Where Orendas Fly . . . SERVICE GOES TOO

By MAX BRAITHWAITE

WHEN CANADIAN - made Sabre 6 fighter aircraft arrived in Pretoria, South Africa, this month, Ron Willis, field service representative for Orenda Engines Ltd., Malton, Ont., was on his way from England to help make them ready for this newest operational assignment. His job . . . to act as instructor, adviser, trouble shooter, and whatever else is required to assist the South African Air Force in keeping the Orenda 14 engines that power the Sabres in perfect operating condition. At the same time, he will report back to his company on how its product is performing in this new field of operation.

This is an important "first" for Canada's aircraft industry — the first time that aero-engines of Canadian design have been sold outside this country.

But this is not the reason for crack service man Willis going along with them. Wherever Orenda engines go in Avro CF-100's or Canadair Sabres, from Comox, B.C., to Bad Homberg, Germany, experienced, company-trained specialists go along with them. "They act as our eyes and ears in the field," says Assistant Service Manager Walter S. Bellian, to whom the twenty service representatives regularly report. "At the same time they advise the customer on engine maintenance and operation."

Only Part: All of which points up the fact that delivering dependable engines in the shortest possible time is only part of the job Orenda has mapped out for itself. Another large part of this job is to provide the parts, people and know-how to keep that engine up to the latest standard and operating at maximum efficiency in its role as the powerplant for all first line fighters of the RCAF—and now also in the South African Air Force. At Orenda this is specifically the responsibility of the Sales & Service Department, under the direction of Vice-President F. L. Trethewey. Under him, Paul Y. Davoud, DSO, OBE, DFC, handles Sales; Clare E. Elliott, Contracts & Parts; and Arthur L. Sutton, Service.

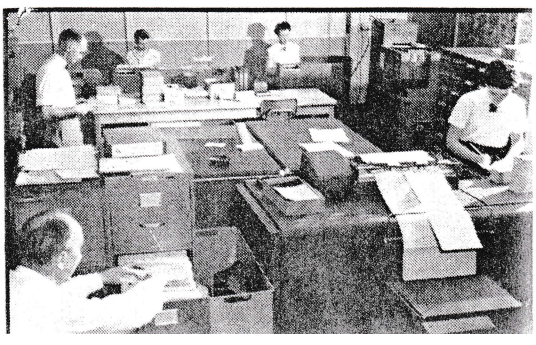
The Service Department's responsibility, as Arthur Sutton sees it, is "To ensure that Orenda Engines give the best possible service in the field" by:

1) Providing the customer with all possible assistance in the installation, service, maintenance and modification of his engines and accessories.
2) Providing training for pilots, ground crew and overhaul shop personnel regarding construction, operation, servicing and overhaul of engines and accessories.
3) Reporting details of engine and accessory performance in service and findings on overhaul so that engineering effort directed for improvement of Orenda engines may be of optimum value.

This is a big job. In Orenda's Sales and Service Department are 235 employees, including engineers, analysts, lecturers, writers, artists, experts on packaging; a new parts building that covers 55,000 square feet; a training

Top of page, at an RCAF European base, Orenda service rep Max Nerriere (R) consults with airmen beside Orenda containers. Above, Training sup. K. Henry with SAAF personnel.

Above is shown the illustration section of Orenda Engines' Technical Publications Department. Below, the IBM section of Service Engineering.



