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A History of Avro Arrow in the Cold War

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The Cold War background to the Arrow. The threat was from across the Pole, and the swaggering post-war Royal Canadian Air Force wanted a strong deterrent.
Design: The Arrow was primarily a triumph of innovative design. Here we glance at a few of the aircraft's design features.
The Arrow's fall from favor is an account of political intrigue and indecision in the face of a technologically changing world. The seeds that would ultimately doom it would be sown very early in the Arrow's life.

In December 1953, following the findings of the All-Weather Interceptor Requirements Team that no aircraft meeting the RCAF's grueling specifications existed in other countries, the St. Laurent government awarded Avro a $27 million contract to design two prototype all-weather, two-seat, twin-engine, supersonic interceptors.

Wing assembly at the Avro plant: Before 1954 the Arrow was rarely referred to in public, and led a rather underground existence. It was after the explosion of a Soviet hydrogen bomb and the introduction of new Myasishchev M-4 Bison jet bomber which opened the possibility of a Cold War "bomber gap",that the program was stepped up. In March 1955, the contract was upgraded to a $260-million contract for five Arrow Mk 1 aircraft powered by Pratt and Whitney engines, to be followed by 35 Arrow Mk 2s with as-yet-unavailable Iroquois engines. It was also determined at this time to do away with the costly development of prototypes and launch into assembly line production with the first model.
In September 1955, Avro told Cabinet that it needed an additional $59 million to keep the program on schedule. It was around this time that the fateful notion began to surface, not only in Canada but in the military establishments of most of the Western Alliance, that the era of the interceptor was over, and that the age of guided missiles would render them obsolete.

A model is tested in a wind tunnel:
It was also in 1955 that efforts began to sell the Arrow to the Americans and British. The Arrow project received glowing praise and

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admiration, but no interest as an actual purchase. This could have been anticipated as American and British Air Forces almost never purchase planes from other countries. But this seems to have contributed to a growing unease in the Liberal cabinet and among the Chiefs of Staff about the cost of the program. This wasn't helped by recurring approaches from Avro for more money. In December 1955, Cabinet limited Avro to the eleven prototypes and put a spending cap on the overall program of $170 million over the next three years. By this time, Avro had become the third largest corporation in Canada, and was employing some 41,000 people.

Inspecting the landing gear:
In 1956, events took place that would seriously cripple the Arrow's future. Conventional wisdom concerning aircraft suggested that a radical new design should be combined with off-the-shelf components like the engine and armament system to keep costs down. The Arrow project was already developing a new engine, and now the RCAF decided that the Hughes Aircraft radar fire control system didn't meet its standards. They chose to have a new system developed in Canada at RCA-Victor, and when the chosen Sparrow II missile development was cancelled by the U.S. Navy, its development was also subsumed in Canada. Avro strenuously objected to these choices, and in hindsight, it appears that these extra burdens may have pushed the Arrow over the budgetary edge.

In February 1957, Cabinet ordered the spending cap increased to $216 million, and squadron deployment wasn't expected until 1961-62. There is evidence that the Liberals were losing faith in the Arrow, but it was far from politically expedient to cancel the popular project in an election year. To the surprise of many, in June 1957 the Liberals lost the election and a minority Conservative government under John Diefenbaker took power.

The Bomarc:
In August 1957, an event took place that was to have far-reaching implications on the fate of the Arrow. Diefenbaker signed onto the North American Air Defence (NORAD) agreement with the United States, committing Canada to integrating its continental air defence with the USAF. This meant that two new weapons systems would come into the calculations, the Bomarc missile and the Semi-Automated Ground Environment (SAGE), a ground-based surveillance and weapons control system.

These new weapons, combined with Arrow cost overruns, the unfavorable impression that the Avro lobby in Ottawa was making on policy makers, and the general impression that the threat from manned bombers had disappeared, were to gravely threaten the future of the Arrow project.

The Arrow was rolled out to an admiring public of 12,000 people on Oct 4th, 1957. As fate would have it, the USSR launched Sputnik 1 the same day, stealing headlines and providing an ominous foretaste of a technologically confusing world. But at the Avro plant in Malton, Ont, all was well with the world.

