Interceptor - missile combination provides defense in depth. Family of weapons concept a continuing requirement to give integrated air forces adequate fire power. Future procurement major snag as

ON WATCH. Scanning the sky around the clock, Distant

NORAD Hits Stride, Now Packs

By Ernie Hemphill

An ominous blast behind the Iron Curtain late in 1949 registered a grim fact with defense planners in the Western World. Atomic warheads were no longer the exclusive property of the armed forces of the United States.

It was an inevitable development. But it came considerably ahead of Western estimates on Soviet technological capability.

Russia's earlier than expected access to nuclear weapons brought an immediate reaction in the West, and particularly in North America. It was realized that a deterrent force (Strategic Air Command) in being was not enough to guarantee defense.

The North American continent, and more particularly the deterrent force itself, must be protected from a surprise blow by a nuclear armed air force.

This was the climate in which what is now North American Air Defense Command was created. At first the air forces of two nations, Canada and the United States, planning, building and then working together to mold a co-ordinated defense team (Air Defense Command in Canada and Continental Air Defense in the United States). Eventually, and again inevitably, a single operational command (NORAD) linking not only the forces of two nations but also complementary units of the three services, Navy, Army and Air Force, within the nations.

It has not been a particularly easy road—or a short one.

But just over nine years after the first Soviet atomic blast, NORAD Deputy Commander Air Marshal C. Roy Slemon, RCAF, a man with a disturbing (from a press point of view) reputation for saying nothing unless he can speak with conviction, could say: "with honesty that our air defense system has developed to the point where we feel it is sufficiently effective that a potential aggressor would have to think very hard before he would risk attacking us.

". . . insufficient numbers of his attackers would get through to be decisive against us, whereas he would lay himself open to devastating counter attack.

"... we can now achieve such a high percentage of kill against him that our defenses, added to the threat of our retaliatory forces, constitute a real deterrent."

Over the Hump

Air Marshal Slemon's views are shared by NORAD's Commander-in-Chief, General Earle E. Partridge, USAF, who is able to view NORAD capability in the light of defense potential when he assumed control of the American CONAD organization in 1955.

North America, the USAF air defense expert declares, can now be defended "enough to win a war."

What brought the air defense operation over the hump?

