

OUR ALL-OUT GAMBLE FOR JET SUPREMACY

By GERALD ANGLIN

CANADA is bidding \$30 millions for a lead role in a new air age. For the first time we are out to crack the world market with aircraft and engines not only built but conceived and designed in Canada.

We are making this gamble just as aviation is hurtling into a revolutionary new era in which anything mounting a propeller is as old as the Wright Brothers and in which you must be jet propelled to win, place or show.

The great Canadian dare has been undertaken by Avro Canada Ltd., at Malton, Ont., a firm backed about 50-50 by the Canadian Government and Canadian bank loans, the latter underwritten by famous British planemakers who have supplied a few key technical men and invaluable experience. To date Avro Canada has:

- Successfully test-flown a new kind of airliner—the Jetliner—a propellerless plane which blasts its way through space on four jets of superheated air, whisking its 40 to 50 passengers along with noiseless ease at 427 miles an hour, 30,000 feet up.
- Designed and built a secret long-range fighter for the RCAF, which may be in the air by the time this appears.
- Designed, built and successfully ground-tested a new jet engine—the Orenda—which is as powerful as, and perhaps more powerful than, any gas turbine yet built anywhere. The Orenda was expressly tailored for the new Canadian fighter and will also be tried in the U. S.-designed F86 Sabre fighters which the RCAF also has on order.

Jet-propelled fighter planes of both British and American make have already flown faster than the speed of sound and the Yanks have a jet-engined bomber. Several British planemakers have experimented with jet power for civil use, and de Havilland put its long-range Comet into the air about a month before the Canadian Jetliner. But U. S. firms, profitably busy filling the immediate postwar demand for propeller-equipped skyliners, have dismissed commercial jet planes as five or 10 years away. Now they are just awakening to the horrible realization that they've been left behind. So far as is known, no American planebuilder has a jet transport past the design stage, or is even actively working on such a project.

U. S. Civil Aeronautics Administrator Delos W. Rentzel has conceded that the British Comet is "a threat to U. S. superiority," and that "the Avro Jetliner is further advanced than the Comet in terms of U. S. requirements. The American market is wide open for it."

The Canadian-built Jetliner (the name has been copyrighted) was designed after long conferences with top TCA officials as an intercity carrier to compete with the twin-engine propeller planes of today for the high-revenue, short-hop routes between major population centres. It is not intended to compete with the 2,500-mile Comet on trans-ocean and transcontinental routes.

What's this air-age Canadian pioneer like, and how good is it?

It looks like any large four-engine transport,

with three striking differences. Its whole silvery length seems to hug the ground. (Old-style planes must perch high on their landing gear so their propellers will clear the pavement.) Its four engines aren't spread out along the wings, but snuggle in pairs, close in. Finally, the towering rudder and the elevators are mounted high above the tail to escape the 1,200-mile-an-hour blast from the engines.

The engines start up with a high climbing whine, a hurricane blast of hot gases sweeps back across the field, and the Jetliner races down the runway pursued by a rushing sound like a distant train. As it circles low overhead, watchers hear a whistling roar, then stare with amazement as 30 tons of airplane start to climb like a World War II fighter at 6,000 feet a minute.

But the big surprise in store for the jet-age air traveler is the strange new flying sensation—silence.

"It's almost frightening at first, it's so quiet in the cockpit," says test pilot Don Rogers. "You can hear the ticking of instruments on the dashboard, droning engines tell of another plane's approach, but though you're nudging 400 miles an hour you can't hear your own motors—just the hiss and flutter of the airstream over the outer skin of the cabin."

Says Jim Orrell, Avro Manchester's crack jet tester who was borrowed to direct the new Canadian ship's first trial: "You wonder who's pushing you."

The Jetliner is 100 miles an hour faster than the speediest airliners now in service, 200 miles faster than most. It can hop from Vancouver to Calgary (524 miles) in 1 hour and 44 minutes (TCA's present

The Avro Jetliner—50 passengers, 427 m.p.h. — designed, built and test-flown in Canada, is aimed at inter-city hops.

AVRO CANADA PHOTOS



At Malton they staked \$30 millions on a bid for supremacy in the jet age. Now the gamble's paying off.