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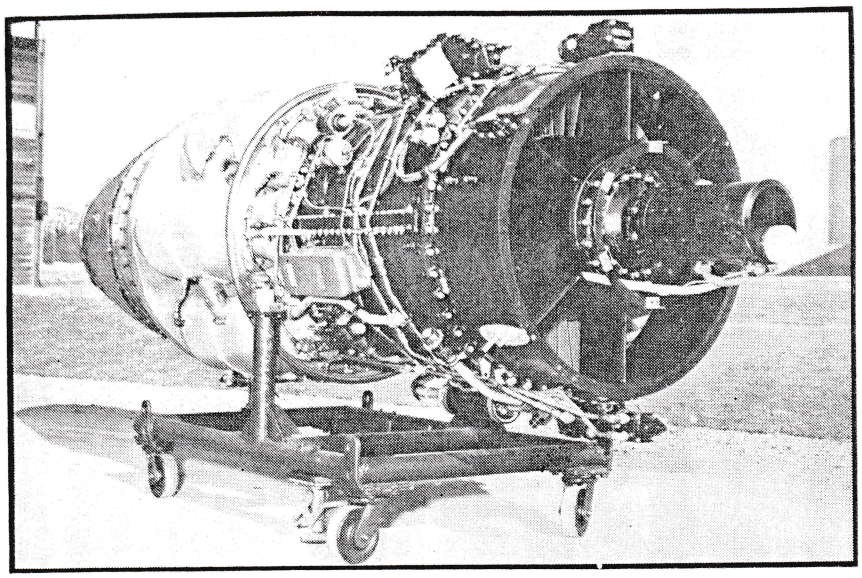

An Orenda 14, ready for packaging in a metal jet engine cannister.

school equipped with three classrooms, a theatre and a small scale engine shop; and 20 key field men at points in Canada, England, France, Germany and South Africa.

Increased Serviceability: The first part of Orenda's service job is designed to increase the Orenda engine's serviceability rate to an absolute maximum. Present production and modified Orenda engines have a service life between overhauls in excess of 200 hours. At complete overhaul, the engine is stripped down to the smallest part and selected parts checked for metal fatigue, cracks, wear, and mechanical damage. This overhaul job is designed to return the engine to service within 60 days of the time of removal.

Then there are the constant overhaul modifications. As in all other phases of the swiftly advancing industry of aviation, jet engines are constantly under development to improve performance. Orenda introduces a total of 150 to 200 "mods" a year, ranging from an improved fuel line pipe to the two-stage turbine on the Orenda 14. Since the first Orenda flew, these "mods"—products of engineering progress put into effect by Orenda's manufacturing department — have decreased the weight of the engine by 200 pounds, increased the thrust by more than 1,000 pounds, and improved the specific fuel consumption by 10 percent.

On top of this there are adjustments to be made in the field. Electrical and fuel system parts to be reset or replaced, filters changed, and regular inspections carried out on other parts. In many instances only a specially trained mechanic can do this work.

The latest ignition system in the Orenda gives successful relights in flight at heights in excess of 40,000 feet — a feature rarely used as it is almost impossible to flame out an Orenda unintentionally. The new emergency flow control system, according to Art Sutton "is the ultimate in reliability and simplicity, as it operates on the principle of the kitchen tap". While many of these improvements are made only during major overhauls, some can be made in the field. All of these efforts are backed up by a constant flow of parts from the new parts building beside the Orenda plant at Malton.

Modern & Efficient: This new plant, to which the Parts Department moved from smaller quarters this spring, is perhaps the most modern and efficient of its kind in the country. Measuring 200 ft. by 225 ft., it has, exclusive of the school and office space, 45,000 square feet of storage space and 3,800 more in the shipping dock. Here, in storage bins and on the floor, some 4,000 different parts for the five models of Orenda engines, ranging from tiny engine plugs to compressor casings, are stored ready for instant shipping to any spot in the world.

Parts Superintendent Ed McCloskey explains that . . . "The entire setup—receiving, storing, inspecting, packaging and shipping—is geared for the maximum of speed and efficiency. When we get an AOG* from AMC* we ship directly to the station concerned by the quickest possible means."

Sometimes, if the emergency justifies, the RCAF will send a jet aircraft to Malton to pick up the part. Some other shipments are made by air freight direct from Malton but the bulk of the parts go by rail, truck or boat.

Handling all the spare parts for five different Orenda models, keeping them organized so that you can put your hand on any part at any given moment, preventing deterioration while in storage and shipping them out in packages that will preserve them under any conditions for as long as five years, is an exacting task.

Requirements: It begins with the spare requirements analyst, who goes into a huddle with officers of the Air Force using the engine to determine exactly which parts are spares and in what quantities they will be needed during the lifetime of the engine. These parts are then purchased in the required amounts from their manufacturer, Orenda or one of its subcontractors.

