

TEST PILOT TALK

Canadian Skies staff

Canadian Skies discusses fighter jet capabilities with test pilots from Boeing, Dassault, and Lockheed Martin.



When the CF-18 first came on line in 1982, it was expected to be in service until 2003. Proactive aircraft management, including structural airframe repair programs, has extended the life of this fighter. The CF-18 has also undergone a comprehensive modernization of its systems. These initiatives have ensured that it has remained capable and relevant...for the time being. Cpl Pierre Habib Photo

The debate rages on about which fighter jet platform will best meet Canada's future needs. But how are those needs defined? In consultation with industry experts, Canadian Skies assembled a list of questions concerning critical aircraft capabilities. Then, we invited test pilots from Boeing, Dassault, Eurofighter and Lockheed Martin to answer those questions. All but Eurofighter came to the table to debate what we consider to be key capabilities required of Canada's next fighter.

Ricardo Traven

Chief Test Pilot

Boeing F/A-18 Super Hornet

A graduate of the Royal Military College of Canada, Ricardo Traven is the Boeing chief test pilot for all models of the Hornet family of aircraft, including the F/A-18E/F Super Hornet and the EA-18G Growler. He is also the Boeing air show demonstration pilot for the Super Hornet and recently expanded his flight test duties to include a 737 type rating and flight testing on the U.S. Navy's P-8 program.

CS: How well will the aircraft integrate with each of these examples of existing Canadian infrastructure: air-to-air refuelling assets and 6,000-foot runways?

RT: The Super Hornet is fully compatible with current Canadian air-to-air refuelling assets with no infrastructure changes required. It also has the unique ability to tank—freeing up strategic tankers

for other high-value missions and bringing flexibility to the force. With an attached air refuelling store, Super Hornets can refuel one another in flight. In the tanker configuration, the Super Hornet can perform as its own armed escort and provide situational awareness for aircraft being tanked. The Super Hornet is designed to take off and land in all weather conditions, and can easily do so on a 6,000-foot runway.



Ricardo Traven, chief test pilot, Boeing F/A-18 Super Hornet

CS: Upon aircraft delivery, what percentage of the air-to-air and air-to-ground weapons that Canada currently holds in its war stock will be compatible with the aircraft?

RT: The Super Hornet has more than 400 weapons configurations approved for carriage, and nearly all weapons currently cleared for the CF-18 will also be available for the Super Hornet. Additionally, special equipment used to load weapons onto the aircraft is exactly the same for the Hornet and Super Hornet. These commonalities represent significant cost savings and increased capability. The U.S. Navy and the Royal Australian Air Force currently operate Super Hornets alongside existing legacy Hornets to take advantage of these savings.

CS: Are there any special or unusual handling requirements for cold weather operations and aircraft consumables like fuel, oil and hydraulic fluid? What is the minimum temperature the aircraft can be left outside for a prolonged period of time and achieve an unassisted start?

RT: There are no special handling requirements needed for cold weather operations. The Super Hornet's rugged landing gear and two nose tires are perfect for unimproved and icy runways,

with no need for a dangerous drag chute. The Super Hornet is designed to similar weather standards as the CF-18, which has a proven track record in Arctic conditions, and performs equally or better. Internally installed components are tested to operate in all climates between -40C (-40F) and 71C (160F). CF-18s have operated at temperatures below -40C without difficulty.

CS: Will the aircraft be delivered with SATCOM? If not, when would it be available?

RT: Yes, if required.

CS: What are the guaranteed industrial regional benefits to Canada?

RT: The Boeing industry plan is a guaranteed best-of-industry approach to align with Canada's industrial and regional benefits (IRB) policy, compared with a best-effort approach by others within a global competitive market. Boeing's plan incorporates opportunities in both defence and commercial aviation, and also leverages with Boeing's industry partners. Canadian industry already contributes to Boeing commercial and defence programs, and that partnership continues to grow with opportunities in research and technology. Boeing brings a wide portfolio of world-class technology and opportunities that can keep Canadian industry highly competitive in the global marketplace.

CS: What is the unit price of an operational aircraft including engine(s), radar warning receiver, jammers, expendable dispensers, internal gun, pylons, etc.—essentially, an operational aircraft without weapons? Is this price dependent upon or tied to any other nations or customers purchasing the aircraft?



Boeing claims that its F/A-18 Advanced Super Hornet—fitted with new conformal fuel tanks (CFT) and an enclosed weapons pod (EWP)—will be able to outperform perceived threats well beyond 2030 in the anti-access, aerial denial environment. The advancement in capability is thanks to a suite of low-cost modifications, including enhanced stealth capabilities. Boeing Photo

RT: The fly-away cost for today's Super Hornet is approximately US\$52 million, including radar, avionics and engines, and is not affected by other customers' purchase decisions. The biggest cost consideration for any customer is operational expense. The Super Hornet's known and projected operational expenses are less than half of the F-35's estimate. From an acquisition standpoint, the Super Hornet is low risk and fits within Canada's budget.

CS: Why is this jet the best choice for Canada?

