

Strategy and the F-35

The political controversy around the F-35 has left many confused. The key party leaders have accepted that Canada should replace the CF-18, which ends its useful life between 2017 and 2020. However, there has been a lively debate (and some distortions) around the planned replacement. Now that the election is over and, with it, some of the inflated rhetoric, it is timely to ensure the facts are understood. Debate primarily centered around three criticisms: the failure to conduct a requirements analysis; the lack of competitive process; and the failure to agree on the costs. This article will address these three concerns of the Joint Strike Fighter (JSF).

The Requirement

Any nation that aspires to protect its citizens, requires an appropriate level of military capability – it is an important insurance in an uncertain world. The more a given nation seeks a global and influential voice, the greater that level of military capability ought to be. Not that it is the only or even the most important capability, but in certain situations it becomes the backstop that reinforces other dimensions of exerting influence in the world.

What is Canada's global level of ambition to be? Over the years, both the Liberals and the Conservatives have sought a combat capable military force to support Canada's foreign policy. The *1994 White Paper on Defence* even sought equipment that would be the 'best of the best'.

The higher the level of international presence or voice desired, the more demanding the military requirements will be. In addition, the global geopolitical structure is becoming much more competitive; the Western world will rely more than ever on collective action.

After an initial post cold war drop, global military expenditures have been increasing since 2000. With its vast natural resources and enormous area to protect, an ability to enforce Canadian sovereignty at home and protect our political interests abroad, in part, depends on a flexible and capable fighter force.

In the early 1980s Canada bought 138 multi-role CF-18s to replace about 400 previous fighter aircraft that were acquired in the 1960s. From about 15 fighter squadrons in 1970, Canada reduced to 8 in the 1980s. Today, we have 77 modernized CF-18s, organized in only two operational fighter squadrons, one east and one west. This sharp drop is directly related to questions of affordability.

Relatively recent studies have supported the need for a fighter force of about 80 aircraft. As the numbers shrink to only 65 aircraft, it is critical that the capability of these aircraft be enough to do everything that the government may require, now and into the future.

When compared to Australia, which has committed to acquire 100 JSF, Canada will have half the ratio of aircraft to the area to be defended. It is worth noting that, not counting our economic exclusion zone and other military areas to be patrolled; Canada has a 30% larger area than Australia, but intends to acquire only 65 JSF.

When the government announced the Joint Strike Fighter (JSF) as the successor to the CF-18, Canada had concluded that the next generation fighter aircraft would have to be manned with a pilot. Unmanned technology is not yet at the point that such aircraft can complete all required missions.

An unmanned combat aircraft is unlikely to be capable enough to fully replace a manned platform before 2050, thus the requirement must consider at least this time frame.

The military requirement demands that its future manned fighter aircraft be interoperable with key allies, have specific performance parameters, be deployable, be survivable, and contribute to integrated intelligence, surveillance and reconnaissance capability. While many details of these requirements must remain classified, they are an important part of defence policy.

These requirements consider various scenarios in which a full spectrum of Canadian Forces (CF) capabilities may be needed. All CF requirements must be integrated; air, land, and maritime capabilities must work seamlessly together. To remain effective, a modern military needs to train with all of these capabilities together. All future military operations require an integrated or joint perspective to ensure success on any future battlefield, which can, and will, vary greatly in terms of complexity and scope.

One advantage of today's technology is that it can permit automatic digital coordination between modern systems. This puts a high demand on sensor fusion to enable the combat pilot to make accurate and timely decisions in stressful situations. New generation aircraft, like the F-35, are designed to operate within a 'system of systems'. These aircraft will automatically inform each other as well as other systems.

Other fifth generation aircraft – the F-22 Raptor or the Russian PAK-FA – are highly capable but are not available to Canada. Even so, the F-35 has some improvements



over the F-22, and the supportability of the PAK-FA is uncertain. Some claim that emerging technologies may reduce the effectiveness of some stealth characteristics, but fourth generation aircraft would be even less survivable. Indeed, a fifth generation aircraft will “see” a fourth generation aircraft well before the latter could “see” the fifth generation aircraft, and this is a significant tactical advantage.

In sum, the requirements for the next generation fighter capability were subjected to a rigorous process of review. Since Canada cannot afford more than one fleet of expensive fighter aircraft, and since the CF will probably operate the next aircraft for perhaps another 40 years, these requirements were scrutinized as to how suitable they might be well into the future.