"The point we keep in mind at all times," Mr. McCloskey points out, "is that some man will fly behind each one of our engines. We do everything we can to help him. This involves a system of constant inspection, both on receipt of parts and before shipping them out."

Every part is numbered and must be stored in condition that will prevent damage or deterioration. At present Mr. McCloskey and his right-hand man, W. G. (George) Sutherland, are introducing a system of storing many parts in units in the same type of container or package that will be used for shipping.

(Continued overleaf)

An Orenda service employee seals the polyethylene wrapping on a spare part.

**An AOG is a notification from the Air Force that there is an Aircraft on Ground because it is waiting for a replacement part. AMC is, of course, the RCAF's Air Materiel Command.*

F. L. TRETHEWEY
Vice President, Sales & Service

P. Y. DAVOUD
Sales Manager

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J. P. BURGESS
Chief Service Engineer

A. L. SUTTON
Service Manager

During the last few months polyethylene and other synthetic films have been used extensively for storing materials. According to Mr. Sutherland, it is proving "as useful here as in the grocery store for keeping carrots and other vegetables fresh."

They are particularly valuable for storing odd-shaped parts such as long fuel line tubes with twists and turns in them. Instead of difficult wrapping with non-corrosive paper, an airtight plastic sheath can be slipped over the part and sealed off at both ends. The part is protected from dust, moisture, and dirt. Since the plastic is transparent, the label can be placed on the inside of the sheath where it is always clean and readable.

Money Saving: Mr. Sutherland emphasizes that preservative wrapping on such parts which used to cost up to 40c each can now be done for 10c. Besides being surprisingly cheap, plastic materials are most durable. True, they will harden and crack if left constantly in the blazing sun for twelve months, or when subject to temperatures lower than 70 degrees below zero. "But even in our widespread operations these conditions are extremely unlikely," Mr. McCloskey points out.

And polyethylenes have by no means replaced all the methods of preservation. In fact, the science of packaging is a most vital part of the whole operation and one that calls for constant experimentation as the scope of the company's activities increase.

In charge of this department is Ronald Langley, who, before taking over his present duties, spent three years on the assembly line in the Orenda production plant where he gained a thorough knowledge of parts and their functions. "We take no chances," he says. "When a mechanic, working in the desert or the Arctic or wherever else he may be, reaches for an engine part we have to be absolutely sure that it is the right part and that it is in perfect condition no matter how it has been handled or how long it has been stored."

Packaged to Suit: The method of packaging depends upon where the part is going and when it will be used. A fuel pump going by truck over to de Havilland or to St. Hubert by plane for immediate installation doesn't require the same treatment as one that is headed for a supply depot in Zweibrucken, Germany, where it might stay for two years before being attached to an Orenda engine.

The nature of the part, too, determines the method of its handling. The RCAF has issued definite directives for the packaging of each part that it will use. At the same time Ron Langley and his staff are continually experimenting to determine the effectiveness of their methods. "We'll package a part and throw it out in the snow for three or four months," he says. "Or we immerse it in sea water. Or drop it from ten or twelve feet. All those tests are to see how our packaging stands up in keeping the part in good condition."

Corrosion is the shipping department's worst enemy. Even finger prints on an oiled surface can, under some conditions, develop into corrosion spots. Delicate parts, which because of their nature cannot be cadmium or silver plated, must be guarded against moisture as a surgeon's hands are guarded against germs.

Such parts are first dipped in a heavy or light cleaning solvent and then into a fluid known as a "finger print neutralizer". After that the part is never touched by the bare hands but is handled by tongs, rubber gloves or suspension by a non-hydroscopic cord. (Ordinary cord might leave a ring of moisture.) Then, depending on the amount of protection required, it is dipped in a light oil or heavy oil, liquid wax or even a quick-drying plastic that leaves it with a thick waterproof, airproof covering.

