

AIR POWER STUDIES CENTRE

PAPER 56

Month Year

**FUTURE ADF AEROSYSTEMS AND PROCUREMENT
FROM THE INTERNATIONAL AEROSPACE
INDUSTRY**

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About the Author

The ...

INTRODUCTION

A strong Australian defence industry is important in sustaining the operational effectiveness of the Australian Defence Force, and ensuring that the Force is able to adapt to changing circumstances. Industry's contribution to our defence effort will become more important as our strategic environment becomes more demanding.

We ... need to ensure a capacity to repair and maintain equipment, including the ability to handle the additional maintenance requirements which would arise in conflict. These requirements underpin the Australian Defence Force's sustainability.¹

Background

Of the 12 different types of fixed wing and seven different types of rotary wing aircraft currently operated by the ADF, the capabilities provided by all but one type of aircraft will probably require replacement within the next 25 years.² The most costly capabilities to replace will include those of our fast-jet combat aircraft, the F/A-18 Hornet and the F-111.³ The capabilities provided by these aircraft are due for replacement around 2015 and 2020 respectively,⁴ with phase-in periods for any new aircraft taking around three to five years.

The recent, rapid evolution of the international aerospace industry suggests that future procurements of aerospace platforms will face a range of new issues. For example, mega-corporations are forming which will soon have the capacity to supply entire defence systems, and fewer, more expensive, types of combat aircraft are planned, with a greater focus on multi-role capabilities. Also, the next generation of fast-jet aircraft are intended to have longer operational lives than current platforms, thereby requiring more system upgrades.

Defence's acquisition practices must evolve in order to remain relevant to the modern defence aerospace market. As lead times for the development and acquisition of major aerospace systems are particularly long, Defence must demonstrate its foresight in considering the ADF's future requirements for the purchase and support of aerospace assets.

Purpose

The purpose of this paper is to consider developments in the international defence aerospace market and to identify potential implications for future ADF aerospace procurements with regard to our purchasing leverage and the level of support available from Australian industry. As the F/A-18 and the F-111 fleets are the most

¹ *Defending Australia: Defence White Paper 1994*, Department of Defence, Canberra, 1994, pp 113, 115.

² The Chinook helicopter is the only aircraft currently in service which is unlikely to need replacement by 2020.

³ For the purposes of this paper 'combat aircraft' will refer to fast-jet, fighter/strike aircraft only.

⁴ Replacement dates derived from: Joris Janssen Lok, 'Joint Strike Fighter tops Australia's wish list', *Jane's Defence Weekly*, 31 July 1996, p 4; and Greg Ferguson, 'Strategic Strike', *Australian Defence Monthly*, March 1996, pp 34-35.

costly and at the heart of our air combat capabilities, this paper will focus on their replacement. The paper does not attempt to provide definitive answers, nor does it attempt to pre-empt the Defence capability development process. Instead, it seeks to promote thought and discussion on important upcoming issues.

AUSTRALIA'S OPTIONS FOR REPLACING AIR COMBAT CAPABILITIES

Australia currently does not have the indigenous capability to design and build a complete modern combat aircraft and is highly unlikely to develop one in the foreseeable future. Australia must therefore continue to rely on the international aerospace industry to supply its equipment requirements in this field. Over the last ten years the international scene has changed vastly, and it will continue to evolve rapidly.

The United States

The United States has been the international leader in aerospace weapons systems and platforms for some time and it is no coincidence that all of Australia's combat aircraft have been purchased from the United States. As our largest ally, systems interoperability with the US remains a strategic concern. Accordingly, Australia is likely to maintain its interest in American aerospace systems in the future.

The last ten years has seen a plethora of mergers, takeovers and joint ventures in the US defence aerospace industry. Subject to US Government approval of the intended Boeing/McDonnell Douglas merger, there will soon be only two US defence companies capable of manufacturing major aerospace platforms: Lockheed Martin Corporation and Boeing Corporation.

