, allows the F-111 to integrate into the Network Centric battlefield of the future. This type of battlefield may be some way off in the regional context anyway, not least because many other maritime, land and air elements will need a similar Link solution.

Ensuring the structural integrity of the F/A-18A/B and the F-111 has provided many challenges for the ADF over the last few years. However some spectacular work by a team from the RAAF, the Defence Science and Technology Organisation (DSTO) and industry has resolved these issues. The F-111 wings now have no operational limitations and the F/A-18A/B centre-barrel replacement project is well advanced. This effort has demonstrated Australia's knowledge and ability to sort out ageing aircraft issues to a world-class standard.

Effects on technological capabilities

The implications of a 2010 or earlier retirement of the F-111 also have considerable flow-on implications for other ADF programs and capabilities, particularly as Australia is now the only country to operate the F-111. Moreover, since the contracting out of F-111 depot-level maintenance in the late 1990s, much of the technical and engineering maintenance support of the F-111 is provided by Australian industry not the RAAF. At the very least the retirement of the F-111 means a significant loss in the associated scientific, engineering and flight-test capabilities, and in the highly-skilled workforce involved.

This Australian industry-based capability provides the RAAF with a vital rectification and modification capability

for the F-111. Just as importantly these additional capabilities enable such skills to be applied to other current RAAF aircraft (F/A-18A/B, B-707, etc) and more importantly future aircraft employed by the Air Force (such as Wedgetail). This means Australia maintains a significant indigenous and autonomous technological capability, and such a degree of operational sovereignty means we have obvious strategic advantages in terms of independent action (and with encouraging competitiveness among foreign suppliers of high-tech weaponry).

The F-111 Block Upgrade Program, for example, has successfully integrated the AGM-142 missile system and a new electronic warfare system. Further application of this indigenous capability is being used to optimise the reliability and capability of the aircraft. The implementation of numerous small-system optimisations and modifications will enable our F-111s to continue as a capable and reliable platform well into the future or until they are withdrawn from service.

The modern capabilities provided to the F-111 in the Electronic Warfare and AGM-142 Missile programs have significantly increased the effectiveness of the platform, as shown at recent Red Flag exercises. The current F-111 is considered very useful during these deployments by US forces. The reduction in sustainment funding based on a 2010 retirement has, however, suspended these programs and as such the ADF will not realise the efficiency and capability benefits that have already been paid for by Australian taxpayers.

At the very least, the retirement date of the F-111 should be put back to 2015, and probably to 2018 when a fully operational F-35 capability is realistically expected. Delaying this decision has already caused a significant shortfall in funding and this will soon limit the current capability. If the date to retire the F-111 remains at 2010 or sooner, many of the associated engineers and maintenance personnel will leave the industry, as has already happened with the RAAF itself. Such a situation first occurred some years ago when the early retirement (then around 2006) of the F-111 was initially considered. Resignation rates increased significantly as people were unsure of their future and could not foresee challenging work. Such losses are expected to have the following outcomes:

- The Authorised Engineering Organisation and Authorised Maintenance Organisation functions (and accreditations), in which the Commonwealth has invested heavily, will lose the capability to perform all but the simplest of modifications to ADF aircraft. All the regulations with which Australian industry now comply will become meaningless as the engineering will be done overseas.
- The Wedgetail through-life support program and future modifications will not be able to use the large F-111 industry capability if it is prematurely eroded. This will limit the Commonwealth's ability to support and modify the Wedgetail platform.
- Current platforms such as F/A-18A/B, B-707, JP129 (airborne surveillance for land operations) will not have enough basic engineering capability as there is no 'core

contract' to support maintenance capability-building. Even if the F/A18A/B contractor base is enlarged it is not sufficient and in the wrong place geographically to form such a core. It is also too late as it takes many years to build this core capability, as the RAAF's Directorate-General of Technical Airworthiness (DGTA) well knows.

- The current 2010 retirement plan has a very small rate-of-effort for the aircraft. This means Australia's ability to deploy an operational capability will effectively cease in early to mid 2009.

The Authorised Engineering and Maintenance Organisations (AEO and AMO) are unique within Australia in their ability to perform significant integration and modification tasks. Defence, DMO and DGTA correctly view these industry capabilities as national strategic assets. The F-111 AEO and AMO have been built up over a large number of years and now benefit from the experience of a number of successful complex programs. As noted, the ADF will continue to require these capabilities for platforms such as Wedgetail, F/A-18A/B and other aircraft.

In summary, The F-111 engineering and modification capability is a national strategic asset, is a capability built up over many years and is one not easily reinstated. A 2010 retirement plan also does not provide an operational capability past mid 2009 and would probably result in an F-111 engineering wind-down sooner.

The retirement of the F-111 as early as 2010 will detrimentally affect the following areas:

- the existing Australian-industry-based engineering and maintenance capacity;
- the supporting modification-support back-shops, small businesses and suppliers;
- application and management of unique Australian certification and air worthiness requirements;
- future weapons, electronic warfare and capability enhancements offered by DSTO; and
- our longer-term ability to incorporate modifications by having qualified professional engineers and trades-people with the right skill sets and in sufficient numbers.

The true costs of killing the F-111

In the last decade Australian industry has lost enough general manufacturing and engineering jobs overseas. The same should not occur for defence industry capabilities that are a national strategic asset.

The F-111 is the only ADF combat aircraft managed largely by Australian industry. The firms involved are rightly proud of managing, maintaining and enhancing this essential defence force capability. Such reliance on industry support should not be seen as a risky proposition but rather a sensible one.

The multi-role F-111 provides a strategic deterrent posture, and provides a wide range of credible strategic strike, maritime strike and battlefield support capabilities. There are no technical, financial or operational reasons preventing this from continuing well into the future.

In short, the F-111 is certainly not clapped out or a high technical or financial risk if retained in service. The only real question worth debating is the length of such a retention, either with or without significant enhancements and modifications.

The current aircraft could be retained for at least a decade and very much longer if updated. At the very least, the planned retirement date for the F-111 should be extended out to 2015. Given the expected delays in the JSF program the F-111s should be retained until they can be effectively replaced, probably around 2018-2020.

All this begs the question why informed public debate on Australia's new air combat capability has become so difficult – and why the facts about the F-111 capability have been so obscured in much official comment. Some serious rethinking on our need for future air dominance is required by the Department of Defence, the hierarchy of the Air Force and the National Security Committee of Cabinet.

If this is not done, Australia faces a future of considerable strategic fluidity with insufficient flexibility and breadth of capability in our air combat force structure. By persisting with the current plan for the F/A-18F and F-35 we will most likely be locked into a generation-long situation of not possessing the type of vital capability edge needed to offset all our disadvantages of great distances, small forces, limited population base and economic reliance on vulnerable sea-lanes. ♦

Don Middleton is a nom de plume.



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