Gentle Treatment: Other parts, such as delicate gauges that would be adversely affected by a coating of anything, are given a different treatment. They are first wrapped in a Grade A barrier paper to protect them from oil, enfolded in a cushioning material and placed in a cardboard box (made to specifications right in the department). The cardboard box is then wrapped in a Grade C barrier paper which protects it from moisture and the whole package is dipped into the plastic dip.

"That part will last for ten years under any conditions you want to give it," Ron Langley says. "Outside of burning it or blowing it up you can't hurt it."

Other materials are placed in airtight, moisture-controlled cans. The Orenda engines themselves are shipped out in the daddy of all these cans and could even be dropped into the sea and towed ashore without damage.

But parts, regardless of how carefully handled, are useless unless somebody knows how to put them on the engine properly. So, Orenda operates a complete training school for its own mechanics and those of its customers.

How to Do It: Under the direction of Kenneth Henry, this school gives a complete and comprehensive course covering all phases of Orenda engine operation and theory. Situated in a corner of the new Parts Building, it comprises three modern classrooms, a small theatre with regular theatre seats and the best of equipment, and a common room where the students—from the RCAF; South Africa; Metz, France; Brockworth, England; Cold Lake, Alberta; and other points—can sit around and compare notes. Before any Canadian jets were shipped to South Africa, technicians from this country's Air Force were trained in the Orenda school.

Highly trained instructors using text books, cutaway models, wall charts,

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ERRATUM

In the story about the Project Vanguard work being undertaken by The Glenn L. Martin Co., which appeared in the May edition of *Aircraft* ("Science Non-Fiction", P. 30), it was said that: "The vehicle will comprise three stages, made up as follows: the first stage, approximately 4 ft. in length and . ." The length should have been, of course, 45 ft.

we have a relatively small number of sub-contractors. We must always be careful to protect these small industries and suppliers, for if a war started these firms would form a solid foundation to our vital war effort. If we lost them, the big companies would be swamped with war work, and undoubtedly we would have a mad scramble trying to set up a new sub-contractor baseline, to replace the one that had been eroded by the skimpy contracts of peacetime defence.

Drawbacks: J. M. Brian sums it up this way: "The drawbacks of such a contracting system as we see it, particularly in Canada where there are few contracts of this nature, are that it puts a tremendous competitive advantage in the hands of the contractor who is given cognizance over any given system. Naturally he tends to keep as much work as possible within his own or affiliated organizations, thus preventing the general industry from being able to participate as fully as they might."

However, Brian also suggests a solution: "This could be minimized by the Government directing that the Weapons System contractor spread a specified percentage of the work around to companies that are not a part of his own organization or affiliated with it."

While Canada and the nations of the West are still experimenting with the organizational aspects of the weapons system concept, it is safe to say that the system as a whole is certainly here to stay. For it is only through such a system that we can keep our thinking straight. And straight thinking, in turn, ensures that we have all the components that make up a complete air weapon—or the oil for the lamp, as Anaxagoras said to Pericles in Athens nearly 2,000 years ago. As the great philosopher John Dewey phrased it in his book, *Reconstruction in Philosophy*, ". . . notations, theories, systems, no matter how elaborate and self consistent they are, must be regarded as hypotheses . . . They are tools. As in the case of all tools, their value resides not in themselves but in their capacity to work as shown in the consequences of their use."

DELIVERUM

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the hour, estimating Luxembourg at one-five."

Near destination, you call the section into echelon formation.

"Random Charlie is cleared to the break on runway three-three."
"Charles on the pitch!"

As you shut-down the engine for the last time, an excited group of squadron pilots gather to look at The Six.

"How is she? What's she like at altitude? How long to climb to forty-five?"

The Overseas Ferry Unit, in two and a half years of operation, has delivered more than five hundred Sabre aircraft to Europe. The unit has accomplished this feat without the loss of a single pilot. Hence their motto " Deliverum Non Dunkem". The OFU holds the record for a trans-Atlantic ferry flight with a 45 hour crossing. Another achievement was the elusive "Triple Hop," smoked through by Random Eighteen, flying from BW-1 to Germany in a single day.