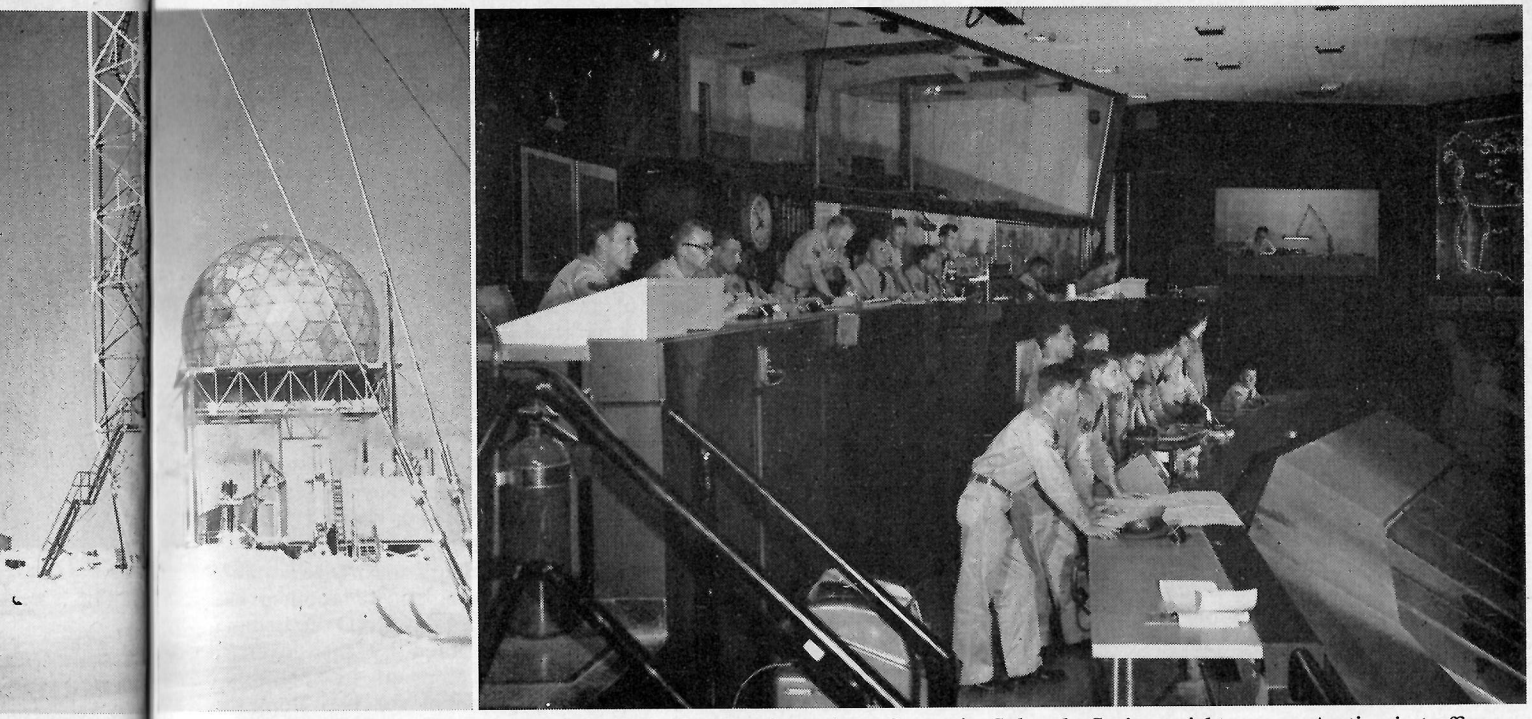
As General Partridge puts it, "One of the biggest things that we have done is to bring Canada and the United States together with one control headquarters trying to see that the whole job is done as one. NORAD is well integrated and it operates as well as it can with the equipment available. This is a big step forward."

NORAD has been physically in existence for just over a year, since September, 1957, although formal notes between the governments of Canada and the United States regarding its establishment were not exchanged until about mid-1958.

The organization which is now NORAD has in fact been a reality for much longer than that. The air defense forces and personnel of Canada and the United States did not suddenly mesh when authorities said "Go" on NORAD.

A number of the RCAF officers who now hold key positions at NORAD headquarters in Colorado Springs were at their posts before the integrated command came into existence.

Typical is Group Captain C. W.



Early Warning radars, left, keep NORAD's Combat Operations Centre in Colorado Springs, right, up on Arctic air traffice.

Enough Defense 'To Win a War'

McNeill of the RCAF's Directorate of Plans and Requirements who holds the post of Deputy Chief of Staff, Plans and Operations at NORAD. Group Captain McNeill, whose home town is Vancouver, B.C., has been at Colorado Springs for better than three years.

NORAD, according to G/C McNeill, operates on the principle that the West will not start a Third World War and thus must be prepared to accept the first blow if there is a general conflict.

Prevention of a Third World War then becomes a task of convincing a potential enemy that despite his nuclear capability he can be prevented (by NORAD) from hitting North America and its nuclear-armed deterrent force hard enough to eliminate a devastating retaliatory blow.

A prime requirement is the elimination of any possibility of surprise attack. Thus the Arctic Distant Early Warning radar line (formally taken over last month by the Royal Canadian Air Force); the Mid-Canada microwave-link doppler radar, electronic fence type detection system; the radar-equipped picket ships plying the Pacific and Atlantic Oceans and the Texas Tower type radar platforms anchored off the Atlantic Coast; the U. S. Navy lighter-than-air blimps and the specially equipped Super Constellations with their airborne-early-warning and tracking equipment; and finally the vast network of heavy surveillance radar which makes up the Pine Tree complex providing continuous coverage over Southern Canada and the greater portion of continental U. S.

