

JSF
Contract
Membership
has its
Privileges

The Mustang of THIS Century



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In the Second World War, the North American P-51 Mustang revolutionized air warfare. It provided high altitude, long range escort for bombers and yet was versatile enough to bust tanks at treetop level. With its Rolls Royce engine and American airframe, it combined the best of two great aeronautical nations, and served in 15 air forces, including the RCAF. Rated the best fighter aircraft of the Second World War, the Mustang owed its success as much to its versatility as to the international character of its production. Each P-51 Mustang cost North American \$57,000 to build, a sum that far exceeded the symbolic and tactical value of the aircraft.

By the 1990s, the U.S. Government wanted a single-engine, stealthy (radar-evading), supersonic multi-role fighter for warfare 40 years into the future. And if that wasn't difficult enough, it also had to be "transformational." With development costs for modern fighters rising, commonality and outsourcing to multiple allies became the norm that produced the Tornado, the Eurofighter, and the Joint Strike Fighter (JSF).

In December 1994, Boeing, Lockheed Martin, McDonnell Douglas, and Northrop Grumman were each awarded 15-month Concept Definition and Design Research (CDDR) contracts. Northrop Grumman and McDonnell Douglas/BAE teamed shortly after the CDDR contracts were awarded. The contractors refined their Preferred Weapons System Concept designs and performed a number of risk reduction activities (such as wind tunnel tests, powered-model STOVL tests, and engineering analyses).

In the spring of 1995, all three of the contractor teams selected derivatives of the Pratt & Whitney (P&W) F119 engine to power their aircraft. Accordingly, in November of that year, P&W was awarded a contract for preliminary design of each of the primary JSF engine concepts.

Concurrently, General Electric (GE) was awarded a contract to investigate whether the GE F110 or YF120 could be developed into an alternate engine for one or more of the JSF variants. By 1996, GE's YF120 had been identified as the "best fit" for a tri-service solution, and GE initiated preliminary design efforts.

Several Defense Acquisition Board (DAB)-level program reviews were conducted in late 1995, and the final Requests for Proposal were issued in March 1996. By that time, the Joint Advanced Strike Technology (JAST) program name had changed to the Joint Strike Fighter.

In May 1996, JSF was designated an Acquisition Category I, DoD acquisition program. In June, the weapon system prime contractors submitted their Concept Demonstration Phase (CDP) proposals. A formal Milestone I Acquisition Decision Memorandum was signed by the Under Secretary of Defense (Acquisition & Technology) on 15 November 1996.

Thus, the JSF was born in November 1996 when the US Government awarded CDP prime contracts to two consortia, led by Boeing Aerospace and Lockheed Martin. The JSF was to be manufactured in three versions: a conventional-takeoff-and-landing (CTOL) variant for the U.S. Air Force; an aircraft-carrier version (CV) for the U.S. Navy; and a short-takeoff/vertical landing (STOVL) version for the U.S. Marine Corps.

One of the two consortia would be selected for the development and manufacture of all three variants. Whichever won – Lockheed Martin or Boeing – it would be the largest military procurement contract in history – an estimated US \$200 billion.

The first flight of the Boeing “X-32A” CTOL variant was on 18 September 2000. First flight of its “X-35B” STOVL variant was in March 2001, with vertical flight testing beginning in June 2001.

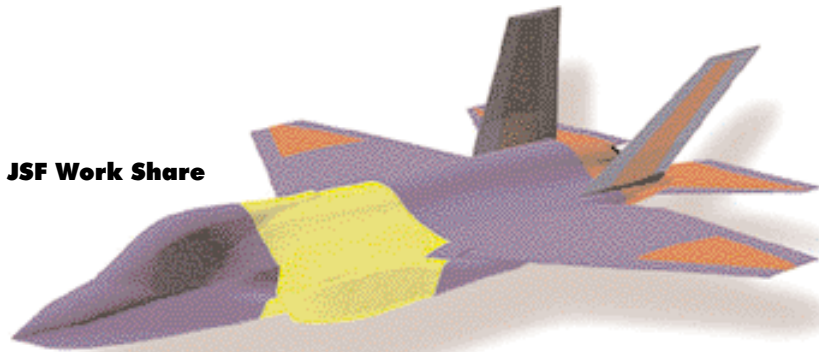
First flight of the Lockheed Martin “X-35A” CTOL variant was on 24 October 2000, and first flight of its “X-35C” CV variant on 16 December 2000.

In October 2001, the Lockheed Martin X-35 was selected as the winner of the competition. Boeing was perceived as having the edge in management, while both companies were rated equally on cost and support. However, the Lockheed Martin design was seen as involving lower risk, with the lift-fan concept for the STOVL variant scoring particular points to win.

