

# The Arrow Decision

By BRENT RAYCROFT\*

**W**HY DID the Government do a flip-flop and decide not to order production of the Avro Arrow interceptor at this time?

That remains the haunting question even after Prime Minister Diefenbaker's explanation on Sept. 23 for the Government decision to buy American Bomarc anti-aircraft missiles and to postpone final decision on the Arrow.

**Rapid Strides:** Mr. Diefenbaker questioned whether supersonic interceptors "will be required at all in the 1960's in view of the rapid strides being made in missiles by both the United States and Russia." He also said:

"The preponderance of expert opinion is that by the 1960's manned aircraft, however outstanding, will be less effective in meeting the threat than previously expected."

But this was not what Defence Minister G. R. Pearkes was saying in July when he told the Commons estimates committee:

"There are important factors necessitating the continued use of manned interceptors in the air defence system for many years, indeed for as far as we can see into the future."

Later, Mr. Pearkes said: "I am convinced, in my own mind, that an aircraft of the Arrow type will be required." And still later: "The Bomarc will not replace the manned interceptor."

**Numbers Game:** The Government was obviously appalled at the cost of the Arrow program. Mr. Diefenbaker said 100 Arrows with Astra and Sparrow would cost \$1,250,000,000. Even without Astra and Sparrow, a single Arrow would cost \$9,000,000.

But the Government must have known about these costs ever since it had taken office last year.

Mr. Pearkes tried to sell the Arrow to the U.S. Department of Defense. But he obviously knew before he went to Washington that the U.S. would not buy.

Thus the only conclusion that can be drawn is that the Government does not want to cut non-military spending and that the only way it could forestall an increase in taxes was to reduce—or,

at least, not to increase—defence expenditures.

It is true that the Arrow is not yet dead. But many in Ottawa think that the Government will kill it outright before next March. It is perhaps significant that unemployment normally reaches its peak in Canada early in March.

**Friend or Foe?** Officials say adoption of the Bomarc will make the vital reconnaissance problem more difficult. Final decision on launching of massive retaliation by the U.S. Strategic Air Command might depend upon positive identification of unknown aircraft in the Canadian air defence system. No missile can carry out such a task.

Even Boeing Airplane Company, manufacturer of the Bomarc, says: "The unmanned military aircraft does not supplant the manned aircraft. No missile is yet capable of judgment, of reasoning."

The problem of identification was explained by Mr. Pearkes in July. He said:

"The manned interceptor can be used in the identification role, whereas surface-to-air missiles cannot. Identification is one of the most difficult problems with which the air defence commander is faced."

"Even though there are certain limitations to the manned interceptor in this task, nevertheless, since the final and critical decision to launch massive retaliation may well depend upon a positive identification of a number of unknown aircraft in the system as 'hostiles', and since failure to launch our defensive and retaliatory forces in time could bring about a decisive defeat of unprecedented magnitude, the inclusion of manned interceptors able to assist in the problem of identification is essential."

"The supersonic manned interceptor is the development of a proven weapon, whereas the long-range surface-to-air missile is as yet untried."

"A bomber, carrying a man and subject to his control, may vary its tactics as circumstances demand in a

manner which cannot be predicted. Thus the manned interceptor has a greater capability in the face of enemy counter measures than has the pure missile system."

## Cause for Hesitation

**O**FFICIALS say they believe this may be one reason the Government has as yet reached no final decision on whether to order limited production of the Arrow. They say final cancellation of the Arrow program would leave the RCAF with no method of reconnaissance over northern Canada unless the subsonic CF-100 jets were kept in service beyond 1961.

At the same time, defence authorities are expressing concern about what they describe as the three-year time gap in Canada's air defence system. Their concern arises from the fact that Canada will not procure any new air defence weapon between now and 1961.

**No Replacement:** It has no direct connection with the Arrow-Bomarc decision because the Arrow would not be ready until 1961. Two Bomarc bases will be built in Ontario and Quebec—roughly on a line running from Sault Ste. Marie to Quebec City—but they won't be ready for operation until 1961. In the meantime, the main defensive weapon will continue to be the CF-100.

One official says there will be tremendous pressure on the nine CF-100 squadrons in the next three years to keep training and efficiency at a peak constantly.

Besides the Bomarc, the Government will buy the SAGE system and install several new radar stations in the Pinetree chain. The two Bomarc sites will cost \$164,000,000 and SAGE \$100,000,000. There is no official estimate of the cost for the new radars. The U.S. is expected to share the cost of all three of these programs, bearing as much as two-thirds of the cost of the new radar.

Mr. Pearkes said Canada and the U.S. are negotiating on the possibility of producing the Bomarc in Canada. Officials in Ottawa do not hold out

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removed many of the design queries, and greatly reduce the hazards of failure in the air.