The Pine Tree system, which is being materially bolstered by the application of SAGE (Semi-Automatic Ground Environment—see page 28) and the construction of additional radar, including gap-filler automatic equipment and more heavy surveillance equipment in the north, is more than a warning system. It is through the Pine Tree radars that NORAD's striking force will maintain its contact with the enemy and be directed in the air battle.

NORAD Arsenal

To fight the air battle, NORAD's unit commanders can call up a vast array of deadly weapons.

There are immediately available 69 manned interceptor squadrons, strategically deployed throughout Canada, the United States and Alaska, plus 61 batteries of ground-to-air guided missiles of the Nike family located for best point defense of important industrial targets and centres of population in the United States.

Nine of the interceptor squadrons are components of the RCAF's Air Defense Command which operates out of headquarters at St. Hubert, Que., under the command of Air Vice-Marshal W. R. MacBrien. The RCAF squadrons are equipped with Avro Aircraft designed and built CF-100 all-weather interceptors, powered by Orenda engines. The Canadian squadrons now have the latest (and final) Mark V version of the CF-100, which carries rockets as its main armament.

Of the remaining squadrons at NORAD's immediate disposal, 59 are under the command of Lt.-General Joseph H. Atkinson of the USAF Air Defense Command. The remaining squadron which makes up the NORAD complement is a United States Navy fighter unit.

Aircraft currently in service with USAF Air Defense Command include:

Convair's F-102 delta-winged Dagger, described as the current backbone of the command. The aircraft is fully supersonic;

The Northrop F-89J Scorpion, a twin-engine, two crew member, subsonic interceptor about comparable with the CF-100 in performance;

The Lockheed F-104 Starfighter, latest operational addition to the command, fully supersonic and with high altitude performance;

The McDonnel F-101 Voodoo, fully supersonic and with good advantages on range.

Just now coming into full production and expected to go operational during the coming year is the Convair F-106, a considerable extension of F-102 development with more speed and increased range over the Dagger.

The lone U. S. Navy squadron assigned to NORAD's immediate operational control was re-equipped during 1958 with Douglas F-4D Skyrays, the Navy's latest supersonic interceptor.

Armament carried by the USAF interceptors includes a variety of rockets and guided weapons. Among those in greater use are the Hughes Falcon radar guided rockets; the Genie atomic-warhead rocket; the Sidewinder infra-red air-to-air guided missile. The Sidewinder, which is also the main armament of the Navy's Skyray squadron, is believed to be capable of carrying an atomic warhead.

In the event of an attack on North America, NORAD's manned interceptor strength would be considerably strengthened by the employment of augmentation forces, squadrons of suitable aircraft from other air force commands and from the Royal Canadian and United States Navies which would be assigned to NORAD operations as they are freed from other duties.

The operational surface-to-air missiles in the NORAD arsenal are in the main Nike-Ajax vehicles. There are 61 batteries of these comparatively short range guided missiles operated by U. S. Army personnel. The Nike-Ajax is in the process of being replaced by the latest version of the unit, the Nike-Hercules, which is said to have about three times the range of its earlier counterpart.

Also expected to come into operational service soon at U. S. Army installations is the ground-to-air Raytheon Hawk guided missile. Specialty of this comparatively limited range vehicle is low level targets.

The NORAD arsenal has been built up with a view to establishing a family of weapons to provide flexibility in warding off any attack. The concept is provision of defense in depth to prevent an enemy from saturating the system and variety in method of attack to deny the enemy the ability to achieve success by overcoming any one weapon.

Critical Problem

An arsenal of this type is seen as a continuing requirement by NORAD's commanders. Long range manned interceptors and long range ground to air missiles to give the command the ability to commence the air battle as far from vital targets as possible, backed up by short range interceptors and missiles to provide point defense for the attackers which may be expected to get through the first screen of weapons.