Since the advent of the two-hundred gallon drop tanks, much of the sweat has gone out of the Operation. Nevertheless, the scarcity of alternate aerodromes along the route, plus the unpredictable weather of the North Atlantic, still make the seven hours of actual flying a challenge.

ORENDA SERVICE

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sound and color film and the actual parts, teach the students the facts about all types of Orenda engines. Then the students go downstairs to the large engine strip-and-build room, which is equipped with overhead crane, vertical build stand and all the required tools, and carry out overhaul exercises on actual engines.

Pilots are given short courses so that they will understand the newest developments on the engines they are flying.

Pictures: Another big job of the Sales & Service Department is to keep the

customer supplied with clear, accurate technical books. This is the responsibility of Russell A. Stanyar, who, before joining Orenda, had 25 years in the engineering branch of the RCAF. Under Russ Stanyar 18 writers and 14 illustrators are at work turning out detailed, profusely illustrated publications such as the Description & Maintenance Manual; the Repair & Overhaul Manual; the Illustrated Parts List; the Manual for Preservation, Shipping and Storing.

"We have the equipment and staff to handle any printing job," Russ Stanyar avers. "And believe me, we need them to keep our customers up to date."

Right beside Stanyar's department in the Orenda offices is that of Chief Service Engineer John A. Burgess, whose job it is to . . . "keep track of the service performance of the engine and initiate action to improve that performance." Mr. Burgess and his staff of 30 issue special modifications bulletins at the rate of about six per month to users of the engine, as well as to manufacturers of parts and accessories. Using an IBM system, they tabulate, and code for ready reference, all field reports on the performance of Orenda engines. They witness the stripping down of engines for overhaul due to unscheduled removals and prepare reports on "what has gone wrong and how to prevent it".

It can be seen from this that a good part of Orenda service efficiency depends upon the ability of the 20 men in the field and their reports to service people at Orenda's home plant. Working with the engines and observing their performance in the heat, cold, dust and humidity of different parts of the world, they know where the kinks are and how they might be ironed out.

The Reps: Each one of these men (average age 33 to 35 years) is a specialist with a background of extensive training in the Orenda plant. They are chosen for their intelligence, alertness, tact, instruction ability and mechanical "savvy". The reports they regularly send into Orenda from their far-flung stations form the basis for modifications that maintain Orenda's enviable reputation.

"We simply can't find out all about an engine by testing it here in the plant," Arthur Sutton explains. "Although Orenda's testing facilities are of the best and most complete, the long haul under actual service conditions is really the final test."

At the Orenda plant engineers, designers and technicians carefully study the reports of the field representatives and their recommendations. Many of these end up as future "mods" and even basic changes in new engines.

So, through Sales & Service Department, the same expert service and attention provided to customers next door to the Orenda plant is available to those in other parts of the world. Parts are available at all times in any quantities and in perfect condition. Expert mechanics are on hand with the proper tools and facilities to do the job.

"Our objective is to provide the best possible engines for the armed services and maintain them in satisfactory operation at all times," says Vice President Trethewey. "That's the job we're doing."

CAI MEET

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de Havilland chief test pilot.

Aerodynamics: Chaired by Dr. D. C. MacPhail, assistant director of the NRC's Division of Mechanical Engineering. "An Experimental Investigation of the Effect of Surface Roughness on the Drag of a Cone-Cylinder Model at a Mach Number of 2.48", by Dr. J. H. T. Wade, Orenda Engines aerodynamics engineer; "Boundary-Layer-Induced Noise in the Interior of Aircraft", by Dr. H. S. Ribner, research associate at the University of Toronto Institute of Aerophysics.

Maintenance & Operations: Chaired by Group Captain E. R. Johnston, Air Transport Command chief staff officer, RCAF. "The Changing Aspect of Northern Flying", by R. N. Redmayne, AITA general manager; "Airline Engineering Evaluation of Transport Aircraft", by A. E. Ades, TCA assistant director of engineering; "Field Data Analysis—Some Techniques Currently Being Developed in the RCAF", by Squadron Leader J. E. Neelin, Air Materiel Command logistics programming officer, and B. Larmour, Air Materiel Command logistics analysis officer.