Technology, Production And Defence

By D. A. GOLDEN*

"In the last analysis, the entire conception of production sharing rests on the assumption that, on a selective basis, Canadian technology and production resources can make the most of the new opportunities."

The following is a very slightly abridged version of a speech given by Mr. Golden before the Canadian Convention of the Institute of Radio Engineers, held in Toronto late last year.

THE EQUIPPING of Canada's armed forces—quite apart from the financial problems which it involves—has never been an easy task, and unfortunately it shows no signs of becoming any easier in the foreseeable future. A large number of factors combine to create difficulties for an organization like ours, not the least of them being the interaction between technology, production and defence. Moreover, the three elements in this relationship are continuously changing at an accelerating pace, with the result that we no sooner manage to cope with one complication than another succeeds it.

Defence procurement was complicated, in the first place, by the specialized nature of so much military equipment. Many of the things needed by the military are, of course, of equal concern to civilians, but there are no civilian counterparts to tanks or naval guns or guided missiles. To some extent, this has been true of military hardware at least since the invention of gun powder, and, for several centuries, the response of most countries was to build and maintain arsenals at public expense. We still have a number of these arsenals in Canada.

Keeping Pace: However, in our own lifetime, this relatively simple solution has become inadequate. The equipment needs of the armed forces have become so diverse as to call for production to stringent military standards by virtually every part of industry. Even in peacetime, the rate of innovation in defence equipment has become so rapid that a versatile and progressive industrial base is essential to keep pace with the needs of the services. Sources of supply must be developed, maintained, and adapted from time to time to new production tasks. The flow of materials must be ensured. Work-loads must be stabilized as much as possible to prevent disruption in the labour force and the dissipation of essential skills.

Inherent in these problems there is another complication: that military equipment, when it is really needed, is needed badly. To this must be added still another: that in meeting the needs of peacetime, it was necessary to bear in mind the much greater and more urgent needs of a possible war.

Each of these considerations played its part in shaping Canada's defence production program after the outbreak of fighting in Korea. The expansion and re-equipment of the armed forces was accompanied by the establishment of a diversified defence industry. To some extent, this was directly financed from public funds, by re-opening and modernizing arsenals, or providing private industry with Crown-owned plants and production equipment. But the greater part was accomplished by industry itself, with some government encouragement in the form of tax concessions. As a result of the defence production build-up the value of our defence orders placed outside the country declined from over 20% of Canada's total defence purchases in 1951-52 to less than 4% four years later. In the matter of defence production we seemed, by 1956, to be largely self-sufficient.

New Complications: However, events have not stood still. New complications have crowded in to change the picture radically.

The most important recent developments affecting the nature of the defence production problem in Canada were, of course, the increasing complexity of modern weapons systems and the growing integration of Canadian and United States measures for continental defence. These developments culminated in the major defence policy decisions of the past year—the cancellation of the CF-105 and its associated programs, and the adoption of the SAGE control system, BOMARC missiles and the F-104G aircraft. These decisions made it abundantly clear that, in future, it would be extremely difficult for this country to undertake alone the development and production of its major weapons.

We had encountered in 1950 a situation which had some points of resemblance to this new situation, when it was decided in certain areas to adopt U.S. pattern equipment for the Canadian forces; there are, however, two important differences between the two situations. First, the weapon systems of today—and still more so, those of the foreseeable future—are vastly more complicated than were those of the Korean days, and require a range of technical competence beyond our relatively modest resources—excellent though our capabilities are within their limits. Second, Canadian requirements

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for many of the new weapons are too limited to support domestic production, unlike the greater part of our requirements in 1950 and the years immediately following. Technically and industrially, this country is now less able to "go it alone" in defence production than we were before—despite the impressive industrial advances of the past eight years.

The Changing Concept: As it happens, the military argument for making our own way in the development and production of weapons has been significantly weakened by a second development of recent years — the changing concept of war. The emphasis has swung increasingly to the importance of actual peacetime forces — first, as a deterrent to war, and second as being the only military resource on which we could really count if the deterrent should fail.

I am a layman in such matters of high strategy and I would not presume to expound strategic doctrines. In any event, there are sound reasons, quite unrelated to military planning, which make it inconceivable that Canada should view with indifference any substantial diversion of its defence production from Canadian to foreign factories.