During the evaluation process, it was determined that only five manufacturers in the western world produced fighter planes: Boeing (which acquired McDonnell Douglas and produced the F-18), Lockheed Martin (JSF), Saab (Gripen), Dassault (Mirage and Rafale) and British Aerospace-EADS (Eurofighter). Canada determined that the European planes met only some of DND’s mandatory requirements, while the JSF was the only plane in the western world (that is available to Canada) to meet the mandatory requirements. The Russian and Chinese modern aircraft were not players, and the American F-22 is not available for export and is ending its production. The only other aircraft is the F-18 E/F, which will also end its production line very soon.

It is worth noting that Canada has similar needs to those of many of our allies. Fighter aircraft are required to perform a series of common missions that are well understood. Similar to our allies, our government has identified the requirement to defend itself and contribute to international operations. In essence, Canadian requirements are not fundamentally different from

American or British requirements. For an excellent review of the military requirement, see the testimony of LGen Deschamps before the Standing Committee of National Defence, on 28 October 2010.

Surprisingly, there has been little criticism of the 65 number. Nor has there been any debate over how many additional fourth generation aircraft might be needed to meet the DND requirement. The number of aircraft needed is likely this low because the defence strategy needs to allow room for other needed capabilities. This is an indicator that the overall defence budget is, at best very tight, at worst insufficient, as had earlier been noted by the Senate Committee. As a consequence, the need for a more capable multi-role aircraft is important, and these factors contribute to a robust military requirement. For Canada to hold a competition would require political direction to reduce or “dumb down” the requirement.

The Competition

The Canadian government announced the JSF would be Canada’s next fighter aircraft on 16 July 2010. This should have been the apex of a national initiative – a point of national pride – instead, it was the start of much acrimonious debate. The announcement took the public by surprise; there was no preparation. In fact, only months prior, the government had claimed to be ready to conduct a competition for the new fighter aircraft. There was no explanation for this about face. This was a bizarre “roll out” to such an important national decision. It could have been handled much better.

Three key points about competition are important to note here. The first is that the requirement development process for Canada’s fighter replacement was bottom up; the second is that there was a competition for the JSF in the U.S.; and the third is

that a Canadian competition would be problematic. Before going further, however, it should be noted that there are often less-than-perfect competitive conditions in the defence equipment world. And while the default position should be to compete wherever possible, major defence equipments are often unique, with a small number of compliant suppliers, such that in some circumstances, it is incredibly difficult (some would say wasteful) to hold competitions.

When Canada joined the JSF program as a partner in 1997, the process to determine the next generation fighter capability project was just in its infancy. The key rationale was to keep abreast of the latest technology and obtain work for Canadian aerospace industries. In fact, the process to replace the CF-18 started from the perspective that a Canadian competition to determine the optimum solution would probably be held once the work was further advanced. This start point is quite different from that of the C-17, C-130J and CH-47 acquisitions – all of which were essentially directed by the government or by the CDS of the day. Each of these aircraft is somewhat unique, and each was directed to be acquired in essentially a sole sourced manner. Yet the fighter replacement did not start this way, and this process is important to understanding the JSF debate. It was only after considerable research that DND realized that, in this case, the JSF, through the international Memorandum of Understanding (MOU), offered the best solution for Canada. Both Industry Canada and Public Works agreed. This probably explains why the government decided on this path. In fact, Laurie Hawn, a former fighter pilot, the Parliamentary Secretary for National Defence, and a member of the Standing Committee on National Defence, was initially strongly supportive of the F-18 E/F aircraft, but the depth and quality of the DND analysis changed his opinion.

As early as 1992, Pentagon planners were concerned that by 2020, aging and entitlement programs would crowd out the needs of the Department of Defense (DoD) because each service was planning to develop its own costly fighter aircraft. Consequently, DoD developed a top down plan to impose a common “platform” to achieve economies of scale to drive down development, procurement and operating costs. These efforts grew into the JSF, and the





U.S. further decided that the JSF was to be exported and thus had to be “interoperable” with allies to achieve even greater economies of scale.

In 1995, the Pentagon invited defence contractors to participate in this development process with a competition for a design. McDonnell Douglas, Boeing, Northrop Grumman and Lockheed Martin all became competitors. In late 1996, McDonnell Douglas, which by then had teamed with Northrop Grumman, had their design rejected. Thus, the final stage of this competition was between Lockheed Martin and Boeing. Over a five year period, prototypes of these two winning designs were built, flight tested and reviewed in an intense fly off competition that was decided in late 2001.

The assessment of the two flying prototypes involved over 200 people and tens of thousands of pages of assessment ranking sheets. Along with performance, affordability was a key criterion in the analysis, and included long term operating expenses. In part due to the excellent lift fan that Lockheed Martin had developed, they won the competition. Boeing declared that they would not be developing another manned fighter aircraft.