Sputnik, and the launch of the space age:
Defence Minister George Pearkes, who would be so instrumental in the demise of the Arrow, was on hand, as was Canadian aviation luminary John A. D. McCurdy. If the space race and missile technology was making Pearkes change his mind about the Arrow, he wasn't about to mention it here:
"Much has been said of late about the coming missile age, and there have been suggestions from well-intentioned people that the era of the manned aero plane is over and that we should not be wasting our time and energy producing an aircraft of the performance, complexity and cost of the Avro Arrow. They suggest that we should put our faith in missiles and launch straight into the era of push-button war. I do not feel that missile and manned aircraft have, as yet, reached the point where they should be considered as competitive.

"They will, in fact, become complementary. Each can do things which the other cannot do, and for some years to come both will be required in the inventory of any nation seeking to maintain an adequate 'deterrent' to war. However, the aircraft has this one advantage over the missile. It can bring the judgment of a man into the battle, and closer to the target where human judgment, combined with the technology of an aircraft, will provide the most sophisticated and effective defense that human ingenuity can devise." (from the book 'Arrow')
The irony of these comments is remarkable considering subsequent events. After a period of elaborate tests including engine ground running tests, low speed taxi trials, high speed taxi trials and many hours in the most advanced flight simulator in Canada, the aircraft was ready for its first flight. Just before 10 a.m. on March 25th 1958, most of the staff of Avro poured out as loudspeakers invited all non-essential workers to watch the Arrow's maiden flight, with Janusz Zurakowski at the helm. Two chaser airplanes, a single-seat F-86 Sabre flown by Jack Woodman, and a CF-100 flown by "Spud" Potocki with Avro photographer Hugh Mackechnie on board, were already aloft.

Things looked good at Avro:
At 9:51 a.m. the Arrow lifted off, barely halfway down the 3,368 meter runway. At 1525 metres Zurakowski requested the CF-100 to close in and check on the nose wheel landing gear door because the safety light in the cockpit indicated it was open. The speed was then boosted from 200 knots to 250 knots and the Arrow moved up to 3350 meters. After 35 minutes, the airplane landed. The first flight was a success, and only two micro-switches had failed to respond. Zura's only complaint was that there was no clock in the cockpit to tell the time. Upon leaving the craft, he was hoisted on the shoulders of the crowd like a hero.
Crawford Gordon with Canadian flying legend John McCurdy, and Roy Dobson of Hawker-Siddeley, attending the roll-out.

On August 23rd the aircraft was taken to supersonic speeds for the first time. That week speeds up to Mach 1.7 were recorded. The program had its share of small problems, most noticeable when Zurakowski had the landing gear fail and headed off the runway at some 50 kilometres per hour. No real damage was done, and the problems were fixed. There was a similar accident later with Potocki. In general, as testing continued, the Arrow grew easier to handle. Speeds needed to take off were reduced, as was landing runway length.

The maiden flight:
The RCAF stipulation that the Arrow be able to pull 2 G's at 50,000 feet (15240 metres) at a speed of Mach 1.5 was achieved. Avro believed it could be done at 60,000 feet (18288 metres) with the as-yet-untried Iroquois. The aircraft was finally pushed to Mach 1.98, over 2000 kilometres per hour, with Potocki at the controls, and would fly up to a height of 58,000 feet. Jack Woodman, the only RCAF pilot to fly the Arrow and the official representative of the government, reported that the aircraft performing as predicted and was meeting all guarantees. The design team was confident that the Mark-2 Arrows, with their Iroquois engines, would pass Mach 2 easily, and planned on hitting Mach 3 with future series.

The October 4th, 1957, coincidence of the launch of the Sputnik on the same day as the Arrow's unveiling was one of history's ironic touches. It symbolized perfectly the air defence paradigm of the day. Suddenly the "bomber gap" became the "missile gap". Many believed that the quarry which the Arrow had been designed to hunt down, the high-flying supersonic or trans-sonic bomber, was being replaced by intercontinental ballistic missiles (ICBM), which were impervious to manned fighters.

