

Shelving the Arrow is Bad

West's most advanced interceptor may be last token

The government's partial decision on the future of air defense for Canada has been widely misinterpreted.

There are three main areas of misunderstanding.

First: There is the opinion that the use of Boeing Bomarc ground-to-air anti-aircraft missiles eliminates the need for manned interceptors.

Second: There is the belief that if a manned interceptor more advanced than the present CF-100 is required, such an aircraft, with performance comparable to the Avro CF-105, is now going into production in the United States and will be available at the same time or before the Canadian-built weapon reaches operational status.

Third: There is the view that the Prime Minister's statement in no way alters the status of the CF-105 airframe and engine program, and the assurance that the Government intends to place a production order for the aircraft.

The first two interpretations, based on misinformation, are completely in error.

The third must be examined in the light of the condition under which it was expressed. And in this context it is obviously an effort to avert a job security panic which could have destroyed a vital portion of the production potential of the Canadian aviation industry.

Manned Aircraft

The missiles vs. manned interceptors controversy has been with us for some time. There are some who maintain that the day of the manned aircraft, both interceptor and bomber, is over.

Canadian defense planners and the Government have indicated they do not subscribe to this view.

Defense Minister George Pearkes, VC, has repeatedly stressed that his advisers believe the manned bomber represents a major threat for some years to come and will remain a considerable factor even after missiles capable of being launched against North American targets reach operational status.

Recent developments have further strengthened and prolonged the operational life of the manned bomber. There is the glide bomb concept in which a manned aircraft in effect launches an air-to-ground guided mis-

sile some hundreds of miles from the intended target. (The best defense against this type of attack is to intercept and destroy the bomber before it has an opportunity to launch its glide bomb.)

The decision to employ Bomarc missiles in Canada accepts the fact of a continuing threat from manned bombers. For the Bomarc represents defense against manned bombers. It will not defend against a missile attack.

In the over-all defense system, then, the role of the Bomarc is basically the same as that for which the Avro CF-105 weapons system was designed. Basically, but not entirely.

The CF-105 has been designed to a North American air defense system requirement for a high altitude, hypersonic long range interceptor.

It must be capable of operating on patrols far from its base to intercept and identify unknown aircraft. If they prove unfriendly the crew must make the report which will permit NORAD to fully implement defense plans (including launch of ground-to-air missiles against other unknown aircraft). The interceptor must then carry out its own attack on the invader.

In proper perspective, against the over-all North American air defense requirement, Bomarc (or any other ground-to-air anti-aircraft missile) does not eliminate the need for the CF-105. The missile supplements the manned interceptor, providing defense in depth.

This is the concept on which U. S. ground-to-air missiles have been designed. The missile role is point and area defense; the back up of the manned interceptors which launch their attack while the invader is still some distance from target (a comparatively short distance taking into account the range of the current series of American-designed interceptors).

Performance Compared

Definition of the Bomarc and CF-105 roles becomes obvious in a comparison of the capabilities of the two weapons systems. Bomarc performance figures are those attributed to the advanced version of the weapon, the IM-99B. This is the unit which will be delivered to Canadian forces when the two bases are completed in 1961.

Ceiling: The Bomarc is said to be capable of attacking targets up to

100,000 feet. The CF-105 ceiling has been given as well above 60,000 feet. With its missile armament the aircraft would be capable of attacking targets above this height and could no doubt match the Bomarc kill altitude.

Speed: The missile speed is given as about 2,000 miles an hour. The CF-105, without its operational engines, has already traveled well over 1,000 miles an hour and can reasonably be expected to come close to the Bomarc speed with the more powerful Orenda Iroquois installed. (There have been unofficial reports that the CF-105 airframe, in tests to date, has shown itself capable of achieving considerably more speed than other aircraft with a comparable amount of power available.)

Range: The advanced Bomarc will have a range of about 400 miles. Range of the CF-105 has been conservatively estimated at over 1,500 miles.

On a straight comparison of performance, the two weapons have about the same interception capability — with the exception of the CF-105's vast superiority in range. The CF-105 has the added advantage of being able to attack more than one target on an individual flight. Its armament would include six to eight missiles, each of them capable of knocking out an invader. In the North American air defense concept, particularly in Canada with vast areas to be guarded and defended from a minimum of bases, the aircraft's margin in range is critical.

Admitting at least an equal ability to destroy an enemy target once it has been located and identified, there are other factors which leave no doubt as to which of the two weapons is the more essential to our specific defense requirement.

The most obvious of these are the type of attack against which we are trying to defend, the type of defense system in which the weapon must operate and the over-all plan of action in the event of an attack.

Briefly: Our first aim is to deny the enemy the advantage of a surprise attack. In the present cold war situation that means a constant watch. This we achieve with our various radar systems.

But the radar systems cannot tell

Military, Economic Medicine

of Canadian political and technological independence

us for certain that an attack is taking place.