The most obvious objection is, of course, that the defence industry which has been built up in this country is a valuable asset which is not lightly to be discarded. It represents a substantial investment of Canadian resources, a source of livelihood for thousands, and a major repository of technical and managerial skills. As long as the Canadian taxpayers are called upon to support a defence program, they must have the assurance that, as far as possible, their tax dollars will be spent in a manner best calculated to protect this asset.

Setting the Pace: This instinct for industrial self-preservation has been reinforced by another fact that has become increasingly evident in recent years. The development and production of defence equipment has a tendency more and more to set the pace of technological progress for a country. We may hope that someday we may beat our swords into ploughshares, but in the meantime it is of some importance that—to adapt the analogy — the metallurgical discoveries of the swordsmith can also lead to better ploughs.

Nowhere is this more evident than in the field of electronics. Almost every development in defence electronics has more or less direct and immediate applications in the civilian market, and whatever engineering and production skills the Canadian electronics industry now possesses can be traced, almost without exception, to the defence programs of the past. To cut off the flow of challenging new defence tasks would give rise to at least a threat of technological stagnation. The Government, as you know, is seeking an answer to this new problem of defence production through co-operative arrangements with the United States, summed up in the term "production sharing". The basic idea underlying these arrangements—that Canada and the U.S. should pool their economic resources for defence—is at least as old as World War II. However, the general idea of cooperation which was embodied in the Hyde Park Agreement of 1941 and the 1950 Statement of Principles for Economic Co-operation,

THE LAST NORSEMAN

By LAUCHIE CHISHOLM

MONTREAL—The last Norseman aircraft* to come off the production line in a long and epic series dating back to 1935, is airborne. Bearing registration CF-LFR and Serial No. 29-55, it has been sold to J. R. Theberge Ltd., Chicoutimi, P.Q., who will use it to transport men and materials to a construction site on the Peribonka River.

At least two live ghosts from almost a quarter of a century ago, when the first hardy Norseman was rolled out, were on hand to watch the silver and red-trimmed final production number take to the air.

It was a bright, beautiful day when Phil Lariviere, veteran bush and test pilot and Arctic salvage specialist, took CF-LFR up from the airport in suburban Cartierville. Noorduyn Norseman Aircraft Ltd., producers of the last Norseman and successors to Noorduyn Aviation and Canadian Car, is located adjacent to the air strip.

Mr. Lariviere, who probably has accumulated more hours flying a Norseman than any other pilot, was given the honor of test flying LFR. But there were two interested spectators, and their association with the Norseman extends back even farther than Lariviere's, who was flying a Norseman in northern Quebec in 1936.

The men were E. Leigh (Cap) Capreol, who made all but the first test flight on the Norseman prototype in 1935, and A. G. (Tim) Sims, now Canadair's director of military aircraft sales, who took delivery of the first Norseman (CF-AYO) in January, 1936, for the old Dominion Skyways.

Capreol, now manager of Montreal Airport, was test, development and sales pilot for Noorduyn. As he watched the first test of the final craft he recalled that the Norseman he flew originally was float-equipped. He flew from the old seaplane base on the St. Lawrence River at Pointe Aux-Trembles, about 15 miles east of Montreal. The base belonged to Compagnie Aerienne Franco-Canadienne.

He remembered that to get the first Norseman from the factory in Cartierville to the seaplane base, a distance of 25 miles, the wings were detached and the aircraft was trucked in parts.

Tim Sims had other reflections. He noted that there are very few structural changes in the first and last Norseman.

"It's the same aircraft," he said. He agreed, however, that the first Norseman was underpowered.

Austin Latremouille, general manager of Noorduyn Norseman Aircraft, remembered what the composition of the company was in the beginning. There were five employees in all, he said, and the major asset was an aging limousine, used as a truck, with the back seat removed, when it wasn't employed in transporting prospective customers to the plant.

The day the last Norseman was flown was a day of recollections. It was not a sad or a nostalgic day particularly. Rather, the aviation pioneers there remembered the early days and the hardships with wry amusement.

"Imagine," said Tim Sims, who is a devoted aviation historian, "one major airline had three aircraft and four pilots in those days. That was about the entire staff."

In the circuit above Cartierville Airport, Phil Lariviere put the stubby LFR through its paces. "Everything is fine. She's doing great."

At that report, the old-timers, including two long-time Noorduyn employees, a welder and a woodworker who helped build the first aircraft, adjourned to the office to toast the old days.