**Pneumatic Actuating System for 1000°F. Operation**—John A. Osterman, Lockheed Aircraft Corp.

Beginning in the early part of 1956, the Georgia Div. of Lockheed Aircraft Corp., under USAF contract, tackled the problem of high temperature pneumatics. The initial effort was embodied in a study program to determine the feasibility of pneumatics, and to design an aircraft speed brake servo system to operate in ambient temperatures up to 1000°F. Two basic points of philosophy were germane to the program right from the beginning. Since it was felt that much of the failure in other pneumatic programs arose because the "hardware" consisted of modified hydraulic components, it was decided that a policy of "design for pneumatics" would be enforced. Secondly, with the high operating temperatures particularly in mind, it was decided to use the best materials, finishes, and surface treatments available. This approach was taken because the number of critical design problems demanded the utmost care in dealing with each one, so that all possible "weak links" could be eliminated.

**The Role of Electrical Actuating Systems in Supplementing SeaMaster Flight Controls**—Howard C. Zachman, The Martin Co.

Primary SeaMaster flight control systems are all actuated by hydraulic cylinders. A stabilizer-elevator combination is used for longitudinal control. Four spoilers arranged in groups consisting of inboard and outboard pairs, are located on the wings for lateral control, and directional control is accomplished by a rudder. Hydraulic position type servos are located near each control surface, and are connected by cables to the appropriate control column, control wheel, or rudder pedals in the cockpit. Proportional control is attained, since the position of the surfaces are fed back to their respective control valves by a mechanical system of push rods and bell cranks. The wide performance range of the aircraft requires that the control surfaces be fully powered and irreversible.

## ARROW DECISION

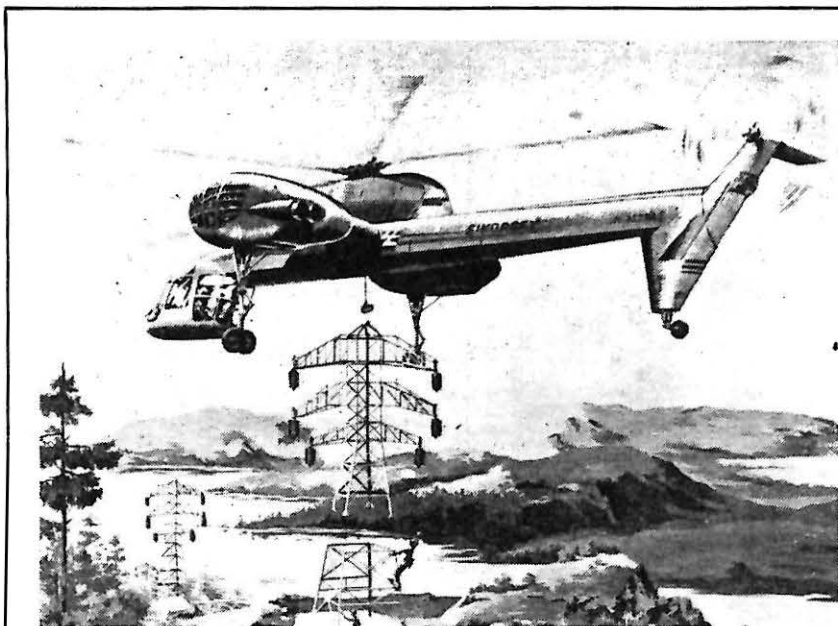
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much real hope for this. But they do feel that arrangements will be worked out with the U.S. for Canadian industry to share in production of the new radar and SAGE equipment.

### Early Start

**T**HE RCAF has been well prepared for years to swing into Bomarc action. It has been studying pilotless aircraft since 1946 and has been closely associated with the Bomarc development since 1949. It has at least 175 missile experts. This number will grow as engineers are shifted from the Astra and Sparrow programs.

The Air Force says the Bomarc is so sophisticated that two of the



**SIKORSKY S-60:** Artist's conception of the Sikorsky S-60 flying crane, a twin-engine helicopter now under construction at Stratford, Conn. Scheduled for its first flight early in 1959, the S-60 will be powered by two Pratt & Whitney R-2800 piston engines. Among design features are a rotating pilot's seat and extra set of controls enabling pilot to face tail during cargo unloading.

weapons will not attack a single target. Each missile will carry a code number so that it can be individually controlled by the master electronic system which will fire it automatically from its launching platform and guide it to the target.

The supersonic Bomarc will operate in almost exactly the same way as the manned CF-100 currently functions in the air defence system. The big difference, of course, is that the Bomarc will carry out its task much more quickly and be able to climb much higher.