Already in the air is a liner designed to knock hours off schedules and spots off competition.

And coming up, a mighty new engine and a hush-hush fighter plane



Rubbernecks below can hear a banshee wail but in the cockpit you can hear the barometer falling. The Jetliner could link Vancouver-Calgary in 1 hr. 44 min.

schedule: 2 hrs., 20 min). Toronto to New York will take an estimated schedule time of 1 hr., 19 min. Present North Stars take 1 hr. and 45 min.

The big drawback to jet propulsion so far has been high fuel consumption. This makes for higher costs and lower payloads. But the Jetliner's higher speed gives it greater mileage per flying day and enables it to do more work than a conventional aircraft.

Take the Toronto-Chicago run for example. Schedule or "block" time (from moment the doors close in Toronto until they open again on the ramp in Chicago) would be 1 hr. and 26 min. for the Jetliner. For a standard twin-engine plane it's 2 hrs. and 36 min. This great speed advantage, says Avro, would enable the 50-passenger Jetliner to complete five such flights in an eight-hour flying day, carrying 250 passengers plus mail and air express. But the 21-passenger "prop job" could complete only two flights and carry just 42 passengers and a comparably lighter mail and express load.

At what it considers a conservative rate per ton mile, Avro says the Jet would thus bring in a gross revenue of \$7,100 a day as compared with \$1,180 for a standard twin-engine plane.

Avro claims that five Jetliners can do the work of 20 standard twin-engine planes. At about \$250,000 apiece the fleet of prop-equipped planes would cost \$5,250,000. Estimated cost of five Jetliners (still a rough guess) is \$3,500,000. The Jet's fuel costs will be higher and its engines will likely need overhauling twice as often as a prop-equipped

plane's. But the piston-engined fleet has 40 engines and 40 props to worry about—the comparable Jet fleet only 20 engines.

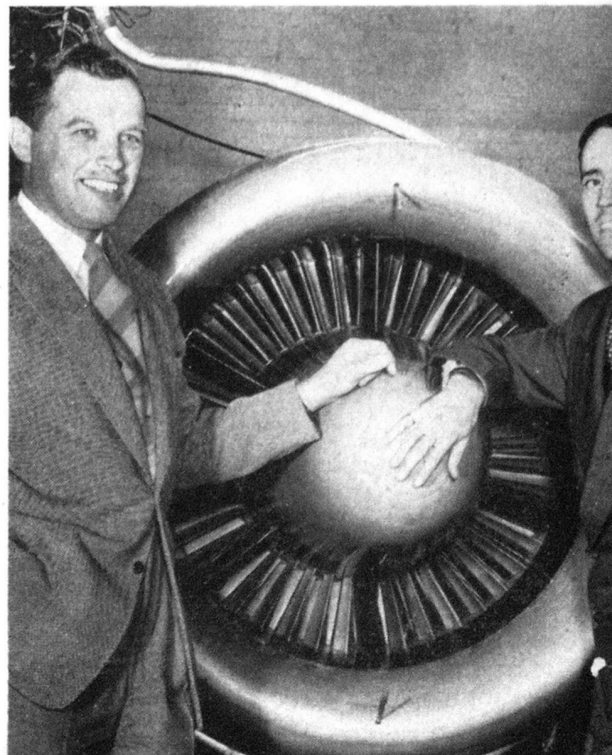
Obviously no final comparisons can be made until the Jetliner has shown its stuff in actual operations. Exhaustive performance tests will be continued on the first prototype until February or March, during which time a second sample model will be completed.

When final modifications are completed, Avro Canada will launch its big drive for airline customers on this continent, in South America and in Europe. It predicts that customers should be able to get delivery in the latter half of 1951.

For heartfelt if nontechnical testimony as to how Avro's jet fighter engine is proving up, just ask the residents of Brampton who couldn't sleep nights for its banshee screaming—and Brampton's 10 miles away. Avro gas turbine crews reluctantly canceled night tests but just long enough to rig up a muffler, then resumed a seemingly deliberate attempt to let the Orenda engine blast its own head off.

