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The 20th anniversary of the CF-18 *Hornet* occurred in 2002. In 2017, it will have served Canada for 35 years, and will thus be one of the oldest serving fighter aircraft in the world.

REPLACING THE CF-18 HORNET: UNMANNED COMBAT AERIAL VEHICLE OR JOINT STRIKE FIGHTER?

by Lieutenant-Colonel Carl Doyon, CD

“[We must be] guided by new fiscal, technological and strategic realities”

– The Honourable John McCallum,
2003-2004 Report on Plans and Priorities

The Available Choices

In May 2001, Art Eggleton, at the time Canada’s Minister of National Defence, announced a \$1.2-billion program to modernize the avionics of the CF-18 and thus to prolong its useful life until 2017-2020. This measure effectively delayed the difficult decision with respect to replacing the aircraft. According to Jason Kirby, an editor at *Canadian Business*: “DND insiders... say it’s not a question of which plane Canada will buy, but what role Canada wants to play in the world. Will it fight wars or keep the peace?”¹ Will it decide to replace the CF-18 with another combat aircraft such as the Joint Strike Fighter (JSF) or will it completely eliminate this operational capability? Will Canada leave it exclusively up to the United States to ensure its protection, especially since the Americans seem resolved to extend their security perimeter to include all of North America? Or will Canada decide to invest in a less expensive but new technology, the Unmanned Combat Air Vehicle (UCAV)?

In June 2003, Thierry Gongora, a Department of National Defence analyst, published a paper in which he presented a dozen options that the government could consider in replacing the CF-18.² Gongora concluded: “We cannot assume that the follow-on system needs to be necessarily another multi-role fighter... We can no longer assume that the only viable alternative to a manned multi-role fighter is another one.”³ Elinor Sloan, a professor attached to the National Defence Headquarters Directorate of Strategic Analysis, observes in a report, “It may make more sense for the Air Force to focus on... stealth Unmanned Combat Aerial Vehicles, which might better be able to carry out many of the missions currently performed by tactical air forces.”⁴ There is no doubt that factors such as Canadian sovereignty, the capabilities that the government is ready to devote to Canada’s defence, Canada’s commitments and the presence it wishes to maintain in the world, as well as available choices and resources, will all be determining factors in the decision.

Lieutenant-Colonel Doyon is an aerospace engineer and Commanding Officer of 3 Aircraft Maintenance Squadron at 3 Wing, Bagotville, Quebec.

In the *2003-2004 Report on Defence Plans and Priorities*, John McCallum, then Minister of National Defence, remarked: “We can no longer afford to invest equally in the capabilities or structures of the past.”⁵ He added:

“That means being guided by new fiscal, technological and strategic realities to make selective, strategic choices on what capabilities we will invest in, what new concepts and capabilities we will pursue or ignore and what old capabilities we will maintain, reduce or eliminate.”⁶

All in all, while attaining its objectives, the government is leaving the door open to the study of new technologies that could enable it to maximize returns on its investment in defence. The literature is currently almost silent on questions regarding the replacement of the CF-18, but it is now time for this subject to be rigorously debated. From this perspective, this article will attempt to demonstrate that, when the CF-18 has come to the end of its useful life, forecast to be between 2017 and 2020, it is not certain that Canada will replace its fleet with another combat aircraft such as the JSF because the UCAV will have reached a state of development that could make it a more competitive choice. After explaining the need for an air combat capability, this article will analyze three options that could be at the core of the coming debate. In the first option, the government would decide to conclude an agreement with the United States for them to assume, from their own stocks of equipment and personnel, the duties now performed by the CF-18 and thereby assure Canada’s aerial protection. A second option would consist of investing in a new technology such as the UCAV. The final option entertained would be to replace the CF-18 with another conventional, manned combat aircraft. Finally, this article will briefly compare the JSF and the UCAV since they represent, in this writer’s view, the two most promising equipment options for the future.

The Need for an Air Combat Capability

Whence the need for air combat capability? Why not simply do without it completely? First of all, the operational capability procured by a combat aircraft such as the CF-18 has always been associated with defending the country. Also, as Canada’s foreign policy bears witness, security and stability in the world are prior conditions for the country’s growth and economic development. It is clear that Canada has an interest “in doing its part to ensure global security, especially since Canada’s economic future depends on its ability to trade freely with other nations.”⁷ And finally, as the *1994 White Paper on Defence* clearly indicates, a country “cannot dispense with the ...air combat capabilities of modern armed forces.”⁸



<http://www.globalsecurity.org/military/systems/aircraft/x-45-pics.htm>

The Unmanned Combat Aerial Vehicle (UCAV) X-45A made its maiden flight on 22 May 2002.