For an industry where development always goes over-budget (remember the Avro Arrow program?), both manufacturers must have viewed the results with some trepidation. If one were to write a book called “Building Aircraft for Dummies” the first lesson would surely be that the more aircraft you plan to build, the cheaper they are to develop. A corollary to that is the more nations you can interest in helping develop that aircraft, the more viable it becomes for in-service and support. Like a teenager without a date for the prom, by the dawn of the new century, the Pentagon, Lockheed Martin and Boeing must have been working the phones, sending out invitations to friends and family, both NATO and non-NATO, to buy in. With each additional participant, the risk, both political and financial, would be reduced. The UK, interested in replacing both its Harriers and Tornados, was the first to participate in JSF development – to the tune of US\$2 billion.

In October 2001, Lockheed Martin was awarded the contract to build the JSF. The Boeing entry looked like a pregnant turtle, a sad commentary on the company that had absorbed North American. While final assembly of the JSF was to take place at its Fort Worth plant in Texas, the JSF team included Rolls-Royce, BAE Systems, Samlesbury, Lancashire, BAE Systems Avionics, Edinburgh, Scotland (laser systems), and BAE Systems Information & Electronic

JSF Work Share



Lockheed Martin

- Prime Contractor • System Integration
- Mate Through Delivery • Vehicle Systems
- Wing • Edges and Control Systems
- Mission Systems • Autonomic Logistics
- Forward Fuselage • Training System
- Air System Verification

Northrop Grumman

- Centre Fuselage • Arresting Gear
- Weapons Bay Door Drives
- Radar • CV Control and Test
- LO Support System
- Mission Systems Software
- Training Courseware & Mgmt Systems

BAE Systems

- Aft Fuselage • Horizontal/Vertical Tails
- CV Wing Fold • Fuel System • Throttle/Side Stick
- Life Support • STOVL Control and Test
- UK Req'ts/Stores/Software • UK Support Centre
- Crew Escape • Electronic Warfare System
- Flight Control Computer

Warfare Systems (the JSF integrated electronic warfare suite). Finally, BAE was contracted to develop a new digital radar warning receiver for the F-35. It was the modern equivalent to putting a Rolls Royce Merlin engine in the Mustang. Yet as the year ended, other European nations – the Dutch, Italians, Danes, Norwegians were still proving reluctant to commit.

Canada probably wasn't on Lockheed Martin's "A" list of potential investors. Its aircraft industry, attuned to luxury jets, hadn't made a fighter since the CF-5 in the 1960s, and the Liberal government in power even couldn't decide what SAR helicopters to buy. Then on February 7, 2002, the Joint Strike Fighter team announced that Canada would participate in the program. As the first international commitment after the United Kingdom, it changed the program from an Anglo-American project to that of a global effort.

Demonstrating uncharacteristic prescience, Ottawa had even joined in the System Development and Demonstration phase of the program, where membership as they say, has its privileges.

The outsourcing largesse that followed the participation of the British, it seemed, hadn't been lost on Canada's Department of National Defence (DND), and by signing on as the second international partner, Canada had become a Level 3 participant. The price for this was \$100 million, plus \$50 million from Technology Partnership Canada (subsidies for companies), plus the services of the Canadian Commercial Corporation, free use of Canadian test facilities, and funding for staff seconded to the JSF Programme Office. A portion of the licence fees payable on sales to third countries would go to Canadians.

A withdrawal clause permits any of the partners to leave the program at their discretion. The Canadian defence ministry could withdraw from the JSF framework agreement and this addendum "...if it is of the opinion that the participation of Canadian industry in this project is not satisfactory."

With current unit cost estimates for the JSF at \$45 million for the CTOL model and \$55 to \$60 million for the CV and STOL variants, Canadian firms that were now eligible for outsourcing contracts could potentially make more than \$9 billion.

Why the sudden efficiency from a Liberal government hardly known for concluding military projects on time and on budget? Financial reasons aside, in "Aerospace Capability Framework: A Guide to Transforming Canada's Air Force," DND explains it with military precision: Canada will require a manned fighter to conduct aerospace control well into the 21st century. The Estimated Life Expectancy of the CF-18 is 2017, and the New Fighter Capability Project office will select its replacement by 2011. A contract will be signed in 2012 and the new aircraft will be delivered by 2015. At Fort Worth, the first CTOL F-35A has already begun airframe assembly and is scheduled for its first flight next summer.

This "Mustang of the 21st Century" is expected to enter service in 2008. While it may or may not be in Canadian Forces colours, much of it will have been developed and built in this country. **FL**



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