The Orenda (which will power a fighter plane, not the Jetliner) does its roaring in the breezeway of a two-story brick testhouse. *Continued on page 44*

Winnett Boyd (left) and Paul Dillworth learned their engineering at Toronto University. Result: The Orenda.



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Continued from page 21

It is a polished steel and gun-metal monster three and a half feet in diameter and 10 feet long. Inside the circular cowl at the front gleams a shiny nose bullet, radiating from which can be seen some of the more than 2,000 compressor blades. Mounted in "stages"—half stationary, the others whirling at about 7,000 revolutions per minute—these suck in air (all the air in your living room in a second), compress it five times and pump it into a series of combustion chambers, each a miniature blast furnace. Kerosene is squirted into these chambers, where it burns. Superheated gases expand so swiftly that they go swooshing out the tailpipe at more than 1,200 miles an hour.

Watch a toy balloon go squirting about the room when you release it, and you get the jet idea. And remember that gas turbine engines no more powerful than the Orenda have driven fighter planes through the sonic barrier.

The RCAF keeps mum about the end result of the Orenda's complex test-performance figures but Canada and foreign observers are known to be more than impressed.

"If you had reached this stage of development three years from now," exclaimed managing director Ernest W. Hives, of Rolls Royce, on a visit from the U. K., "I'd have said you'd put up a very good show."

Avro Canada started just four years ago this month with an abandoned war plant, plenty of ideas and almost no equipment. The development of two new planes and a new engine in that short time was at times threatened by some postwar breed of jet-propelled gremlin. The pioneers were forced to change horsepower in midstream, race against the deadline of expiring government appropriations and in some instances race overseas to find the right man for a specialized job.

A "Flying Fool" at the Controls

The half a dozen huge and airy buildings on Avro Canada's 80 Malton acres, where today 3,500 designers, patternmakers, machine-tool operators, bookkeepers and stenographers are bustling at work, was formerly the home of Victory Aircraft, a wartime crown company. It was here that Sir Roy Dobson, president of A. V. Roe of Britain and a director of the powerful Hawker-Sidley group (a British General Motors with wings), raised an interested English eyebrow at the sight of Canadian workmen who'd never seen an aircraft close up before turning out his giant Lancaster bombers at the rate of one a day. At war's end he leased the plant (since purchased outright) from the Government, signed two contracts with the RCAF for production of a fighter plane and an engine to power it, and one with the Department of Trade and Commerce for assistance with the production of the Jetliner.

The RCAF has so far put up probably \$5 millions for the development and building of the first two sample fighters, plus a few "preproduction" models, and about twice that much for jet engine developments. (Actual cost of building the experimental Chinook, forerunner of the Orenda, came within \$70,000 of estimates.) As a result, both items are the property of the Canadian Government.

U. S. planemakers have estimated it would cost them \$20 millions to \$30 millions to develop a jet-engined transport; Avro figures on doing it for closer to \$10 millions. Avro's government

contract simply stipulates that Trade and Commerce will contribute "from time to time" to such costs. The public purse may be snapped shut at any moment, and neither the government nor TCA is under any obligation to buy Jetliners, though TCA helped draw up the original performance specifications.

Upward of \$30 millions has thus been put into A. V. Roe Canada Ltd., something more than \$15 millions of it by the Canadian taxpayer. The rest was raised by loans advanced by Canadian banks against collateral put up in Britain by Hawker-Sidley.

Once the papers were signed Sir Roy, scarcely lingered long enough to accept the presidency of the new concern, then returned to London with a confident that's-that air.

His confidence was due to the keymen he had left in charge at Malton. In vice-president and general manager Walter Deisher he had caught one of those rare specimens, a "flying fool" of the pre-Lindbergh era who not only stuck doggedly with the scarebrained new aviation business but finally saw it pay off. Deisher, who celebrated his 59th birthday the day following his Jetliner's official flight, is a Virginia-born Canadian by choice who had a pilot's card signed by Orville Wright tucked close to his heart when he came to Canada in 1913.

He had a hand in the early struggles of Fleet Aircraft, at Fort Erie, Ont., between the wars, ended World War II at the Fleet control stick. Fleet produced U. S.-designed Cornell trainers at a rate of seven a day, which bettered total production of three equally large U. S. plants—and Fleet built them cheaper.