Here we see the landing gear malfunctioning on the second accident. The idea began to circulate that manned aircraft were on their way out. This may seem absurd today, but the technological uncertainty that gives rise to wild speculation can be appreciated by anyone watching trends in technology markets today. In 1957, the missile looked like it was the future not only for nuclear attack, but also as an air defence system. In England, for example, the horizon looked dim for the aviation industry when British Minister of Defence Duncan Sandys cancelled all aircraft projects but one.

Six days after the flight of the first Arrow, on March 31st 1958, the Conservatives won the largest electoral victory in Canadian history, securing 208 seats out of 265. There seemed to have been a deep desire to terminate the Arrow in the Diefenbaker government, but the boom of the fifties had subsided, and as it stood, it was politically dangerous to threaten jobs in the employment-poor Toronto area. Diefenbaker had been in no position to rock the Arrow boat as long as the Conservatives held only a minority government. Now deep mutual distrust began to take hold at Avro and among the Conservatives. The Conservatives accused Avro of greediness and intense lobbying, while Avro claimed it was only trying to ascertain what the lay of the land was. Behind the scenes discussions were underway that would have caused a lot of anxiety at Avro, but nothing was leaked out.

By 1958, the Department of Defence Production estimated that $300 million had been spent on the Arrow, and that a further $871 million would need to be spent. The number of planes to be produced was dropped to 169 from 300, at a cost of $12 million per unit. These figures can be interpreted in different ways: Defence Minister George Pearkes, himself perhaps the Arrow's greatest adversary, stated in an 1958 address to the U.S. Secretary of State about the burdensome costs of Canadian air defense, placed the total at only $780 million.
In the military, tensions were on the rise as the Arrow program started to eat up large percentages of the defense budget. Rivalry inside the air force grew as well. The Arrow couldn't be adapted to European theatre needs, and a rift developed between Canadian NATO and NORAD air force officers.
The ready-to-go Iroquois engine being placed into the engine cavity of the Arrow 206. It would never fly.

In August 1958 the CSC advised the government to cancel the Arrow and buy two U.S Bomarc installations and institute its complementary SAGE control system, as well as purchase 100 U.S. built interceptors at $2 million each.

The decision to cancel was without doubt a difficult one for the Diefenbaker cabinet, and there was much discussion over the impact it would have on Canadian morale. But on Feb 20th, 1959, -- Black Friday – Diefenbaker simultaneously announced to the House of

Commons and to Avro itself that the Arrow and Iroquois programs were immediately cancelled. It was a fait accompli.

Black Friday, Feb 20th, 1959 was the day of epiphany for the Avro Arrow. At 11:00 a.m., Prime Minister John Diefenbaker announced before the House of Commons the decision, reached behind closed doors, to terminate the Arrow and Iroquois programs.

Employees leaving Avro that day:
That day 14,525 workers were to leave the Avro plant unemployed. A small percentage were rehired later, but the vast majority were cast into the job market. The employees at Avro found out pretty quickly that their jobs were on the line when a loudspeaker announced the PM's decision at 11:20 a.m. They were at first told to keep working until further notice. That came later in the day, after several meetings by the management. All paid employees were to be immediately laid off.

Hear test pilot Jan Zurakowski, the first man to fly an Arrow, remember Black Friday
After the announcement, employees wandered around in disbelief. They had expected slowdowns, but neither management nor workers had anticipated the sudden cancellation. It was only two weeks until the Iroquois engine was set to fly in tests that were expected to break the world speed record. In any event, officials like Defence Minister George Pearkes had repeatedly given their assurance to Avro management that the program would not be cancelled. Since the previous year, a reassessment of the program had been scheduled for March. Why the sudden cancellation?

We know now that the decision to cancel had already been deeply rooted in the thinking of Diefenbaker's cabinet, and may have been set in stone when Canada signed onto the NORAD treaty with the U.S. But it was politically expedient, to say the least, that the cancellation take place before the Iroquois be flown. If speed records were broken, canceling the Arrow would have been much more difficult. The promise of a March reassessment was the good tactic to lull Avro into complacency, and make cancellation easier.

Destruction
June 28, 1999:
These photos were taken from a helicopter chartered by the Montreal Standard magazine when they got wind of the scrapping.