When Canada joined the JSF Concept Demonstration Phase (1997), it was offered (with partner countries) the opportunity to participate directly in the evaluation of Lockheed Martin versus Boeing. All partner countries, other than the UK, declined due to their confidence in the U.S. ability to run an effective competition (particularly as they were buying the lion’s share of the planes). However, Canada did assign DND personnel to the International JSF Project Office to keep the Government of Canada informed of developments. Thus, Canada had full access to the results of the JSF competition.

The process to select the JSF spanned a 10 year period. Since this was likely to be the last major fighter aircraft development for many decades, the competition was hard fought. Four firms began the competitive process; one disappeared entirely and the others declared that they would exit the manned fighter aircraft business. The JSF is the one major fighter aircraft program

going forward, and is the future of U.S. fighter capability in the foreseeable horizon. It won because it met the requirement at least cost. This was a very real competition with a lot at stake.

Yet the debate continues over whether another competition should be held specifically for the Canadian requirement. Only three aircraft are sufficiently capable to be seriously considered. They are: the F-35, as the leading contender; the F-18E/F; and the Eurofighter. Of these, the Eurofighter is seen as the least capable and is the most expensive. This leaves the F-18E/F made by Boeing, the firm that lost the fifth generation competition for the JSF. It is not fifth generation; it has been in service with the U.S. Navy for 12 years. Both of these other aircraft suffer from two problems: they do not meet the Canadian mandatory requirement; and neither will have the longevity and product improvement (operational relevance) that is designed into the F-35.

To run a realistic competition in Canada would require having a contractor to contractor comparison, but the JSF is a government to government arrangement. It is very difficult to conduct a meaningful competition between a government to government agreement and a contractor bid. They are fundamentally different options. Even if this was attempted, Canada’s review team would have two very different options to assess – with no scope for the usual comparison of bids. For instance, the JSF costs are estimates until the precise year of production for each aircraft, while contractor prices usually result in a firm price inside a contract. The ability to hold a fair comparative assessment would likely be challenged.

Firms spend millions preparing a bid for this type of competition, and would only spend these resources if the probability of a win was significantly high enough to justify the expense to shareholders.

Another point to consider is that the JSF international project office cannot respond to a request for proposals. Lockheed Martin could respond, but only outside the framework of the MOU. It would have no incentive to do so if Canada remained inside the MOU; it would be bidding against itself with higher costs.

For the Eurofighter consortium and Boeing to seriously consider a bid, the requirement would have to be “opened” so their products could compete. But they would be facing the reality that DND and Industry Canada have already determined

that the JSF is the best option for Canada and Canadian industry. What confidence would they have in getting a favourable scoring matrix and final outcome? Furthermore, the MOU arrangements with Canadian industry are only valid if Canada stays in the MOU framework and buys the F-35. While offsets are always required in any proposal of this magnitude (65 aircraft), they would not be the same quality, quantity or duration as the contract opportunities projected for the JSF program, in which Canadian companies can participate in a global value chain for several thousand aircraft.

Thus, enticing other bidders to the table would require that Canada leave the international MOU and pay some of the committed funds as a penalty. Only then could a reasonably fair competitive process be assured. However, since no other aircraft meets Canada’s mandatory requirements, and no other aircraft can offer the same longevity of production support and product improvement, all that would happen is that our cost for the F-35 would be driven even higher.

The Costs

The F-35 costs are only estimates. There has been great controversy concerning the estimated cost, due to confusion over different models and comparison of apples to oranges by various critics. The recent issue between the Parliamentary Budget Office (PBO) and DND shows how important it is to have valid comparisons. DND pointed out a couple of significant errors in the PBO analysis. Clearly, no country will buy its military equipment by the pound, the key parameter in the PBO assessment. In essence, costs for this aircraft will only be known shortly before final commitment is made; costs depend on the actual production numbers when aircraft are acquired. This fundamental uncertainty drives the cost debate, and the next four points address different aspects of it.

First, a newly designed (fifth generation) plane includes many capabilities that the older fourth generation designs cannot achieve. Advances in technology can be more easily incorporated into new designs than they can be retrofitted onto older ones. This increases the effective price of older aircraft, which must add on several costly items (such as advanced avionics) to be comparable and measurable against the operational requirements. The F-35 aircraft does come with a specially designed Pratt

and Whitney engine; the U.S. government recently decided against continuing a second engine designed by General Electric and Rolls Royce. The JSF was able to take advantage of new technical developments that were part of the F-22 program and move beyond in some areas. By building them into the aircraft, a more cost effective solution is created.