The competition between companies is fierce and commercial viability will hinge increasingly on the outcome of bids for single projects. The Advanced Tactical Fighter Program was awarded to Lockheed Martin's F-22 and caused some minor industry changes. However, the Joint Strike Fighter (JSF) Program is the United States' only other major aerospace project currently planned and will dwarf all previous programs. It will inevitably cause major changes to the US defence industry.

The JSF is intended to fulfil the US and UK Service's needs as follows:

| Customer | Role | No.⁵ |
|----------------------------|---|------------------------|
| United States Navy | First day of war, survivable strike aircraft to complement F/A-18E/F. | 300 |
| United States Air Force | Multi-role aircraft to replace F-16 and A-10. | 2,036 |
| United States Marine Corps | Short take off and vertical landing (STOVL) aircraft to replace AV-8B Harrier and F/A-18. | 642 |
| UK Royal Navy | STOVL aircraft to replace Sea Harrier. ⁶ | 60 |

⁵ Goodman Jr., Glenn, 'Critical Sideshows', *Armed Forces Journal International*, June 1996, p 21.

⁶ *JSF Program White Paper* - March 1996.

The JSF Program will supply all these requirements with three different aircraft, with a 70 per cent or higher commonality between them. The high level of commonality has been sought to reduce manufacturing costs and lower through-life support costs predominantly through economies of scale. The aircraft must perform at a level equal to or greater than that of the present F-16, be stealthy, reliable, survivable, supportable and affordable, while maintaining sufficient payload and fuel capacity. The expected cost per unit is between A\$32m-A\$44m,⁷ and the aircraft will have a greater focus on multi-role capabilities and be more adaptable than anything presently in service. At least 3,078 airframes are expected to be built, and significant exports are predicted. Notably, an unresolved issue is whether the US will allow other countries access to the stealth technology embodied in the JSF, when it has in the past so vigilantly guarded the information, even from its allies.⁸

The JSF is the biggest defence aerospace project ever planned. No previous project has envisaged such a long production run, and as such, the unsuccessful tenderers could be depleted of the necessary skills base and experience to create a competitive tactical aircraft in future. The JSF is expected to satisfy the US military for at least 20 years after the end of production, and the sheer scale of the program has brought comments from the head of Lockheed Martin's aeronautical section such as: 'It's winner takes all' and 'If you don't win this program, you're a has-been in tactical aircraft'.⁹

The three original bids for the JSF came from: Lockheed Martin, Boeing and a joint venture between McDonnell Douglas, Northrop Grumman and British Aerospace, with the latter bid being eliminated from the prototype stage in November 1996. Almost immediately after the elimination of the joint venture bid from the JSF competition, the planned merger between Boeing and McDonnell Douglas was announced. This has been viewed by some observers as the 'salvation' for McDonnell Douglas after losing the JSF contract.¹⁰ Recently, Northrop Grumman joined the Lockheed Martin bid for the JSF, and both Boeing and Lockheed Martin are said to be 'eyeing British Aerospace as a potential third partner'.¹¹ These activities highlight the fluid nature of the US aerospace industry and its international teaming networks.

Europe

For the purposes of this analysis, the Western European defence industrial base is examined as a whole, as countries in the region often refer to it as such in their defence policies.¹² The pan-European approach is readily apparent in the defence aerospace industry, where Europe is presently the only substantial competitor to the

⁷ This figure represents US\$25-\$35 million at an exchange rate of US\$0.79=A\$1.00. This is the projected cost to the United States Government. However, the cost to Australia may well be substantially higher.

⁸ Cook, Nick, 'A relationship under wraps: US-UK Stealth', *Jane's Defence Weekly*, 4 September 1996, pp 43-45.

⁹ Shenon, Philip, *Jet makers preparing bids for a rich Pentagon prize*, US Press, 12 March 1996.

¹⁰ Chaisson, Kernan, 'Reshaping the Aerospace World', *Defence Outlook*, January/February 1997.

¹¹ 'Northrop Grumman Corp. Joins Competition for JSF', *Defense News*, May 12-18 1997.