A short, stubby and energetic businessman with a grey toothbrush mustache, Deisher gives his depart-

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ment heads full authority to run their own show, makes a twice-a-day sortie through the plant from air frames to engine design to the testhouse where the tornado lives, catching the feel of the whole purring Avro machine.

About the time Deisher was burying himself in an aircraft plant for the duration, Hamilton-born Fred Smye was being dispatched to New York at the tender age of 24 to help Canada's Department of Munitions and Supply buy war goods. He developed a knowing eye for an aircraft contract, negotiated half a billion dollars worth of same in Washington, finally became assistant to aircraft production boss Ralph Bell in Ottawa.

"We spent a good part of the war on our hands and knees, begging the British and Americans for engines and other equipment to put in the planes we built here," recalls Smye, still smarting. "I swore then that Canadians would never have to do that again if I could help it."

Four Engines, Not Two

Today this handsome six-footer (now 33) with blond hair combed straight back, a liking for tan shoes, knitted ties and sharp black-and-white pinpoint checks, is Avro Canada's assistant general manager—for which read spark plug. He holds down the No. 2 managerial spot in the same friendly and relaxed manner in which Bing Crosby tosses off a ballad.

No matter what Dobson's intentions (he once asked Smye, "Are you fellows working for me or the Canadian Government?"), Deisher and Smye determined Avro's Malton plant was going to be no offshoot but native growth. Eighty-five per cent of the 350 designers engaged on the three current

projects are Canadians as are almost all the skilled tradesmen. Yet, realizing that Canadians had no experience in designing modern aircraft, they adopted the next best course of hiring crack British experts and turning them into fervent maple leaf wavers in minimum elapsed time.

As top man on the air frame side they hired E. H. Atkin, formerly assistant chief designer at Avro Manchester, a stocky, middle-aged Briton who looks intensely practical behind his horn-rimmed spectacles. Atkin has tersely stated the nightmare factor in pioneering in this swiftly changing field:

"Your aircraft is going to take three or four years to build. If you design it to suit an already well-proven engine, your power plant will be obsolete before your plane is in the air. If you decide to build it to suit an engine of more advanced but still untried design, the engine's sure to turn out no good. You can't win!"

Avro Canada, first deciding that its Jetliner would have two engines, took a calculated risk on a new power plant, and lost. There was no time to build an engine if Avro was to get its product on the market ahead of the crowd, so it decided to import Rolls Royces. But after nearly two years and more than \$1 million had been spent at Malton on design and construction of a twin-engined transport, reports from Britain began to make it increasingly clear that the desired Rolls Royce jets wouldn't be ready soon enough. So the design was changed to accommodate four less powerful Rolls Royce Derwent engines, but engines of a type which have already flown more than 150,000 hours in military aircraft.

Now the Avro Canadians agree it was a change for the better because their Jetliner thus acquired not only a thoroughly proven engine but the additional safety margin of a four-engine ship.

Not the engines but the hydraulic equipment (another imported item) caused all 3,500 Malton planebuilders, plus a few thousand bystanders, to hold their breath for a new record of one and a quarter hours during the Jetliner's second time up. The obstinate refusal of the undergear to lower produced an unplanned burst of headlines which only served to publicize the new ship's rugged airworthiness. For after long and futile efforts to lower the wheels to landing position, pilot Jim Orrell finally declared, "Nuts—I'm coming in for lunch," and he set her down on her belly without denting more than the equivalent of a few fenders.

To Kidnap an Aerodynamicist

At an earlier date managers Deisher and Smye had known a moment when they felt like denting their own heads together, after unwittingly misplacing a prime ingredient necessary to developments on the gas turbine side of their great experiment. Actually the jet engine project got off to a screaming good start thanks to the fact that a wartime crown company named Turbo Research had already started to design a trial power plant. As part of the RCAF deal, about 86 Turbo Research personnel and some equipment were shifted from Leaside, northeastern Toronto suburb, across the top of the city to Malton. Most of the 86 had been badly bitten by the jet bug and were tickled to see a new field for accomplishment open up; but one member of the design team insisted that any patentable ideas he developed must remain his own property (actually title to both the Orenda engine and the fighter plane is vested in the Crown) and he had bigger ideas of his salaried

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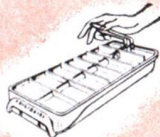
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worth than Avro at that point was prepared to pay.