"Our workmen did it. We walked in there and took them apart. We used saws -- you couldn't use torches because it was too dangerous. The fixtures in the plant were torched; the aircraft were sawed. And we paid $ 300,000 for the works.... We put them on trailers and took them down to the smelters where every one was smelted down. Nobody could purchase the material from us because we were under security. They were watching us all the time. We had three or four men watching us and we had to do it as quickly as we could. War assets came and took the vital parts out of the aircraft, but when that was done they wanted them out in a hurry, scrapped and out. When we got to the smelter the weights had to coincide with delivery. No part escaped. In fact I had to guarantee that if any got out I was in trouble." Sam Lax - Lax Brothers Salvage, Hamilton
-- from page 275 of Greig Stewart's book "Shutting Down The National Dream."

The masses of newly-unemployed Avro workers had left the factory floor some two months before. On April 22 1959, a new crew moved their equipment onto the premises of the A.V. Roe company, and began a detailed and thorough destruction of all Arrow prototypes, the machines and tools used to construct them, and all plans and blueprints.

The seemingly wanton destruction has always stood out as the Arrow affair's most poignant feature. Like the martyr to his faithful followers, it could be said that the Arrow might never have transfixed the minds of Canadians in quite the same way had it not been so brutally obliterated.
Many still consider Diefenbaker to be the principal suspect in ordering the destruction of the Arrow aircraft. He denied it to his death.

The Usual Suspect:
The rationale and circumstances behind the destruction has remained mysterious to this day. Though everyone knows that all the prototypes were cut up for scrap shortly after the project cancellation, (besides the legend that a single Arrow got away) a culprit is noticeably missing from many accounts. Traditionally the blame has rested on the shoulders of then-Prime Minister John Diefenbaker, but in recent years new evidence has made finger-pointing more complex.

The case against Dief has rested on a few scenarios. The highly influential CBC teledrama The Arrow, which took a great deal of license with the Arrow story, posited a guilty Diefenbaker working a hasty hatchet job to cover his tracks and leave no trace of the could-have-been glory he had struck down in its prime. The record shows no indication that photographs and films of the Arrow had been earmarked for destruction. Only plans, drawings and blueprints, which were of strategic value, were to be destroyed. Arrow, in any case, was well-

known to the Canadian public at the time.

The Butler did it:
Another culprit for the arc-welding atrocity got the spotlight in 1988 when Pierre Sevigny, associate defense minister in Diefenbaker's cabinet from 1958 to 1963, came forth to tell his version of the story to the Canadian press. The 80-year-old said he wanted to set the record straight and to clear Diefenbaker's name. He laid the blame squarely on the shoulders of Crawford Gordon, the mercurial, hard-drinking boss of A.V. Roe company, a bitter personal foe of the Diefenbaker's.
Gordon, who died impoverished in New York City in 1967 of cirrhosis of the liver, dropped out of the business world soon after the Arrow debacle. He was noted for his irascible temperament and the personal animosity he had for Diefenbaker (who was by many accounts no easy man to get along with either).
Gordon destroyed the Arrow, Sevigny suggested, for revenge. "That order did not come from the cabinet," Sevigny told the press. "Gordon took it upon himself to destroy the thing because he thought Diefenbaker's government should have listened to him and was to blame."

According to Sevigny, one man who saw the need to make Gordon's actions public was Defence Minister Gen. George Pearkes. Sevigny said Pearkes advised Diefenbaker to call a news conference regarding Gordon's decision, but the need for secrecy and Diefenbaker's paranoid tendencies persuaded the Prime Minister otherwise. Pearkes cringed, said Sevigny, when Diefenbaker refused to make Gordon's actions public and chose instead to hope the issue would go away. Sevigny quoted Pearkes: "It's a horrible mistake and we're going to pay for that. Why would I give the order to scrap these plans? Why? I wouldn't have done something as foolish as this and I didn't," Pearkes reportedly said. "It was done by this madman, this bounder, Crawford Gordon."

Was destroying the Arrow the kind of malicious act that a man who would fire 14,000 people could perform? Whether or not it was justifiable to send the workers home on the day of cancellation, the fact remains that the Arrow was military property. The government had already sunk hundreds of millions into it. It wasn't Gordon's possession to do with as he pleased -- he would have faced criminal charges for ordering its destruction.