¹² For example, it has been suggested by a senior British industrialist that Britain will pay up to an extra 20 per cent in order to buy European rather than buy a technologically equivalent weapon. Hitchens, Theresa and Miller, Charles, 'UK Awards Set Buy-European Precedent', *Defense News*, September 9-15 1996.

United States. Joint ventures, trans-European teams and uncertain coalitions have been part of the European aerospace industry's attempts to compete with larger and more efficient US firms. Thus far, most European collaborative projects have suffered from funding difficulties, political power plays, partner withdrawals and cost blow outs. Despite these difficulties, the current process does mark the first steps by several countries to form true industry links within the European Community.¹³

European defence aerospace companies are also increasingly using rationalisation to find efficiencies to compete with US companies. This was a driving force in the recently announced merger of former French rivals Dassault and Aerospatiale.¹⁴ Further, at the European level, a senior British Aerospace official recently stated that the European aerospace industry would die within five years unless it united and rationalised into a single large company in order to compete with the US, and that if British Aerospace was still *British* Aerospace in five years time, the company would have failed.

Essentially, the European defence industry is attempting to unite in order to achieve the economies of scale and efficiencies necessary to compete with the US defence industry. This is seen as necessary in light of the shrinking world arms market and increased international competition. While there is a considerable way to go, it is very likely that there will be fewer products on the European market rather than more.

Europe has three major air combat systems currently in development that will meet European requirements into the next century. These are the Dassault Rafale, the Eurofighter and the JAS Gripen. On current planning, fewer types of combat aircraft will be produced in Europe, and those that are will be produced through collaborative ventures. This led Etienne Lefort, Managing Director of Eurosam, to state that very soon 'No one [European] country will be able to build a complete aircraft'.¹⁵ The difficulties associated with pan-European ventures, however, were highlighted by the political and technical problems of the Eurofighter project. Originally a collaborative venture between the UK, France, Germany, Spain and Italy, France withdrew its support in July 1985, instead focussing on the Dassault Rafale.¹⁶

Solutions From Other Nations

Russia. With the break-up of the former Soviet Union and lower domestic demand for military aircraft, the Russian company Rosvoorouzhenie is now aggressively marketing internationally its Sukhoi combat aircraft. While unlikely to find an Australian order due to supportability, interoperability and alliance concerns, this company could possibly offer viable products in the future.

Japan. Japan has been working closely with Lockheed Martin to produce the Japanese FSX Fighter. While based on the F-16, the aircraft has been substantially

¹³ Matteucci, Roberto, 'Europe integration is vital', *Defense News*, July 15-21 1996, p26.

¹⁴ Lewis, Jac, 'Aerospatiale, Dassault set for year-end union', *Jane's Defence Weekly*, 10 July 1996, p 37.

¹⁵ Bickers, Charles, 'Industry prepares for battle', *Jane's Defence Weekly*, 12 June 1993, p 52.

¹⁶ 'Eurofighter 2000', *Jane's All the World's Aircraft*, 1993-94, pp 100-101.

modified and its exact abilities are unknown at this time.¹⁷ It is unlikely that Japan will export this item not only because it has informal but strict prohibitions on selling lethal equipment,¹⁸ but also because the intellectual property for many systems is still owned by various US companies. Nevertheless, a new producer of modern fighter aircraft has been created.

Korea. Similar to the FSX, the Korean Fighter Programme (KFP) is a marriage of the F-16 with Korean technology to produce a unique fighter aircraft. General Dynamics' Fort Worth Division (a subsidiary of Lockheed Martin) is also helping South Korea develop and produce an indigenous trainer aircraft.¹⁹ As with the FSX, the KFP could only be exported if US companies relinquished much of their intellectual property in the aircraft. More importantly for Australia, however, neither the FSX nor the KFP is likely to represent the most sophisticated and reliable systems in the timeframe envisaged for the replacement of the F/A-18 and F-111.