The government therefore considers that it has an ongoing interest in maintaining combat-ready multi-role forces. The tragic events of 11 September 2001 in the United States provide eloquent witness to the unforeseeable nature of threats and the need to maintain an air force that is viable and capable of defending national and international interests. The usefulness of such an operational capability is therefore not called into question, nor is Canada’s will to maintain such a force. The challenge will be to replace this force with limited resources. With respect to the replacement of the CF-18, do we absolutely have to acquire another traditional combat aircraft, or is it possible to find a solution that is as effective and less costly?

First Option: Entrust the Protection of Canada to the United States

This solution would consist of concluding an agreement with the United States whereby their forces would fill the role of the CF-18. A nation may conclude agreements with other nations to defend common interests, as is the case with the North American Aerospace Defence Command (NORAD) the Canadian-American agreement that, since its creation in 1958, has been the core of Canada’s capability to defend its airspace against any potential aggression. Leaving this mandate to the United States would maximize the use of American infrastructures and air resources, and this could produce economies of scale. The cost of defence would therefore be less, an eventuality that would be in Canada’s best interest. However, such a measure would weigh heavily against the need to maintain forces capable of having our national laws respected and of exercising control over our national air space. Furthermore, it would be difficult to entrust the maintenance of this airspace to another government without placing our sovereignty in question. As Colonel Paul Black, president of the Royal Canadian Military Institute, remarked: “How Canada defends its territory and its domestic interests

is an important element in how other nations relate to Canada. A 'strong' Canada, with an efficient military, secures a measure of respect from other nations."⁹ What is more, the *1994 White Paper on Defence* maintains that "Canada should never find itself in a position where the defence of its national territory has become the responsibility of others."¹⁰ As the working group that studied the repercussions of the Revolution in Military Affairs (RMA) upon Canadian defence beyond the year 2010 noted: "The armed forces are the ultimate recourse the country has to defend its interests, on its territory and abroad. They must therefore be in a position to apply significant combat strength when it is asked of them."¹¹ As well, in a survey by the Department of National Defence conducted in the fall of 2001, 93 per cent of Canadians polled considered it important to defend Canadian sovereignty, and 83 per cent considered it important to maintain the capability of conducting combat operations alongside our NATO allies, in order to ensure peace and security in the world.¹²

Under these conditions, the option of entrusting the protection of Canada to the United States is difficult to entertain seriously, since it would put our sovereignty into question, a condition neither the government nor the citizens of Canada in general appear to desire. Furthermore, on 28 August 2002, Minister McCallum reaffirmed the government's position in this regard: "Our bottom line is that we are a sovereign nation, and we are going to stay a sovereign nation. We don't want to integrate; we don't want our soldiers to be under [permanent] command of the Americans."¹³ In all likelihood, the operational capability provided by a combat aircraft such as the CF-18, procured in the first place for the defence of Canada should, in principle, be maintained and we should not depend upon the Americans. Consequently, this option will not be compared with those offered by the JSF and the UCAV.

Second Option: The UCAV

To replace the CF-18, Canada could consider acquiring a UCAV – that is, an aircraft commanded at a distance by an operator on the ground or programmed before a mission is carried out. The technology of the remote-controlled aircraft is not new. By 2001, approximately 80 varieties of this type of aircraft were in service in more than 55 countries.¹⁴ What is new is the concept of an armed remote-controlled aircraft, the UCAV. The *Predator* is currently the remote-controlled aircraft whose capabilities most closely approach what is expected of a UCAV. But is it realistic to think that such a machine can fill the same roles and the same missions as a traditional combat aircraft? On this subject, Lieutenant-Colonel (ret'd) Charles Barry, a defence consultant in Washington, and Elihu Zimet of the *Office of Naval Research*, consider that "(UCAVs) are capable of becoming one of the technologies which will transform the traditional operations most radically in the whole spectrum of combat, from

peacekeeping to regional wars."¹⁵ According to extensive research carried out to date, including that of Elinor Sloan, "many military experts predict a long-term move away from manned fighters and toward unmanned combat."¹⁶