The most critical phase of the watching must be carried out by manned aircraft, with the ability to intercept the unknowns and make positive identification.

If the unknown turns out to be an enemy, then any other unidentified aircraft being tracked by ground radar become fair game for all the counter measures at our disposal.

"Confirmed as Bogie" will be the signal which will bring NORAD's missile-equipped squadrons into the front line of air defense and take the leash off Strategic Air Command's nuclear-armed bombers. But until the interceptor has been completed the ground-to-air missiles and the bombers remain respectively in tactical and strategic reserve.

No one in a responsible position in North American Air Defense Command is willing to dispense with the manned interceptor as a vital part of the system. The missile bases considerably strengthen the system. But without an interceptor to fly the front line in the cold war, they remain impotent. Unless we are prepared to blast friend and foe alike out of the air.

U. S. Development

The CF-105 has been widely recognized, early in its flight test program, as the most advanced interceptor in the free world at its present stage of development. The belief that the United States has an aircraft with the performance capabilities of the CF-105 presently in production is erroneous.

The F-106, the latest of the American Century series now in production, has been singled out in a number of the reports and commentaries which followed the Prime Minister's September announcement as comparable to the CF-105 — and available to Canada.

This is not the case. There are essential differences between the two aircraft.

The F-106 is a single-engined aircraft lacking the CF-105's twin-engine margin of safety for the long patrols over isolated areas which are the everyday duty of the RCAF's Air Defense Command squadrons.

The range of the CF-105, carrying the same amount of armament as the

F-106, is well above that of the American aircraft. Operating at the same range as the F-106, the CF-105 could manage considerably greater fire power. The CF-105 equipped with its Astra 1 and Sparrow system would be an entirely different weapon than the F-106 with a much greater intercept and kill capability.

As to speed and operating ceiling, definite information does not warrant a claim for marked superiority on the part of either aircraft. But it is fairly safe to assume that the CF-105, with two more powerful engines, will enjoy a distinct advantage.

These comparisons are not intended as a claim for over-all superiority of Canadian design. The simple fact is that the F-106 was not designed to

project was launched by Canada's defense procurement authorities they were given assurance that a similar project was not at present under way and was not contemplated.

It is the fact of this present somewhat parallel development in the U. S. which makes the Canadian government's indecision on the CF-105 such a bitter pill to Canadian industry.

For there is indecision! Indecision which has placed the entire CF-105 project in serious jeopardy.

It is indecision based not on the question of the need for a weapon of the CF-105's capabilities in the NORAD arsenal, but on the question of whether Canada can afford to finance such development for the exclusive equipment of its own forces.

This appraisal of the results and consequences of the government's new proposals for air defense has been made by Canadian Aviation's Editors, **Ernie Hemphill** and **Peter Brannan**, after examination of all available information, and assessment of opinions expressed by Canadian military and industrial leaders.

do the CF-105's job. It is a first-rate aircraft in its assigned role, which is not to fill the NORAD requirements for a long-range interceptor.

Evidence that NORAD chiefs and defense planners in the United States as well as Canada are still seeking an aircraft with the CF-105's particular capabilities is to be found in development work now being carried out in the U. S. on the F-108 twin-engined, two-man-crew interceptor.

Specifications on the F-108 are sketchy. But as far as can be judged its general capabilities—in everything except range, where the Canadian design maintains a considerable margin—will be about the same as later marks of the CF-105.

However, the 108 weapons system is still only in the design and engineering stage. This could mean it is upward of three to four years away from production and more than that away from operational service. The CF-105 is expected to be available for squadron service in 1960.

Once again, there is no intention to belittle U. S. development effort. No one questions American capability to design an aircraft with the CF-105's performance. Up to now it has just not been attempted. When the CF-105

The Prime Minister in his September statement stressed the effort which his government has made and was making to work out a plan for integrated defense procurement by Canadian and U. S. forces.

The present situation in which Canadian industry is being squeezed out of production on an advanced weapons system, at least partially because it parallels later American development, is an indication of how much Canadian participation can be expected in any future programs.

Without the CF-105 program, the outlook for a large segment of the Canadian aviation industry is frankly grim.

Some indication of what might be expected in the event of an over-all cancellation on the CF-105 project may be gained from what has occurred in the electronics and aviation firms already affected by the cut-off on the Astra 1 and Sparrow programs.

None of the firms involved have been able to avoid layoffs. Despite efforts by the government to hold key personnel in Canada by arranging study contracts "until something else turns up," there has already been a considerable shift of personnel to American companies. The number of

Two Bomarc bases will give only thin yet costly defense cover

U. S. job advertisements carried in Canadian newspapers in the areas affected were ample evidence of the trend.

The situation in Toronto reached a point where the American Embassy not only ran out of visa applications, but had a waiting list for the forms in excess of 400.

The prime factor in the government's recent moves, and a major influence in any future decisions, is and will be a desire to cut down on defense spending. The Prime Minister indicates as much in stressing that cancellation of the Astra 1 and Sparrow programs realized a saving of \$330,000,000.