*See AIRCRAFT, September, 1959, "The Saga of the Norseman", p. 12 et seq.

had to be given practical expression in a form which would meet the new situation.

As soon as this need was recognized, the U.S. authorities were approached, and the Canadian case for production sharing was presented to them. It was impressed on them that Canadian measures for continental defence were being integrated increasingly with those of the U.S., and it seemed only logical that this should be accompanied by closer co-operation in the development and production of weapons and equipment for the common defence of the two countries. In addition, it was indisputable that this country had, on a selective basis, built up valuable engineering and production capabilities; because of the growing interdependence of the two countries it seemed scarcely less important to the U.S. than to Canada that these capabilities should be used.

American Share: Moreover, it could be demonstrated that American industry had always shared significantly in the Canadian defence program. Quite apart from the purchases which the Canadian Government had made directly from U.S. sources, our own Canadian contractors had, of necessity, looked to foreign supplies for some of the content of their products, and the foreign source, in many cases, had to be American. There has been a natural tendency, based on geographical and commercial factors, for Canadian industry to look to American industry in those cases where there was no Canadian market sufficient to warrant Canadian manufacture.

On the other hand, the U.S.—because of its position of leadership and the size and diversity of its own resources — tended to ignore Canadian capabilities and to look solely to its own industry for the development and production of its military hardware. There were, of course, exceptions to this rule. But it was generally true that U.S. government procurement offices and, to an even greater extent, U.S. defence contractors, gave little thought to the possibility of Canadian participation in their programs. In addition, defence purchasing policies and procedures in the United States contained a number of obstacles to participation by any foreign suppliers, including Canadian. What was needed, in the Canadian view, was effectively recognition by the U.S. that Canada has a useful contribution to make and a valid claim to enjoy readier access to American programs.

The American response to this approach was prompt and co-operative, and within a matter of weeks the production sharing program was launched with an agreed set of objectives. By the summer of 1959 we had obtained from the U.S. government a framework of policy and regulations which opened the way to Canadian participation in their procurement programs—in some respects on an equal footing with American suppliers.

Complete Acceptance: This removal of roadblocks represents virtually, a complete acceptance of the Canadian claim to enjoy readier access. To make that claim effective, however, and secure recognition of our ability to contribute, requires a more sustained effort aimed, not at the senior authorities in the U.S. government, but rather at the widely scattered procurement centres of the American armed services, and the major U.S. defence contractors. This effort is well under way, with officials of both governments working in the closest possible harmony to identify opportunities for Canadian participation and to acquaint American procurement offices and contractors with Canadian capabilities.

For the future success of the program, yet another step is necessary. The defence equipment which seems to offer the greatest promise for future production sharing is characterized by a very high degree of engineering content. Canada's ability to share in such programs, therefore, depends on the maintenance and continued development of its engineering capacity. This can only be accomplished if Canadian industry is able to secure development tasks of an advanced character. Once again, the U.S. authorities have recognized this need and have agreed that production sharing, in the long run, presupposes develop-

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TRACKING BY TRIANGULATION

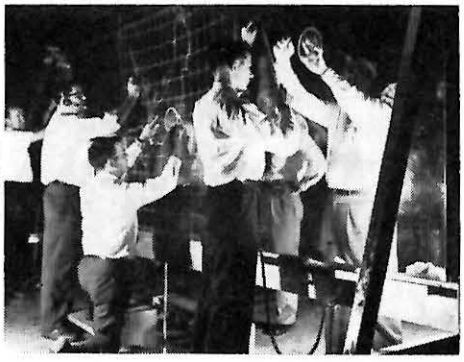
A new simplified system of air defence control has been developed by Boeing Airplane Co. Called MANTRAC for Manual Angle Tracking Capability, the system was designed to provide an accurate yet economical means of tracking and intercepting hostile airborne weapons in areas where the SAGE system or alternate electronic systems are not available. The MANTRAC system utilizes men instead of complex computers and machines.

MANTRAC utilizes the principle of triangulation to determine the position of the enemy by measuring the geometric angles between the unknown and two known points.

The operation centres around a large plexiglass map of the area which is blocked off in sectors. Mounted on either side of this on roller tracks are two additional plexiglass panels attended by men who serve as plotters. Each of these men is linked by direct phone line to one of a number of radar sites within the defence area.