As Sloan remarks: "As a means of bridging the gap before its stealth UCAV can be fielded, the U.S. Air Force (USAF) has armed some of its *Predator* UAVs with precision weapons."¹⁷ In 2001, the *Predator* had to its credit a dozen air-to-ground attacks in Afghanistan, where its effectiveness was nearly perfect.¹⁸ The same type of aircraft was used by the Central Intelligence Agency (CIA) in Yemen on 4 November 2002 in an attack on six members of Al-Qaeda. These individuals were headed for an unknown destination when the CIA, discovering their vehicle, launched a *Hellfire* missile that killed the six alleged terrorists on the spot. One of them was Ali Qaed Senyan al-Harethi, suspected of being the author of the attack against the American destroyer *USS Cole* in Yemen in October 2000.¹⁹ Since August 2003, despite difficulties of adaptation, the Canadian Army has used a remote-controlled *Sperwer*-type aircraft to assist its land forces deployed in Afghanistan. A *Predator* system, which has proven itself, could turn out to be an option offering much more than operational capability to the Canadian Forces. It could serve the interests of the army, the navy and the air force in monitoring, information gathering and reconnaissance missions. It could also provide an armed combat capability.

The rapid development of the UCAV follows a new orientation of the American superpower and the important investments of recent years. This is not surprising, given that President Bush and Secretary of Defense Rumsfeld have made the UCAV one of their priorities for the transformation of American defence.²⁰ According to Barry and Zimet: "Congress added a provision to the 2001 *Defence Authorization Act*, specifying that, within a decade, one-third of all U.S. deep-strike aircraft should be UCAVs."²¹ In June 2001, General John W. Handy, Vice-Chief of Staff of the USAF, declared: "We are heavy into... UCAV. I am a pilot, but I am not on any crusade to keep jobs for pilots... It represents some tremendous capability, and we shouldn't limit ourselves in any fashion to what we can do with the UCAV ..."²²

Boeing, with its X-45, and Northrop Grumman with its X-47 *Pegasus*, were the first companies to launch a UCAV program, whose first flights took place on 22 May 2002 and 23 February 2003 respectively. As Gary Ervin, Sector Vice-President, Integrated Combat Systems at Northrop Grumman noted, "This success... points to the potential for joint use of the *Pegasus* design to meet Air Force requirements in the government's emerging Joint UCAV program."²³

"...We can no longer assume that the only viable alternative to a manned multi-role fighter is another one."

It cannot be denied that the UCAV offers a lot of potential. Although its air-to-ground effectiveness is not in doubt, its air-to-air capability has not yet been demonstrated. However, the long-term prospects appear promising. In June 2003, in a research note, Lieutenant-Colonel Cate

Versions and Expected Costs of the F-35 Compared to Other Combat Aircraft

Version	Description	Expected Cost ²⁷ millions CA*, 2003
F-35A	Land version for the U. S. Air Force (classic takeoff and landing)	\$52
F-35B	Short-takeoff-and-vertical-landing version for the United States Marine Corps	\$65
F-35C	Shipboard version for the aircraft carriers of the U. S. Navy	\$71
F/A-18E/F	U. S. Navy Super Hornet	\$112
Nil	Typhoon Euro Fighter	\$112
F/A-22	U. S. Air Force Raptor	\$328

* US \$ conversion rate = CDN \$1.2899, as of 9 January 2004

Table 1

of the USAF concluded: "It is conceivable that a next-generation UCAV could be developed with air-to-air capability that would satisfy all air superiority missions, including sweep and escort."²⁴ However, according to Cate, the challenges will be substantial, especially in close air combat. Barry and Zimet agree when they write that the "UCAV holds promise in the far term (2025), to provide a capable and prolific air superiority fighter."²⁵

In view of the progress generated by Boeing and Northrop Grumman, the UCAV will certainly be an operational system by the time Canada has to make a decision on the subject of replacing the CF-18. The government should therefore be in a position to properly assess the value of such a system as an alternative to replacing its combat aircraft.

Third Option: Another Combat Aircraft, the Joint Strike Fighter

Another option would simply consist of replacing the CF-18 with a modern combat aircraft capable of filling the same functions. In order to limit the analysis of this option, only the one aircraft in which Canada has already demonstrated an interest has been considered, the American F-35 JSF. An important factor in the choice of a combat aircraft, beyond its operational capabilities, is its cost. The JSF, currently valued at \$52 million, is expensive, but it appears to present the best capability/price ratio. Paul Mitchell, Director of Studies at the Canadian Forces College in Toronto, considers that "if the Canadian Forces choose to retain an offensive air capability, the JSF certainly represents its most likely choice."²⁶

There will be three variations on the F-35: a land-based version mainly for the air force; a shipboard model for naval carrier operations; and a short-takeoff-and-vertical-landing version for the United States Marine Corps. The construction of the first model began on 10 November 2003 and the flight of the first prototype is expected towards the end of 2005. Table 1 shows the estimation of the cost of each of the versions of the F-35, compared to other combat aircraft.