RT: The combat-proven Super Hornet represents the right mix of stealth and capability, can easily operate in expeditionary and Arctic environments, and is interoperable with coalition forces. With its extended range and endurance, rugged airframe and landing gear, and twin engines that offer a margin of safety not possible for a single-engine platform, the Super Hornet is uniquely suited for Canada. The RCAF's transition would be cost effective, taking advantage of existing infrastructure and minimal training requirements. The Super Hornet offers billions of dollars in savings to Canada via a regional benefits package, and acquisition and operational costs that are second-to-none.

Olivier "Nino" Ferrer

Chief Test Pilot

Dassault Rafale

Major (Rtd) Olivier "Nino" Ferrer is the Rafale test pilot. Ferrer is an ex-French navy fighter pilot who gained extensive experience on Vought F-8 Crusaders and Dassault Super Étendards before joining the Rafale fighter program. Ferrer is also a ground pilot/"handler" for the nEUROn stealth unmanned combat air vehicle (UCAV) demonstrator program.



Olivier "Nino" Ferrer, chief test pilot, Dassault Rafale

CS: How well will the aircraft integrate with each of these examples of existing Canadian infrastructure: air-to-air refuelling assets and 6,000-foot runways?

OF: The Rafale uses the probe-and-drogue method of refuelling used by the CF-18 and other NATO countries. This means Canada won't have to change its CC-150 Polaris refuellers or rely on other countries to provide refuelling services. The Rafale is also "buddy-buddy" refuelling

capable, which means it can be refuelled from another Rafale to extend range and stay on-station. As well, the Rafale is designed to operate in austere conditions on short runways. It can land in 1,500 feet without using a drag chute. The Rafale also has a tail hook for use with ground- or carrier-based landing arrest cable systems.

CS: Upon aircraft delivery, what percentage of the air-to-air and air-to-ground weapons that Canada currently holds in its war stock will be compatible with the aircraft?

OF: Rafale International offers full technology transfer to Canada, so Canada can integrate any other desirable weapons upon delivery. The Mil-Std-1760 compliant stores management system provides easy integration of customer-selected weapons. The Rafale already uses the NATO standard laser-guided bombs or unguided bombs used by Canada. Rafale also offers a full suite of new and next generation air-to-air and air-to-ground weapons for unprecedented fire power and precision, including long-range "cruise" stand-off missiles, the very long range air-to-air METEOR missile, and the HAMMER (Highly Agile Maneuvering Missile Extended Range). One Rafale is capable of firing upon and hitting six different targets simultaneously.

CS: Are there any special or unusual handling requirements for cold weather operations and aircraft consumables like fuel, oil and hydraulic fluid? What is the minimum temperature the aircraft can be left outside for a prolonged period of time and achieve an unassisted start?

OF: The Rafale was designed from the outset for all-weather operation, from freezing cold to "hot and high" conditions and marine environments. The Rafale is proven for autonomous operation at temperatures of -40C (-40F) and below. It has performed NATO support missions in Iceland and other northern environments.

CS: Will the aircraft be delivered with SATCOM? If not, when would it be available?

OF: If requested by the Canadian Armed Forces, the Rafale will be delivered with SATCOM and any other communications or data link required for full NATO and NORAD interoperability. This is part of the extremely advanced 360-degree sensor suite, data fusion and data synthesis capability of the Rafale, which automatically sorts out and serves the pilot just the right information needed for the mission, reducing decision time and improving situational awareness and survivability.



Rafale International has guaranteed at least 100 per cent return on Canada's investment in a fighter purchase. France has also pre-cleared Canada to receive all associated intellectual property, including source codes. Canadian companies can perform any work, including Rafale manufacturing and assembly. Dassault Photo

CS: What are the guaranteed industrial regional benefits to Canada?

OF: Rafale International has guaranteed at least 100 per cent return on Canada's investment in a fighter purchase. Not "up to," "maybe," "possibly," but guaranteed. France has pre-cleared Canada to receive all associated intellectual property and technology, including source codes. Canadian companies can perform any work, including Rafale manufacturing and assembly. Canada will have complete autonomy and independence to design new components, capabilities, and handle any degree of interoperability with other countries. All in-service support, mid-life upgrades, and future capabilities would be done in Canada. Economic benefits extend to opportunities on other commercial/business jets, UAV programs, space programs and more.

CS: What is the unit price of an operational aircraft to include: engine(s), radar warning receiver, jammers, expendable dispensers, internal gun, pylons, etc.—essentially, an operational aircraft without weapons? Is this price dependent upon or tied to any other nations or customers purchasing the aircraft?

OF: Rafale has given Canada a price for an aircraft as described, well within the acquisition funding envelope using KPMG life-cycle costing parameters. In a competition, we will offer a very competitive price, fully independent of any other nations or customer decisions. Remember, the greater cost is the aircraft's in-service support over 30 years. The maximum operating cost per hour for the Rafale is known and documented (combat tempo, in-theatre of operations, 100 per cent availability), with a much lower peacetime cost. While billions of dollars less than other aircraft, all work would be done in Canada, generating excellent ROI.

CS: Why is this jet the best choice for Canada?