Second, the DoD is absorbing most of the Research and Development cost and any increases – escalating development costs fall on the US, not Canada or its partners. As part of the JSF programme, Canada has committed to contribute \$551 million through this phase of the MOU. Canada is paying for a share of the research and development costs through these fixed contributions to the international program. Thus the various cost reports from the U.S. Government Accounting Office (GAO) are, to a degree, not directly transferable to Canada. On the other hand, some of these Canadian fixed costs (\$551M) ought to be considered in the overall support costs for the Canadian F-35 project. It is important to compare apples to apples. The DND estimates make a rigorous attempt to do exactly that, and compares favourably to those of the Parliamentary Budget Office.

Third, there are three versions of the F-35 – Canada is buying the conventional take off and landing model (F-35A), which is the least expensive and least complicated of the JSF variants. The other two options have the more challenging technical problems, yet GOA reports and estimates lump all variants together. The U.S. is buying the short take off and vertical landing version (F-35B) as well as the carrier version (F-35C). These latter two variants involve more research, development, and testing costs; in fact, the F-35B is currently on probation due to these complications. Conversely, the flight test program on the F-35A is proceeding very well.

Fourth, if Canada were to withdraw from the government to government MOU, yet eventually choose the JSF anyway, it would have to pay an \$850-900 million premium for the same aircraft by getting it from the contractor through the U.S. Foreign Military Sales program. Since the unit flyaway costs of any alternative fighter aircraft (with same capability) are estimated to be similar, this premium would make a significant difference in the F-35 price.

As discussed earlier, there is no simple option to compete the MOU against a contractor-provided response to a request for

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proposal. Furthermore, Canada would then have to negotiate its financial obligations to the partnership based on its previous commitment to the Production, Sustainment, and Follow-on Development Phase of the JSF program.

As with any complex and advanced military equipment, there are schedule and cost risks. Reports out of the U.S. GAO confirm these issues. However, DND’s estimate of the total costs is still the best estimate available, but final costs depend upon the multi-year production rate being established to achieve the best prices. The most recent report from the GAO shows serious cost concerns. The contingency funds identified for this project are intended to cover the whole acquisition period, so it would not be good to have to rely on these reserves at such an early stage. But there is some encouraging news as well: the latest Low Rate Initial Production (LRIP) contract is half what the first aircraft were costing, and it is a fixed price contract which demonstrates some comfort with the supply chain. It shows that the trend to lower production prices, while slower than hoped, is roughly in line with predictions.

Due to fatigue life, Canada must replace the CF-18 within five to ten years, which means DND faces some tough choices. The U.S. decision to reduce numbers will probably delay the program and this could affect Canada’s costs. Initial operating capability in the U.S. may be delayed by as much as two years. If other countries delay or reduce their acquisition numbers in the near term, this would impact the final cost in a given year. With the above issues, it is quite likely that slippage may occur. Thus Canada may have to assess how much slippage it can accept to enable the best costs. These risk areas need to be monitored closely and carefully managed.

An additional benefit applies to Canadian industry participation. As long as Canada stays in the MOU framework and commits to buying the F-35, the JSF program will offer Canadian aerospace companies high value work until 2051. While there is some debate as to the overall value of this arrangement, Industry Canada and the Aerospace Industry Association of Canada have endorsed it, noting that the MOU offers more opportunity than the minimum that would be guaranteed under the normal IRB approach. This is an

unprecedented opportunity, and many companies have already begun reaping rewards from being accepted into the JSF supply chain.

Conclusion

Canada needs to replace the CF-18 relatively soon, therefore this debate matters. Knowing how long we will likely be operating a replacement aircraft, DND has established that only the latest generation of aircraft design can fully meet Canada’s requirements far enough into the future. Since fighter aircraft are very expensive, a robust capability and longevity of service are essential. The JSF is the result of a tough and protracted selection process that will leave it the only U.S. fighter in long term production. A Canadian competition, however desirable by some, would be very problematic at this stage, especially since Canada has assessed that only the F-35 meets its mandatory requirements. Since cost has been a driving factor in the program from the outset, the MOU arrangement is the least expensive way to acquire this advanced capability, and it offers excellent high value potential to Canadian industry.

While the F-35 clearly has some issues, it still remains a reasonable long term investment for Canada. As a member of NATO, NORAD and the United Nations – with the inherent “Responsibility to Protect” – Canada must be willing to share the costs of this commitment by investing in the necessary military equipment.

While politics is important, the future of Canada’s role in the world is at stake. The F-35 will provide excellent support to Canada’s foreign and defence policies for the next 40 years. It is an important national military capability that will enable Canada to maintain its respected position.

While it has great promise, it is not without significant risk. These risks must be monitored and addressed carefully – and the government must be fully transparent in so doing. Potential cost escalation and potential mitigation must be dealt with openly, to shore up public confidence. While the fighter replacement is indeed costly, the capability potential of the F-35 is too important to lose. **FL**

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