Sales forecast already number in the order of 3000 aircraft to the United States and the United Kingdom alone, and the revenue turnover from these sales would amount to \$US 200 billion. According to several sources, 3000 additional aircraft may well be purchased by export markets. In order to reduce the unit cost of these aircraft and to make the JSF program more attractive to potential purchasers, the

Pentagon has authorized certain allied countries to take part in refining the aircraft's development and capabilities. Eight countries, including Canada, have signed an agreement to this effect. In addition to the UK, which has undertaken to purchase 150 aircraft, possible purchasers include the international partners shown in Table 2. Furthermore, according to John Tirpak, Editor-in-Chief of *Air Force Magazine*: "About 35 nations operate the F-16, F/A-18 or AV-8B, and all would be considered candidates to purchase the JSF at some point in the future."²⁸

By becoming a Category III partner,³⁰ the Canadian industry can officially respond to requests for proposals, take part in all stages of the program, and possibly land subcontracts. It is important to emphasize that the agreement signed by Canada in no way commits it to purchase the aircraft. However, according to several sources, the government will experience very strong pressures to do so. Given the potential economic benefits, the Canadian aerospace industry will certainly be the first to exert pressure. Ken Epps, Senior Coordinator of the *Institute of Peace and Conflict Studies* at

International Partners and Investors in the American JSF²⁹

Country	Category	Investment (millions US)	Date of Agreement
United Kingdom	I	\$2056	17 January 2001
Italy	II	\$1028	24 June 2002
Netherlands	II	\$800	10 June 2002
Turkey	III	\$175	11 July 2002
Australia	III	\$150	31 October 2002
Canada	III	\$150	7 February 2002
Norway	III	\$125	20 June 2002
Denmark	III	\$125	28 May 2002

Table 2

LMTAS photo http://www.f-16.net/f-16_photos_album80.html



In 2001, a Joint Strike Fighter (JSF) X-35B demonstrator made a successful vertical take off test flight.

Conrad Grebel University College in Waterloo, foresees that “Canadian aerospace industrial participation in the program will generate economic pressures not only to consider the F-35 first among combat aircraft, but also to give priority to the F-35 above other procurement needs.”³¹ Epps also considers that “... the economic benefits to Canadian industry of the JSF program – regardless of their final size – may have already determined a future military procurement decision.”³² Another element of pressure will inevitably be the U. S. government, the more so because it wants Canada to do more in terms of defence of the North American continent.

In political terms, Mike Slack, manager of the Joint Strike Fighter project for Canada in Ottawa, gave an update in April 2003 before the Standing Committee on National Defence and Veterans Affairs (SCONDVA).³³ His presentation appears to have been well received by the Committee. On the other hand, one of the politicians who called the program into question is Claude Bachand, the Bloc Québécois Defence and Veterans Affairs critic. According to Kirby, Bachand said to Slack: “I would just like to warn you... we will not support that type of purchase [JSF] because... we would like to see more investment in drones [UAVs and UCAVs].”³⁴ Despite the significant benefits derived to this point by Canadian companies, the debate in the Canadian Parliament has the potential for becoming stormy in the coming years.

Comparative Analysis of the JSF and the UCAV

Of the UCAV and the JSF, which is the system more likely to be favoured by Cabinet? That choice will have to be made in accordance with several criteria and the weight given to each of them.

The cost of the life cycle. Of all the criteria, given Canada’s financial resources, the cost of the system’s life cycle will be predominant in the decision. This cost includes not only the expenses related to system acquisition but also operating and maintenance costs throughout the system’s useful life. Major William K. Lewis, a fighter pilot who has accumulated more than 2500 flying hours in the USAF, estimates that the UCAV’s operating and maintenance costs will clearly be lower than those of the JSF.³⁵ The latter is designed for a useful life of 8000 operating hours. If we base our observations upon historical data, 95 per cent of these flying hours will be devoted to training. The rest, or the equivalent of 400 hours, will consist of operational missions.³⁶ A UCAV’s useful life will be 5000 operating hours, and we foresee its employment in operational missions 50 per cent of this