Maintenance of an adequate weapons pool appears to be one of the more critical problems currently facing NORAD commanders in their efforts to keep the command capable of providing "enough defense to win a war."

Current soul searching in Canadian government circles with respect to procurement for NORAD forces is typical.

On the one hand is recognition of the requirement to re-equip RCAF Air Defense Command squadrons with an advanced interceptor, the long range, supersonic CF-105, Avro Arrow representing an ideal vehicle to fill the need; coupled with a desire to establish bases for Boeing Bomarc IM-99B long range ground-to-air guided missiles in Canada and the inescapable need to augment coverage of the Pine Tree radar system and equip it with SAGE to permit effective detection of intruders and direction of intercepts.

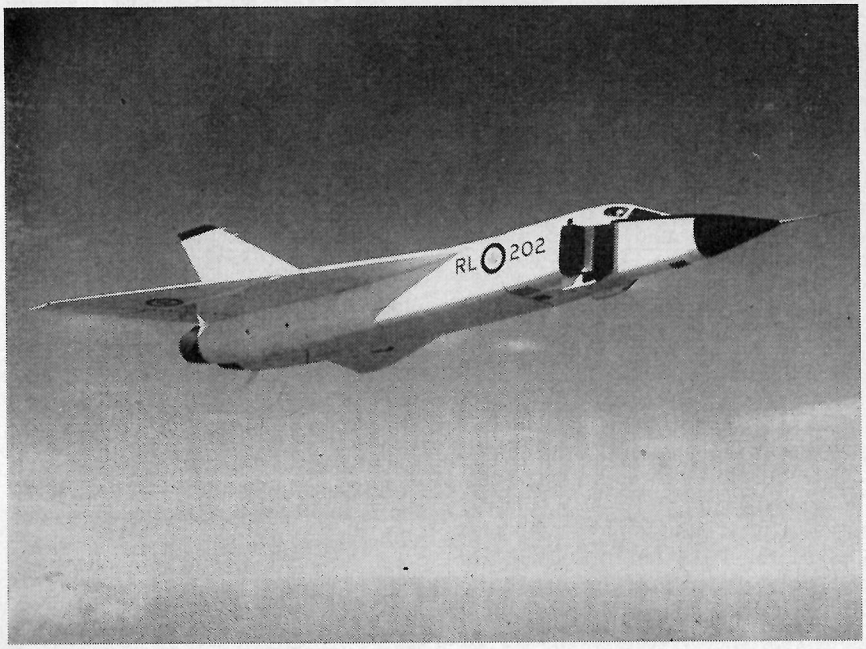
Beefing up and extending Pine Tree coverage and installation of the SAGE system in critical areas are musts to which the Canadian government has committed itself, at a cost of $100,000,000.

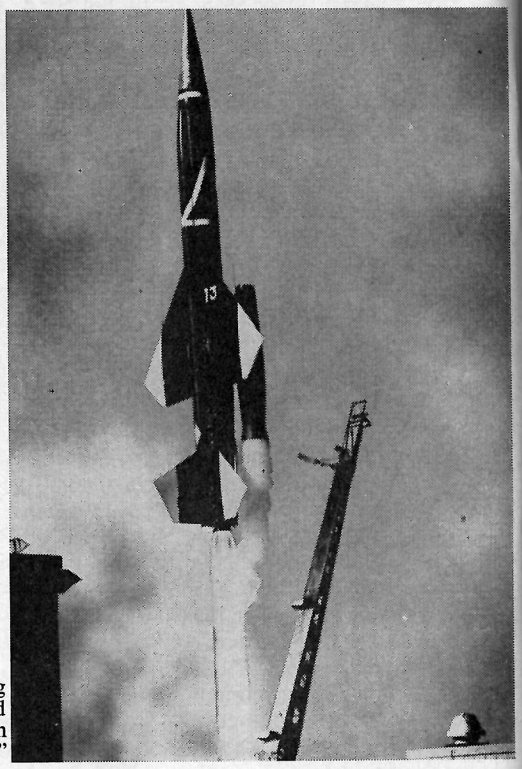
The government's desire to establish a missile equipped component as part of Canada's NORAD contribution was underlined by the government announcement of its intention to order equipment for two Bomarc bases to be established in Northern Ontario and Northwestern Quebec. The cost for these installations is estimated at $164,000,000.