The Paper Trail:
Sevigny's remarks about Pearkes are rather odd when new information is factored into the story. The author of one of the latest books on the Arrow has painstakingly declassified scores of secret documents, including several that point the finger directly at Defence Minister George Pearkes and Air Marshall Hugh Campbell. Palmiro Campagna's book Storms of Controversy documents the events that made the mutilation of the completed and uncompleted Arrows an inevitable consequence of cancellation.
In early March, sometime after cancellation, the RCAF asked the Defense Research Board (DRB) if the National Aeronautics Establishment (NAE), an arm of the National Research Council (NRC), wouldn't have some use for the five finished aircraft. The NAE replied it would have no use for the aircraft; maintaining it would be too expensive; the Arrow had yet to prove its airworthiness which requires 1000 hours of flight, as compared to the 65 hours which the Arrow had clocked in; and that spare parts were unavailable (this was apparently not true).
(It is remembered here by Arrow historians that in 1954 the NAE had been a great critic of Avro and the aerodynamic feasibility of the Arrow program. The issue became contentious, and in the end, the Washington-based National Advisory Committee for Aeronautics was called in as an independent arbiter. They ruled in favor of Avro.)

This failed initiative was followed by a recommendation from Air Chief of Staff Hugh Campbell to Defence Minister George Pearkes suggesting options to scrap the Arrow. By early April, Pearkes approved the scrapping. There is no evidence proving or disproving Diefenbaker's knowledge of the plans.
Throughout the scrapping process, it seems that the idea of saving a few of the planes for posterity was being tossed around. No one seemed to have picked up the ball, and the scrapping proceeded as planned. The question of coordinating the disposal of the Arrow had been turned over to a special Termination Group in early March, and now they sold the Arrows to a Hamilton-based scrap company who dismantled it under heavy supervision (read their account of it here). They paid the government some $300,000 to reduce to scrap a project costing hundreds of millions.

Arrow remnant-hunter Mike McAllister describes the mysterious circumstances surrounding the disposal of the Arrow and the Iroquois.

Why?
The decision to reduce the project to scrap was a result of military security concerns. In retrospect it may seem strange to destroy advanced technological secrets simply because a project has been delayed or cancelled, but a closer examination shows that the decision is pretty consistent with the rest of the affair. Cold War paranoia was a very real thing, and unless a sensitive piece of technology

could be thoroughly protected, it couldn't just be left lying around. While the Arrow was clearly an advanced project, it seemed to have been conspicuously bereft of any friends who would be willing to spend the necessary sums on its maintenance. Its name, it appears, was mud.
The torturous tale of the Arrow is ultimately a story about men making decisions. With the hindsight of history, the observer is left with the distinct impression that many of these decisions were ill-informed, and were made in an atmosphere of prejudice against the Arrow project. The tide of the day seemed to have turned against the Arrow, and as the prevailing opinion gathered momentum, all evidence that pointed to the merits of going ahead with the program was swept away.

After the cancellation of the CF-105, history took an ironic turn. Canada was still faced with a need to defend its skies from the threat of Russian nuclear warhead, whether from ICBMs or bombers. The record shows that very soon after the cancellation of the Arrow, perhaps even before the destruction of all the prototypes, the government was already becoming aware of its blunder.

To appreciate the situation of Canadian air defence in the post-Arrow period it helps to look at the Bomarc missile, which contributed greatly to the feeling that the Arrow was no longer needed.
The Bomarc was an unmanned missile that carried a nuclear warhead. It wasn't big on accuracy, so it could only take out a nuclear-missile-bearing enemy by detonating a nuclear explosion close to it. Needless to say, this wasn't a particularly advantageous situation for Canadians, who would get most of the radioactive fallout on their territory. If the Americans set up the Bomarc along the northern border of their country, as they planned, the detonation would take place over Canada's most populated areas. This undesirable scenario played a big part in influencing Defence Minister George Pearkes' decision to acquire two Bomarc bases in the North of Quebec and Ontario – at least the battle would be carried away from Montreal and Toronto.
The problem was that Canada would be hard-pressed to afford the Bomarc and the Arrow. Bomarc, oddly enough in light of future rationales for the Arrow cancellation, was never designed to take out intercontinental ballistic missiles (ICBM), but rather bombers that had slipped through the manned interceptor defence. (There were at the time of cancellation no weapons at all to deal with ICBMs). Bomarc also had a short range of 400 kilometres and couldn't replace the Arrow. The Americans themselves were using it in conjunction with manned interceptors.