In event of an air attack, the compass bearing of the attacking aircraft is transmitted from the radar sites at precise intervals to their respective plotters at the MANTRAC board.

Taking this information, the plotter draws a grease pencil line along the compass bearing. The plotting panels are then rolled directly behind the main board. The resulting intersection of the plotting lines is the geographic location of the hostile aircraft, and the position is marked accordingly on the main board. The process is repeated until a course line of the enemy becomes apparent.



Engineers are shown demonstrating Boeing's new MANTRAC austerity system of air defence control.

must be of the correct size and correctly placed to permit the publication to fit into standard RCAF binders.

When printing has been completed, three copies of the manual should be sent to the prime contractor who will make a final check and then forward two of them to the RCAF with a Certificate of Compliance. This is required by the RCAF as an assurance that the manual complies in all respects with the relevant specifications. After examination of the sample copies, the responsible RCAF representative returns the Certificate of Compliance, with his signed approval, to the prime contractor. The prime contractor then accepts receipt of the bulk shipment and forwards it to the appropriate RCAF depot.

In some instances, the prime contractor may instruct the sub-contractor to forward the bulk shipment direct to the RCAF. If this is done, he will also give the Contract number and other information to be added to the outside of each package. The method of packaging of the completed publications laid down by the Specifications should be strictly adhered to. In particular the maximum dimensions and weights of each package should not be exceeded.

BIG WHEELS

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west as Banks Island and east to Greenland. Phipps took one party beyond Alert, the northernmost post on Ellesmere Island. There was never any fear of the terrain below; stretches of open water were crossed at an altitude suitable for gliding to solid ground. By the time the "seven dwarfs" filed home to Carp last fall they had logged 3000 hours of safe, inexpensive flying—proof enough for Weldy Phipps! He is already back at the drawing board looking forward to increased business next season.

PRODUCTION SHARING

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ment sharing. The Canadian Government, for its part, has provided funds for the support of appropriate development work in this country.

In effect, what we are having to do is to come to grips again with the old problem of the interaction of technology, production and defence, in a slightly different guise, and on a continental rather than a national scale. For all concerned, both in Government and industry, this requires a major readjustment in outlook and operations. No longer can the opportunities for industrial effort be found, with relative ease, within the equipment programs of the Canadian armed forces alone. This does not mean that we shall not continue to look to Canadian production for by far the greater part of our own equipment needs. But, in addition, Canadian development and production opportunities must be sought, to a significant degree, in the vast and complex defence program of the U.S. and in the face of American competition.

Multiplying Opportunities: On the other hand, the very size and diversity of the U.S. Defence procurement program which complicate the search for opportunities also serve to multiply the opportunities which can be found if the effort is made. There must still, of course, be a concentration of Canadian development and production on those things we can do best. In the face of the competition which must be met, Canadian efforts can be effective only if this is done.

In the last analysis, the entire conception of production sharing rests on the assumption that, on a selective basis, Canadian technology and production resources can make the most of the new opportunities. While our experience is still too limited to support any definite conclusions, there are signs that this assumption will be justified. If the program succeeds—as I believe it will—it will be strong evidence that Canadian industry is approaching maturity.

SWEPT STYLING

Complete redesign of the vertical fin, addition of a new non-congealing oil cooler, and improvements in comfort and convenience, are the major changes in the 1960 Cessna Model 310D. Price of Cessna's slick, light twin is being maintained at the 1960 level.

The new 310D has undergone styling changes inside and out, the most obvious of which is the 40° sweep-back of the tail.

Other major change is the addition of a new, non-congealing oil cooler as an integral part of the oil system—of special interest to operators in extreme climates, such as Canada. The cooler provides a constant flow of engine oil through a warm-up passage in the centre portion of the cooler. When oil temp. reaches upper operating limits, a pre-set valve closes, which diverts oil flow through fin-cooled "veins".

Interior has been restyled and upholstered by using a combination of nylon fabrics, leather, Railite and Royalite.

The lounge interior (photo) features a lounge installation along the left sidewall that will seat two persons or accommodate one passenger fully reclining. Armrests are standard equipment on all single seat installations.

The 310D is powered by two 260 hp Continental engines with fuel injection, which provides the aircraft with a cruising speed of 220 mph and a 440 fpm single-fan rate of climb. U.S. price of the 1960 Cessna 310D remains unchanged at $59,950.