With these commitments, the government is entertaining serious second thoughts about ordering the Arrow into production.

The decision, at writing still scheduled to be announced in March, is clearly an economic one.

NORAD's chiefs are unequivocally on record to the effect that an advanced all-weather interceptor, with long range and supersonic capabilities, is a definite requirement to keep the





NEW NORAD WEAPONS? Canada's controversial Avro Arrow, left, and the Boeing Bomarc ground-to-air missile are examples of the weapons NORAD planners would like to see added to their arsenal. Bomarc is now in production, fate of the Arrow is in doubt. Manned interceptors have been described requirement "as far as we can see."

command's family of weapons effective. They are just as clearly on record as to the requirement of long range missiles of the Bomarc type.

But the missiles are not contemplated, "for as far as we can see," as a replacement for the manned interceptor in NORAD's arsenal. Both are required.

The same situation, but on a much larger scale, prevails in the United States.

American defense expenditures for the fiscal year ending March, 1959, are in excess of $45,000,000,000, which works out to 62 per cent of the total federal budget at something like $257 per capita expenditure. (The comparable Canadian figures are a defense budget of just over $1,700,000,000, which is 32 per cent of the total budget and represents a per capita expenditure of about $100.)

In their 1960 budget, U. S. government officials are struggling hard to hold defense expenditures at $47,000,000,000 and are searching for projects which can safely be curtailed.

For the record, however, it should be pointed out that major increases in the Canadian defense budget over the past six years have not in fact been occasioned by boosts in the amount of money spent for procurement of new equipment. This figure has declined. Operations and maintenance costs and personnel costs have been the main sources of increased expenditures.

The defense budget itself has remained fairly constant since 1954, varying between a high of about $1,800,000,000 in 1954 to a low of $1,600,000,000 (approx.) in 1955.

Procurement of equipment during the period has declined from a high of about $765,000,000 in 1954, with yearly drops to a low of approximately $411,000,000 in 1958. The equipment item for the year ending this March is estimated at some $498,000,000.

In the same six years, personnel costs rose from about $400,000,000 in 1954 to a high of $537,000,000 in the current year; operations and maintenance costs have climbed from $439,000,000 in 1954 to show an estimated $609,000,000 in 1958-59.

It is estimated that the Arrow program during fiscal year 1958-59 resulted in an expenditure of $175,000,000. The amount spent in the previous years that the aircraft and engine, and its missile and flight control system were under development, is given as $220,000,000. Those who urge continuation of the Arrow program maintain that the project costs on production of 200 aircraft would not materially exceed the $175,000,000 spent in 1958-59.

Missile Threat

But taking into account costs of the SAGE, Pinetree and Bomarc programs which the government has initiated, there is no doubt the equipment procurement item would have to increase substantially to bring the Arrow into production.

Having welded a force which they feel can currently cope successfully with any manned bomber threat, NORAD planners are pressing on to deal with threat which ballistic missiles are expected to present.

The true ballistic missile, one gathers from the attitude of NORAD personnel, is not yet considered an existing threat.