Radar will spot the targets just as it does now. The information will be collected, digested and funnelled to the two missile bases by electronic computers which will determine missile courses, firing times and points of interception. When the Bomarc is close enough to target, its own seeking device will take over from ground control.

**The Human Touch:** The CF-100 operates in exactly this way except that the collection, digestion and dissemination of information gathered by radar now is done by humans instead of machines.

Consequently, officials say, there will be no basic change in the RCAF's method of air defence operation. And because the Bomarc is a pilotless plane, no additional ground trades will be required.

The present radar system is not a

limiting factor in Bomarc operation because it has sufficient range to control the missile. Officials say possible jamming of the Bomarc's seeker is a problem but not an insuperable one.

Rate of serviceability is expected to be higher for the Bomarc than for a manned fighter. A rate of 70%—that is, seven of ten CF-100s operational at any given moment—is considered good in the Air Force.

**Increased Range:** The Bomarc about to go into service with the USAF has a range of some 200 miles. However, by the time the Canadian missile bases are ready—construction is to start next year—the RCAF expects the range will have been increased to more than 400 miles. The longer-range weapon now is undergoing trials and will be powered by a solid propellant.

The Bomarc sites will be smaller than 100 acres each and the Bomarc probably will be launched from below ground level. The two Canadian sites will mesh with those in the northern U.S. and protect the Sault Ste. Marie/Quebec City/Windsor triangle, an area the U.S. could not completely cover.

The RCAF is reviewing nearly all its programs in light of the switch to Bomarc. These include air and ground crew manpower and training requirements, jet drone targets, possible reduced need for all-jet training.

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already on order.

The Government gave the industry no forewarning that the Astra and Sparrow programs would be cancelled. Canadair says the company's missile team, built up since 1951, is being re-assigned to other work.

## **MANAGEMENT ENGINEERING**

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better co-ordination and control, more time for essential work because of elimination of duplication. But most important, perhaps, is the increased efficiency resulting from the employment of the right men in the right job, in the right numbers with the right equipment.

Because of its achievements to date the Directorate of Management Engineering appears to have an assured future. Already it is confronted with enough requests for studies to keep it busy for five years. High on the priority list are studies of the newly-acquired Argus aircraft . . . the RCAF's answer to snorkel and atomic-powered submarines . . . and management training requirements for RCAF personnel.

## **BRITANNIA SERVICE**

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The Britannia Orient service involved considerable preparation. First item on the agenda for flight crews was a series of "paper flights"—hypothetical flights over the long-stage airway, which were an essential part of the intensive aircraft and route familiarization program.

During the paper flights, which were designed to supplement practical experience, all chart work necessary during an actual flight was duplicated. Thus before they began their scheduled flights on August 24, CPA's Britannia pilots had logged twice the legally-required hours on the Orient route.

Concomitant with the paper flight training were the many hours that Britannia flight crews spent in CPA's new \$300,000 Britannia simulator.

The final stage in the preparation for North Pacific Britannia operation was a dry run over the route for five full flight crews, to familiarize them with turboprop operation into all ter-

minals and alternates. Each pilot aboard made at least one landing during the round-trip flight, which left Vancouver on August 12.

Britannia service on the North Pacific marks a more than usually spectacular "first" for CPA; it is the first time commercial turboprop aircraft have been put into service on the Pacific, and it is the first time that air travellers have been able—due to vagaries of the International Dateline and the speed of the Britannia—to arrive at their destination before they leave their point of embarkation. By crossing the Dateline, and thus "gaining" 24 hours, CPA's Britannias leave Tokyo at 6:00 pm and arrive at Vancouver at 4:00 pm the same day—according to local times.

## **MERCY MISSIONS**

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always on the alert to sight evidence of fire and notify Lands and Forests stations of its location. They are of course called into service to help fly men and equipment to the site of a serious outbreak, and since 1953 a great portion of 321 miscellaneous flights have been in the protection of the valuable forest regions.

Air disasters occur all too frequently in the mountainous regions of the West Coast which necessitate intensive air search of dangerous wind-swept mountain peaks and valleys for survivors or traces of wreckage. These tragic operations involve a great deal of risk to the search aircraft, but constitute a high percentage of the total 346 incidents and 24,944 hours flown investigating aircraft accidents. Once again the extent of their contribution may only be judged by the log of long hours flown and the number of contacts made by the keen-eyed aircrew.

## **AIRPORT IMPROVEMENTS**

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vices for the collection and processing of weather data," Mr. Hees said.

There had been a gradual but steady increase in pilot training. Number of student pilots being trained eight years ago was 1200 annually. This increased a year or so ago to 1600 and it is expected to pass 2000 this year.

In his report to the Commons, Mr.