time, the equivalent of 2500 operating hours.³⁷ If we *only* consider the acquisition cost of a JSF, valued at \$52 million per unit, compared to \$18 million for a UCAV,³⁸ the cost of one flying hour for a JSF in real operations will be \$130,000, while for a UCAV it will be \$7200, or 18 times less. Furthermore, the possible economies in peacetime should prove to be even more considerable, since almost all training of personnel manning UCAVs will be done by simulator, which will not be the case with the JSF. Major Lewis estimates that the overall cost of operating and maintaining a UCAV will be one-tenth that of a conventional combat aircraft.³⁹ Having said that for the moment, we are dealing with financial forecasts that appear to be fairly optimistic, especially with respect to the UCAV. Nevertheless, relatively speaking, the possible economies in the cost of the life cycle clearly cause the scales to weigh in favour of the UCAV at this time.

Reliability. The reliability of the system is intrinsically tied to the financial elements. Increased reliability and fewer flying hours mean fewer breakdowns, fewer repairs, fewer spare parts, and, possibly, fewer support personnel needed to keep the UCAV in an operational state. The more reliable the system, the more frequently it is available for operational missions. That said, although the JSF is a complex system, its reliability should be as good as that of the UCAV. However, the UCAV, despite having less stringent manufacturing standards, includes many fewer components, and therefore fewer components susceptible to failure.

“... such a measure would weigh heavily against the need to maintain forces capable of having our national laws respected and of exercising control over our national air space.”

Summary of the Comparative Analysis of the JSF and the UCAV

	JSF	UCAV
Usefulness	Excellent	Excellent
Acquisition cost	52 M ⁽¹⁾	18 M, or 1/3 of the cost of the JSF ⁽²⁾
Operating and maintenance cost	High	From 1/2 to 1/10 of the cost of the JSF
Useful life (hours)	8000	5000
% of time devoted to operational missions	5%	50%
% of time devoted to training	95%	50%
Operational capability	Excellent	Good (air-to-air capability has not yet been demonstrated)
Risk of loss of human life	Low	None (no pilot)
Survival capability	Excellent	Excellent
Interoperability	Excellent	Excellent
Reliability	Good (system complex)	Good (fewer components than the JSF, but manufacturing requirements less stringent)

(1) Forecast cost, classic takeoff-and-landing version, in millions of 2003 Canadian dollars.

(2) According to the UCAV Advanced Technology Demonstration.

Table 3

The usefulness of the system. As the working group studying the repercussions that the Revolution in Military Affairs could have upon the defence of Canada after 2010 noted: “The credibility of DND, the CF and, even more, of Canada is tied to the existence of forces which are truly useful and are seen as such”.⁴⁰ In working out their strategy for the year 2020, the CF indicate that Canada’s allies “want it to be a competent partner capable of playing a significant role in inter-allied operations.”⁴¹ To this end, the Canadian Air Force must have a useful system that can make a significant contribution to national and international operations. In this respect, the JSF and the UCAV appear to be roughly equivalent.

Operational capability. The system’s ability to fill the functions and missions of an air combat force is also an essential criterion. Currently, we have to say that the JSF has a head start on the UCAV, mainly because the latter’s air-to-air capability has not yet been demonstrated. However, Major Lewis notes in his study that “... an air-superiority UCAV should be feasible by the year 2025 and that it should provide an effective and affordable alternative to manned air-superiority fighters.”⁴² If this is true, a UCAV system purchased in 2017 could present gaps in air-to-air operations carried out by Canada. If there was no interim alternative, that could place the choice of the UCAV in serious jeopardy. On the other hand, it is possible that the UCAV’s air-to-air operational capability may mature earlier, which could

eliminate this problem. All in all, in terms of operational capabilities, the Joint Strike Fighter currently has a head start on the UCAV in this respect.

Interoperability. It will remain increasingly important to be able to carry out operations with our allies. On this subject, Elinor Sloan seems to be of the same opinion as most of the military experts when she writes that “the new military will increasingly be a joint force.”⁴³ Along the same lines, Andy Knight, Professor of Political Science at the University of Alberta, remarks that “... interoperability is seen as a way of making the best possible contribution at the least possible cost to the Canadian government and people.”⁴⁴ In order to be able to join such a force, the systems used by the CF must be interoperable, first with those of the US, then with those of the other member countries of NATO. The JSF and the UCAV may be on the same footing in this respect, since they both will have excellent interoperability.