OF: The Rafale is combat-proven, offering the most advanced features of latest generation fighters. Two Rafale replace five legacy fighters—a real force multiplier. Besides the F-35, Rafale is the only aircraft offering an integrated optical sensor for air and surface tracks and full data fusion, and ours is combat proven. The Rafale meets or exceeds all Canadian defence needs in the Canada First Defence Strategy, and offers full NATO/NORAD interoperability. It is in production and can be delivered within current CF-18 replacement schedules. The Rafale is a risk-free, stable, predictable investment, and offers Canada the best industrial and economic benefits.

Billie Flynn

Senior Experimental Test Pilot

Lockheed Martin F-35 Lightning II

Billie Flynn is a senior experimental test pilot for Lockheed Martin Aeronautics on the F-35 and F-16 programs. He currently serves as the executive advisor to the Society of Experimental Test Pilots (SETP) board of directors and is also the chairman of the SETP Foundation.

CS: How well will the aircraft integrate with each of these examples of existing Canadian infrastructure: air-to-air refueling assets and 6,000 foot runways?



Billie Flynn, senior experimental test pilot, Lockheed Martin F-35 Lightning II

BF: In my CF-18 experience, the majority of tanker assets weren't available because our Hornets were not boom refuelling capable (we had probe and drogue style refuelling). This was true in peacetime and especially during combat. Today, the USAF tanker fleet provides much

of Canada's tanker requirements, with tankers modified for probe and drogue fuelling. With the F-35, Canada can use this same arrangement, but without modifying the tanker. Also, the F-35A operates on 6,000-foot runways with full fuel and internal weapons (55,000 pounds landing weight). It can use a drag chute, and has an arrester hook for Arctic operations.

CS: Upon aircraft delivery, what percentage of the air-to-air and air-to-ground weapons that Canada currently holds in its war stock will be compatible with the aircraft?

BF: The F-35A will be capable of employing the precision guided munitions (laser-guided and GPS-guided) as well as the AIM-120 AMRAAM currently flown on the CF-18. The nature of fifth generation fighters is that non-guided "dumb" bombs that were flown on legacy fighters will not be used. Experience gained with the CF-18 in combat during my tour commanding combat operations over Kosovo and Serbia in 1999 bore out the value of the Air Force investment in PGMs, because of their precision and effectiveness. The F-35 will enhance that lethality even more.

CS: Are there any special or unusual handling requirements for cold weather operations and aircraft consumables like fuel, oil and hydraulic fluid? What is the minimum temperature the aircraft can be left outside for a prolonged period of time and achieve an unassisted start?

BF: The F-35 is designed to operate from the extremes of 55C (131F) down to well below -40C (-40F). The F-35 requirements are consistent with legacy cold weather requirements and meet or exceed the performance of older, legacy fighters. The F-35 possesses autonomous, unassisted, ground-start capability and the electrical power system can support an integrated power package start at temperatures down to -40C. Operating in the extreme cold will not be unique to the RCAF; the USAF as well as the Royal Norwegian Air Force will operate F-35As in the Arctic environment.

CS: Will the aircraft be delivered with SATCOM? If not, when would it be available?

BF: Block 4A candidates include Integrated Waveform (IW), which provides SATCOM capability which is scheduled to deliver well before the planned full operational capability in Canada.

CS: What are the guaranteed industrial regional benefits to Canada?

BF: The F-35 program is founded on the "best value" strategy to ensure that the aircraft and its systems are both high quality and affordable. Canada has a mature industrial base that can compete to capture work on the global supply chain for the F-35. The industrial work on the F-35 is 100 per cent direct and engages them on a global supply chain of more than 3,000 aircraft. Canadian industry has already won nearly \$600 million in F-35 contracts and commitments to date, which does not include sustainment work.



Lockheed Martin says that the F-35 redefines the tactical fighter role, eclipsing the capability of legacy fighters. Lockheed Martin Photo

CS: What is the unit price of an operational aircraft to include: engine(s), radar warning receiver, jammers, expendable dispensers, internal gun, pylons, etc.—essentially, an operational aircraft without weapons? Is this price dependent upon or tied to any other nations or customers purchasing the aircraft?

BF: The United States government (USG), not Lockheed Martin, determines the price of the F-35. The USG has determined that the F-35 delivered in 2020 will cost US\$85 million in then-year dollars, which is US\$75 million in today's dollars. This is based on the program of record and does not account for additional aircraft sales outside the partnership.

CS: Why is this jet the best choice for Canada?

BF: The F-35 provides the greatest value with fifth generation fighter capability. It's the only aircraft that allows Canada to patrol and control the Arctic, and ensures coalition interoperability. Advanced stealth, exceptional agility and maneuverability, and sensor fusion are integrated for the first time, leading to greater situational awareness, survivability/effectiveness, and improved reliability. The F-35 redefines the tactical fighter role, eclipsing the capability of legacy fighters. I foresee a dramatic leap in Canada's ability to protect its sovereignty. This program will provide decades of high-tech, industrial jobs, and ensures Canadian industrial participation on the global fleet of more than 3,000 aircraft.