Options for Australia

Comments by the Chief of Air Force, Air Marshal Les Fisher, seem to confirm that the JSF is the most appealing of existing options to meet Australia's capability needs.²⁰ The JSF would have the multi-role capability to replace the F/A-18 and the F-111. The Eurofighter, as it exists today, is more expensive, will utilise older technology, and will not have the stealth characteristics of the US 'next generation' aircraft. Further, the Eurofighter as yet has no ability to take over the strike role of the F-111 (though this may change over time²¹). The yet-to-be-released F-22 was not considered in this paper as it is an air superiority fighter and not a strike aircraft. The recently released F-18E/F Superhornet was also not considered as, although it is a multi-role fighter, it has insufficient range and bomb capacity to adequately fulfil the strike role.

PROCUREMENT LEVERAGE FOR AUSTRALIA

By the year 2010, Australia may well have only two viable but unequal procurement choices for replacement combat aircraft; one from Europe and one from the United States. In such a market, there is potential for Australia's procurement leverage to be severely limited. The aircraft design will be set so modification of design for Australian conditions may have to be purchased at an additional cost. As most capital equipment purchases come down to a balance between capability and cost, and as it is unlikely that the aircraft on offer will be equally capable options, the leading aircraft will have a captive market for countries such as Australia that wish to operate at the leading edge. As the supplier will have greater power, bargaining for indigenous

¹⁷ Flamm, Don, 'Post-Cold War US aerospace industry in the international marketplace', *Asian Defence Journal*, August 1994, p 32.

¹⁸ Hayward, Keith, *The World Aerospace Industry: collaboration and competition*, Duckworth, London, 1994, p 92.

¹⁹ Flamm, Don, 'US aerospace industry to face increased international competition', *Asian Defence Journal*, March 1992, p 58.

²⁰ Lok, 'Joint Strike Fighter tops Australia's wish list', p 4. Defence is currently considering investment at the various levels of the JSF Program (see page 9).

²¹ Cook, Nick, 'Europe's future attack aircraft' *Jane's Defence Weekly*, 4 September 1996, p 32.

through-life support and upgrades will be increasingly difficult and access to the intellectual property may be non-existent. Feasibly, Australia could find itself locked into acquiring one type of aircraft, with limited options for through-life support, purchased at a very high price, yet not fully suitable to the needs of the ADF. This scenario not only poses serious questions for Australia's ability to achieve value for money, it also raises concerns for its ability to secure aerospace capabilities critical to Defence self-reliance.

In an attempt to gain greater bargaining power, Australia could join with one or more other countries in making a joint procurement of a larger number of aircraft. Such a procurement would involve Australia finding a country with similar requirements to itself, and then procuring the suitable defence system as a complete product. Joint procurement requires that parties be prepared to compromise on what item is purchased and the timing of the delivery. At the end of this process, there may be no guarantee of satisfactory through life support, nor of a cheaper procurement price. Any bargaining power gained by joint procurement could be limited in a future defence aerospace market dominated by a few very large suppliers.

CO-DEVELOPMENT

Dr Susanne Pearce,²² in her SES Fellowship Report, *Industry Development Through Defence Acquisition: A Study of Selected European Approaches*,²³ identifies a number of means through which the ADF can reduce its overall costs and have influence on the design of new military systems. One of these is by becoming involved in the developmental stage of associated projects. Such involvement would require a significant investment by Defence at the early stages of system development.

Co-development can offer benefits, but can also bring difficulties. A successful co-development relies on three areas of cooperation: capability requirements, politics, and economics.²⁴ If cooperation fails in any of these areas, so too can the entire co-development venture. In the case of new aerospace systems, if nations have vastly different requirements the compromises necessary to create a common system may make the aircraft unsatisfactory to some or all parties.

Co-development provides an opportunity for nations to promote strong alliances and to rationalise their research and development budgets. The size of a multi-national purchase also allows for the partners to achieve economies of scale and reduce the cost of procurement. However, there are dangers, for example, internal political and economic pressures to prop up uncompetitive local industries, especially where 'national champions' are involved, can lead to a cost increase. Once the parameters of the co-development are set, continual changes and bargaining over capability and workshare can cause the co-development to flounder.