No one questions the fact that the cost of adequate defense is high. No one will quarrel with an effort to keep defense expenditures within reasonable limits.

However, once there has been a commitment to at least attempt an adequate job in defense, there is good reason to doubt if cutting down on the total appropriation (at a sacrifice in defense efficiency), and diverting a major portion of the funds available to procure equipment from sources of supply outside the country, represents any real saving as far as national economy is concerned.

If we are going to have to spend high for defense we may as well reap what benefits there are from such expenditures by investing them in our own industrial development.

Of the total amount spent on a production program such as that being carried out on the CF-105, surveys show that 45 cents of every dollar goes in salaries to the prime contractor's working force; 35 cents goes for materials and to sub-contractors for components and parts; and the remaining 20 cents covers plant overheads, operating expenses, profits and payments to shareholders, and corporation taxes.

Of the amount which goes to sub-contractors and for materials, an estimated 50 cents in the dollar is paid out in further salaries. Of the over-all amount spent, an estimated 25 percent finds its way back to the federal treasury in taxes.

All this is money circulated or ploughed back inside Canada, not poured irretrievably into the coffers of another nation.

The cost of going ahead with the CF-105 program to turn out a sufficient number of aircraft for squadron service, using an American-manufactured fire control system and missile, is given as \$900,000,000. This would be spread over the next few years. At

this figure the cost per aircraft would likely compare favorably with costs for the American F-106 in its early stages of production. Increased production could normally be expected to decrease the Arrow's unit cost.

Avro's president and general manager, J. L. Plant, indicated at a press conference last spring that the production version of the CF-105, on an order of between 400 and 500 aircraft, would run about three million dollars each. This figure was for the Arrow with its Astra fire control system and the Sparrow missile. Without these, on the basis of the government's own estimate of savings through using an American system, Plant's total would be reduced by about 25 percent.

Initial cost for installation of two Bomarc bases, plus work to improve the Pine Tree radar chain and make preliminary installations of the SAGE (Semi-Automatic Ground Environment) system has been given as \$264,000,000.

In arriving at total cost for either of these programs the amount which will have been spent on the CF-105 by the end of March, 1959, must also be taken into account. This \$403,000,000 is already a part of our defense investment, regardless of whether or not we build the CF-105. If we don't build the aircraft, however, it's an investment down the drain.

Bomarc Cost Secret

Taking this into consideration, initial cost of Bomarc and SAGE installations becomes \$667,000,000. Of this, \$164,000,000 is the amount said to be required for the Bomarc program, with the SAGE installation accounting for \$100,000,000. It is fairly clear that the \$164,000,000 allocated for Bomarc does not include supply of the actual missiles, but covers only the ground installation.

Cost of the missiles is a closely guarded secret, but it has been estimated at about \$400,000 each. If Canada buys 200 for the initial two bases, that means another \$80,000,000 for the minimum of coverage.

Adding costs already incurred, total outlay for CF-105 production becomes \$1,303,000,000. But to this total there should also be added the \$100,000,000 for the SAGE work, which is necessary with either weapon.

On the face of it, looking at the two figures and bearing in mind the government's apparent preoccupation with dollar economy, there appears to be little doubt as to what the final CF-105 decision will be.

There would probably be little

difficulty in selling the average taxpayer on a decision to place full confidence on missiles for air defense at a saving of some \$600,000,000 over a program in which we continued to place prime emphasis on manned interceptors, to the exclusion of missiles for the present time.

There is every reason to believe that this is the nature of the decision which the government is preparing to make. There can be little hope that an economy-minded government will be prepared to tell the taxpayers that it has decided to proceed with both programs.

And yet the latter would be the soundest course from an air defense point of view.

Two missile bases covering areas 400 miles in radii is spreading protection a little thin for a country the size of Canada.

It is difficult to see the "missiles only" version representing any lasting or true "economy" to the nation.

In the first place the network would have to be considerably extended to provide adequate coverage.

In the second, as argued earlier, the need for an advanced manned interceptor still exists and must be met sometime in the near future, unless we are prepared to let adequate defense of North America begin at the American border. Going to U. S. sources for our aircraft needs after abandoning our own extremely advanced project would be bitter crow, and something less than sound economy.

The hard fact is that we are going to have to pay high for defense whatever course we follow. But an arrangement under which the bulk of the spending goes to sources of supply outside the country will be infinitely more costly to our over-all economic well-being.

The CF-105 weapons system, including its original fire control system and armament, represents a current NORAD requirement. It is available before any comparable weapons system can be expected to come off production lines in the United States.

No doubt the Prime Minister and his colleagues have brought this to the attention of the appropriate officials in the U. S. Department of Defense. What was their answer?

They have their own aircraft industry to support and it's a vital part of their national economy? So have we and so is ours!

They can't afford to depend on sources of supply outside their own nation in the event of an emergency? Can we?