"Finally, we tired of dickering and told him to beat it," recalls Fred Smye sadly. "He did, and it wasn't till too late we twigged that it took an aerodynamics man to design the all-important blades for the engine compressor—and this guy we threw out was the only such specialist we had."

The new gas turbine division registered severe shock when it discovered what management had unwittingly done, but its two head men knew where to go for a replacement.

Gas turbine boss Paul Dillworth and project designer Winnett Boyd had been pals since engineering days at University of Toronto. Boyd, 33, is a chunky, smiling enthusiast; Dillworth, 34, is slim, angular and more the serious or slide-rule type of engineer. Both confess to having developed a crusading determination while at college that Canada must some day design and build her own aircraft engines.

To meet the emergency Boyd went off to England to kidnap an aerodynamicist from Power Jets Ltd., which had been the world's first jet aero engine laboratory under Air Commodore Sir Frank Whittle, the Columbus of the gas-turbine age.

The victim was 25-year-old Harry Keast. The Cambridge and Whittle-trained youth reported for work at Malton August 8, 1946, was given five weeks to design the vital compressor blades, each one a tiny airfoil, the curve of whose surface—like those of an aircraft wing—must be calculated with awesome cunning and precision. Keast met the deadline and it began to look as if Avro's strange new gadget might have a compressor, after all.

Nobody at Avro Canada will ever forget March 17, 1948, the day they pushed the button on the experimental Chinook, their first jet engine. They didn't even get a chance to try out their baby in secret; their customers were breathing down their necks.

RCAF officials who had ordered the engine had seen two years and a lot of money go by without getting any results to show an appropriations committee. Now, with the end of another government fiscal year only 14 days away, all future development might hang on what happened when Dillworth, Boyd & Co. pushed that button. As a result the technicians could scarcely get elbow room in the engine testhouse for nervous RCAF brass hats and Avro top management.

"You could hear the knees knocking all the way into the village of Malton," recalls Fred Smye, "but when the boys

pushed the button she started up as obediently as your car."

The RCAF, however, viewed the Chinook's construction chiefly as a trial run for the Avro engine builders and not nearly powerful enough for their new fighter. Before Chinook was even running Dillworth and Boyd were called to Ottawa for a conference at which the Air Force laid down performance requirements for the new engine; these were so far beyond those of any known engine at that time that the two Avro jaws dropped in unison, and the engine team crept numbly out of RCAF Headquarters still shaking their heads.

Soon after their departure their RCAF colleagues were startled by two loud explosions. These reports were later established to have been backfires from a truck, but a British jet expert who had been at the conference was heard to exclaim, "I say—you don't suppose those poor chaps . . .?"

The Fighter's Still in Wraps

Engine No. 2 was the Orenda, which after weeks and months of further stratospheric mathematical calculations and many a production headache was guest of honor at another knee-quaking coming-out party in February this year. Again the button was pushed and again the blasting of the new engine's jet stream was dwarfed only by the joint sigh of relief which went up from all parties concerned.

Until the RCAF lets it out from under wraps the story behind the fighter plane remains a blank, but confident conclusions can be drawn from the fact that the project designer immediately responsible for its heft and size and shape is J. C. M. Frost, the same man whose sure hand laid out the lines of de Havilland's 108—the first British plane to fly faster than the speed of sound.

Some conclusions about Avro Canada's campaign to assure that its imported experts go native without delay can also be drawn from the case history of Englishman Jack Frost.

Frost brought his wife and infant son to Canada less than three years ago. They promptly homesteaded in a barren suburban development north of Toronto; they built the second house on the street. Since then a new district has grown up about them and Mrs. Frost says she's made more friends in her new home than she ever had in England.

"Newcomers?" exclaims hotshot designer Frost. "Why, we're pioneer stock!" ★