Here were other problems with the system. The SAGE network which was designed to control the Bomarcs was susceptible to electronic jamming, a technology that the Russians were known to have.

A NORAD map circa 1960:
Was Canada obliged to buy the Bomarcs from the day it signed onto the NORAD agreement? There is some evidence to support this possibility. But it seems clear that both Pearkes and Charles Foulkes, Chairman of the Chiefs of Staff Committee, were quite sold on the Bomarc idea themselves. The arguments of the time reflect the heavy financial burden of the Arrow program in combination with the Bomarc and SAGE system. They do not, however, mention that Canada was under no obligation to take on the Bomarc, (the Americans themselves admitted the Bomarc was designed not for Canada, but entirely for the defence of the American Strategic Air Command) but did so largely because of the convictions of men like Pearkes. Interviews with him in later years suggest that relatively vague American promises of access to large amounts of U.S. aircraft tipped the scales for him to abandon the Arrow.

In 1958, before the Arrow was cancelled, the U.S. planned to build forty Bomarc bases. But Bomarc was a flawed system and turned out to be an expensive dud. It began to be phased out by the American military almost before it was deployed in Canada. The number was reduced to eighteen, and then to twelve. Canada was told in mid July of 1960 that work on the two bases in Canada was being slowed down.

On Feb. 4th, 1960, less than a year after the cancellation, Gen Laurence Kuter, the head of NORAD, told the RCAF that 9 CF-100 squadrons should be replaced by newer aircraft, and suggested 6 squadrons of McDonnell F-101Voodoos. Ironically, this was one of the alternative designs the RCAF had studied, but rejected, before embarking on the Arrow.

The political implications of purchasing American aircraft so soon after the Arrow cancellation were devastating. Diefenbaker agonized over the situation, and seemed to realize he had been fooled, claiming that he had been against the cancellation all along. On March 8th, 1960, Cabinet decided against purchasing aircraft, opting to postpone. On July 4th a proposal was put before Cabinet to exchange 37 CL44s, freighters built by Canadair in Montreal, for 66 Voodoos. A deal was announced by Diefenbaker about a year later on June 12th, 1961, but there is no record of any CL44s being sent to the USAF. The final deal was for Canada to man sixteen Pinetree Line radar bases in exchange for the Voodoos, and the Canadian aviation industry was left out in the cold.

One of the promises made when the Arrow was cancelled was that of Defense Production Sharing, a way to rationalize the trauma that

cancellation of the Arrow would wreak on Canadian industry. Under this system, Canadian industry was to get a piece of the pie in future defense production contracts for NORAD. This wasn't particularly successful, as is illustrated in the following excerpt from an essay written by a former employee of Avro.

Not so well known is the fact that defense production sharing turned out to be a playing field sharply tilted in favor of the U.S. The purchasing procedure in the U.S. followed the normal practice of issuing a specification to those on the bidder's list in the U.S. and calling for tenders to be in by a certain due date. An information meeting would be arranged by the agency calling for tenders so that all the prospective bidders would have a chance to ask questions and get any uncertain areas cleared up. When the specification was issued to U.S. suppliers, it would also go to a joint U.S./Canadian committee who would decide if Canadian suppliers could take part in the bidding. If the answer was yes, the specification would then be sent to the Canadian government, which would circulate it to Canadian firms.

With these built in delays, by the time a Canadian firm got the specification, the date of the information meeting would be past and the due date for tenders rapidly approaching. There were even cases in which the request for tenders arrived after the closing date. Thus, frequently it was not worth the effort to prepare a bid. Should a Canadian firm decide to bid, there were a couple of other hurdles to overcome. Offshore bids had an automatic 15% penalty assessed against them. If an American firm that was in an area of high unemployment put in a bid, it had an advantage of up to 20% over both American and Canadian bids. Crumbs from the table would be a better name than Defense Production Sharing.