²² Dr Pearce is currently First Assistant Secretary Industry Involvement and Contracting in the Department of Defence.

²³ Pearce, Dr Susanne, *Industry Development Through Defence Acquisition: A Study of Selected European Approaches*, Department of Defence, Canberra, February 1996, p 43.

²⁴ Lorell, Mark and Lowell, Julia, *Pros and Cons of International Weapon Procurement Collaboration*, Rand Corp, Santa Monica, 1995.

There are many examples of failed European co-developments. A major flaw in the Eurofighter Project, for example, was that workshare arrangements were a deciding factor by which companies won contracts, rather than value for money.²⁵ Finding another nation that has the same requirement in a combat aircraft and is willing to spend an equal amount per unit is difficult. In the Eurofighter program, each nation required a different type of aircraft for different types of missions and as a result compromise led to further compromise until the aircraft was not as suitable as originally intended for each customer. As an example of the differences involved, Germany wished to pay much less per unit than Great Britain, so two different avionics suites were developed.²⁶ The time of delivery was yet another compromising factor.

The Australian Context

Australia currently does not have the indigenous capability to design and build complete aerospace systems, nor are we likely to develop that capability in the foreseeable future. Australian industry, however, does possess and can further develop the capabilities to provide some components of defence aerospace systems. By drawing on the lessons learned from ventures such as the Eurofighter project, Australia can minimise the possibility of joining co-developments with partners likely to cause difficulties. Australian industry and the ADF could experience significant benefits, especially in relation to through-life support, from a successful co-development project.

Australia's participation in co-development programs requires early planning and a firm commitment to gain maximum rewards. Becoming involved at a developmental stage of the Dassault Rafale, Eurofighter or JAS Gripen is not possible as they have completed development. However, it is possible to use the JSF as a case study for early participation in an aerospace product.

Participation in the JSF

Currently, Britain, Norway and the Netherlands are considering purchasing the JSF, and have signed agreements with the United States to 'look deeper into the program'.²⁷ The JSF program office has also announced that Denmark could join the program within months, with foreign participation expected to increase even further.²⁸ The Pentagon's Joint Advanced Strike Technology Office, which administers the JSF program, has established four levels of JSF participation for foreign countries. These are:

- a. a full partner with more than 10 per cent participation (such as the UK which has invested A\$265m);
- b. an associate partner with 2 to 10 percent participation;

²⁵ Bickers, Charles, 'UK report highlights problems facing collaborative projects', *Jane's Defence Weekly*, 26 August 1995, p 17.

²⁶ 'Eurofighter 2000', *Jane's All the World's Aircraft*, 1993-94, pp 100-101.

²⁷ *Defense News*, Daily News Note, 7 May 1997 (<http://www.defensenews.com/df050797.html>).

²⁸ *ibid.*

- c. a future partner which may undertake trade studies but decide not to currently participate; and
- d. a country with which the USA may contract for work on a fee for service basis.²⁹

For the JSF, if Australia were to replace the F/A-18 and F-111 with a similar total number of aircraft (100) at a cost of A\$44m per unit, the purchase could be in excess of A\$4,400m, with a total in service cost possibly as high as A\$11,000m.³⁰ As this is a substantial future investment, Defence should consider early participation in the JSF project, and some initial financial contribution could be merited. Such an investment could see Australian industry involved in the development stages of a major US aerospace project, rather than attempting to secure workshare after initial aircraft production.

With some development costs to be met by Defence, Australian industry could secure its place in the JSF program. If the ADF were to place its order and secure a mere 2 per cent of the construction project for the JSF, this would represent approximately A\$2,797m³¹ worth of work for Australian industry. These figures only take into account the aircraft currently required for the US, UK and Australia, and do not account for the ongoing value of the intellectual property gained. As exports of the JSF are likely to exceed that of the F-16, the returns to Australian industry and the Australian economy are potentially very great.³²

Conversely, if Defence remains reactive and seeks to acquire products as off the shelf items, Australian industry will not have a sufficient basis to provide through life support. The *Review of the F/A-18 Industry Program*³³ illustrates how Australia paid a premium (estimated at \$700m) to develop local industry to support the F/A-18 Hornet. While capabilities for the support of the Hornet were developed in Australian industry, a limited domestic demand and no real exports saw the loss of these capabilities without any significant return on the investment.