The capability of surviving in a hostile environment. It is also important that the system adopted be able to carry out a mission successfully without having that weapon system destroyed by the enemy. The JSF and the UCAV will both be capable of surviving in combat situations, since they will be based on stealth technology and therefore will be hard to detect by the enemy. Table 3 summarizes this comparative analysis of the JSF and the UCAV.

If we consider the relative importance of all the criteria evaluated, the long-term prospects of the UCAV play in its favour. Furthermore, according to Mitchell: “Given the volume of airspace that needs to be monitored in Canada, aircraft that can remain on station for long duration are particularly valuable,”⁴⁵ and this factor will

“A Predator system, which has proven itself, could turn out to be an option offering much more than operational capability to the Canadian Forces.”

certainly apply to the UCAV. Furthermore, if one takes into account several broad analyses on the subject area, including one presented by *Global Defence Review*, "... all future combat aircraft are almost inevitably going to be unmanned."⁴⁶ Tim Robinson, Editor of *Aerospace International*, also considers that "...with the rise of unmanned combat air vehicles (UCAVs), – or armed robot drones, the JSF could well be the last manned fighter ever built."⁴⁷ Nevertheless, despite the high cost of its life cycle, the JSF undeniably remains an option that could easily satisfy the Canadian Air Force's operational requirements in a combat aircraft. The UCAV also offers several advantages that the decision-makers must seriously consider. Elinor Sloan clearly leans in favour of UCAVs when she says that they "...would be significantly less expensive, they would remove the risk of aircrew casualties and, in some cases, they might even be able to outperform manned aircraft."⁴⁸ In this article, the analysis of these criteria appears to corroborate Sloan's assertion. When all is said and done, according to Barry and Zimet: "Allies should be encouraged to embrace the technologies required for closely integrated coalition operations, including UCAVs from multiple nations".⁴⁹

"Despite the significant benefits derived to this point by Canadian companies, the debate in the Canadian Parliament has the potential for becoming stormy in the coming years."

In the short term, it seems inevitable that the coming debate on the UCAV and the JSF is likely to be agonizing. George Wilson, an editor at the *National Journal* in Washington, provides an interesting summary of what is likely to take place on the Canadian scene with respect to this issue during the coming years. "... in this manned versus unmanned fight... a fierce lobbying effort by all sides is guaranteed to continue through 2010, when the JSF and the UCAV will have both been flying and showing what they can and cannot do."⁵⁰

Conclusion

Acquired by Canada in 1982, the CF-18 is now more than 20 years old. Although it has been modernized, it will reach the end of its useful life between the years 2017 and 2020. What will the Cabinet do to replace the operational capability provided by this aircraft? The most likely options have been analyzed, namely, not to replace the CF-18 and to leave Canadian air defence up to the United States, to acquire another combat aircraft such as the JSF, or to invest in the new UCAV technology. In the final analysis, it is not inescapable that Canada will replace its fleet with another combat aircraft



DND photo

A modified Unmanned Aerial Vehicle (UAV) *Predator*, Altair CU-163301, leased to the Canadian forces in August 2004, taxis to the runway for takeoff at 5 Wing Goose Bay for tests in Eastern Canada and Arctic.

such as the JSF, since the UCAV's long-term prospects seem to play generally in favour of the manned aircraft at this time.

However, due to the importance of the decision to be made, a much more exhaustive study must be carried out and an in-depth analysis of all the options must be performed before the government makes an irreversible choice. The options called for by Thierry Gongora are a good point of departure for a subsequent analysis.⁵¹ What will the reaction of Canadian aviators be to the idea of adopting UCAVs, assuming this is an issue? At what point will the operational air-to-air capability of the UCAV really become available, and what will the operational effectiveness of this UCAV be in an air space as vast as that of Canada? Will the actual costs of the JSF and the UCAV be different from those that are anticipated? Furthermore, what would be

the repercussions with respect to the participation of the Canadian aerospace industry in the JSF program if Ottawa decides not to purchase this aircraft? To answer this last question, a specific politico-economic study would have to be conducted.

It is always difficult to foresee what the future holds, and that is certainly the case with the UCAV and the JSF. The debate on the replacement of the CF-18 will clearly be stormy in the coming years. By the time Canada has to make a decision, both the Joint Strike Fighter and the Unmanned Combat Aerial Vehicle will have shown what they can and cannot do, but the ultimate decision that the government will have to make with respect to the CF-18 replacement will not be an easy one.



NOTES

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