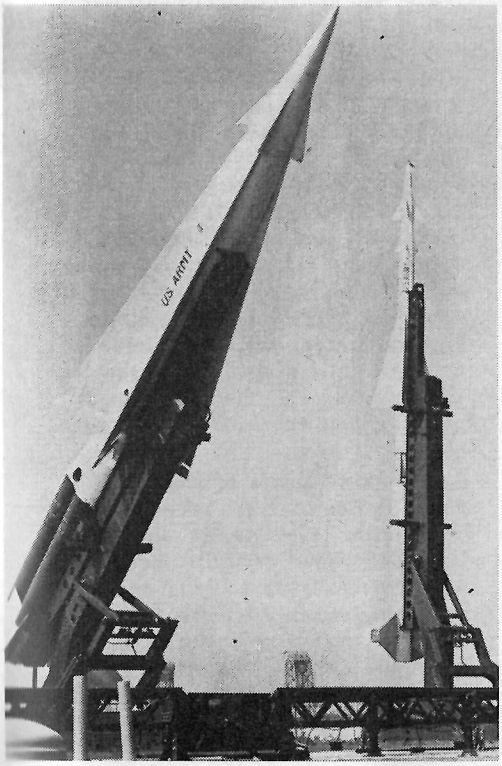
It will be—and to meet its operational debut development of an anti-missile system is being given high priority.

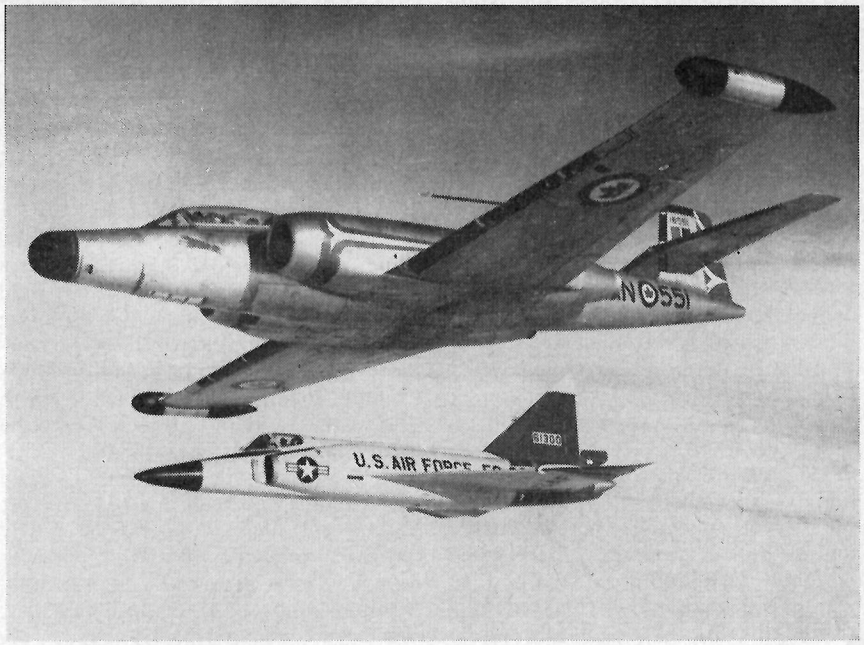
The pattern is the same as for establishment of the manned bomber defense. First the setting up of an adequate warning network, the Ballistic Missile Early Warning System. This is conceived as long range radars providing overlapping coverage in the estimated areas of ICBM launching sites. Radars of this type are currently under construction at sites in Alaska, Thule (Greenland) and the United Kingdom.

There is a further potential threat against which NORAD's General Partridge admits frankly there is at the present time "zero defense." That is the submarine capable of launching an ICBM while submerged. The only consolation the general could offer in this regard—"We don't think a potential enemy has such equipment operational at the present time."

A U. S. Navy captain on NORAD assignment was a bit more optimistic. He implied developments in submarine countermeasures will make it extremely uncomfortable for the enemy commander attempting to get within Intermediate Ballistic Missile range of North America.

But as of right now, the men responsible for North American air defense are confident they can "win a war."





CURRENT ARSENAL. A combination of missiles, manned interceptors is NORAD's present weapon's inventory. Left, two versions of the Nike family of point defense ground-to-air missiles. Nike Hercules, in the foreground, has greater range and striking power (atomic) than the Nike Ajax. Right, an Avro CF-100 and a Convair F-102.