Whichever future aircraft Australia chooses, it is highly likely that one type will be required to fulfil the roles of our two current combat aircraft. The likely extent of our purchase would justify some expenditure in the development phase of the JSF in order to satisfy some of Australia's unique requirements and lower costs for the finished product. Additionally, access to developmental information, particularly intellectual property, for a project such as the JSF could give Australian industry the capability and legitimacy to enter into additional international projects and find new paths for development in both the military and civilian spheres.

²⁹ Cook, Nick, 'International market beckons USA's JSF', *Jane's Defence Weekly*, 4 September 1996, pp 47-50.

³⁰ This figure represents 100 units @ A\$44,000,000. After discussions with DCFC(Aero) it was revealed that the total cost to place a new aircraft in service with appropriately trained crew and support has historically amounted to 2.2 x the initial procurement cost.

³¹ This figure is based on two per cent of the total UK+US purchase of 3,078 airframes plus 100 Australian airframes representing a total of 3,178 airframes at A\$44,000,000 per unit.

³² The JSF Program Manager has already briefed Canada, France, Greece, Germany, Israel, Italy, the Netherlands, Norway, Spain and Sweden (Cook, 'International market beckons USA's JSF', pp 47-50). The JSF Program Manager is expected to brief the ADF in February 1997.

³³ Conducted by the Industry Involvement and Contracting Division, March 1994.

It is important that Australia has the ability to bargain for access to the intellectual property component of the aircraft it acquires. By focussing on the short term goals of reducing costs in the acquisition phase, Australia has often overlooked the ongoing value of intellectual property (IP). With access to IP, Australian defence-related industry has:

- a. a greater ability to develop and maintain a strategically important skills base within Australia;
- b. a greater ability to upgrade ADF weapons platforms at a lower cost as the whole system will not have to be redeveloped in order to upgrade;
- c. the ability to develop and evolve products using the IP gained from collaborative projects as a basis (eg evolving software utilising pre-existing base code);
- d. the ability to export high value-added items;
- e. a greater ability to find further uses for the skills developed in defence work by applying them to other areas, thus retaining the skills base; and
- f. a greater ability to utilise the IP in seeking further international collaboration.

CONCLUSION

In the not too distant future Australia will have to devote much of its limited Defence budget to the purchase of replacement aerospace systems, necessitating a more strategic approach to defence aerospace procurement. In particular Defence needs to consider how it is going to achieve value for money and how it is going to maximise the effectiveness of its investment in a market increasingly dominated by a few, very large corporations. Beyond the acquisition phase, Defence must take full account of what defence industry capabilities are necessary for effective through life support and what can be done to sustain those capabilities for the future. Such considerations are vital to Australia's defence and self reliance needs.

While this paper has focussed on the replacement of the combat aircraft capabilities of the ADF, it must be noted that the trend of mergers and joint ventures in the aerospace industry is going to continue. All future aerospace purchases will face a market which contains a few large companies producing a few aircraft types. This could leave Australia with much less bargaining power when purchasing defence aerospace systems.

A situation in which Australia has less bargaining power could see us forced to purchase a system that is too expensive, not fully suited to ADF requirements, with limited access to the intellectual property, and with limited indigenous through-life support. Australia must not place itself in such a position, as Defence has a limited budget, and any increase in cost for the purchase of one capability must be made at the expense of other capabilities.

The best way to develop our own capabilities for support may well be through seeking international collaboration so as to provide industry with the ability to support itself through being part of a large, internationally based project. If we can focus our requirements in the near future and seek out international collaboration at the developmental stages of projects, Australia can reduce its costs in many areas and hopefully develop an indigenous industry which is capable of supporting itself through business in the international market.