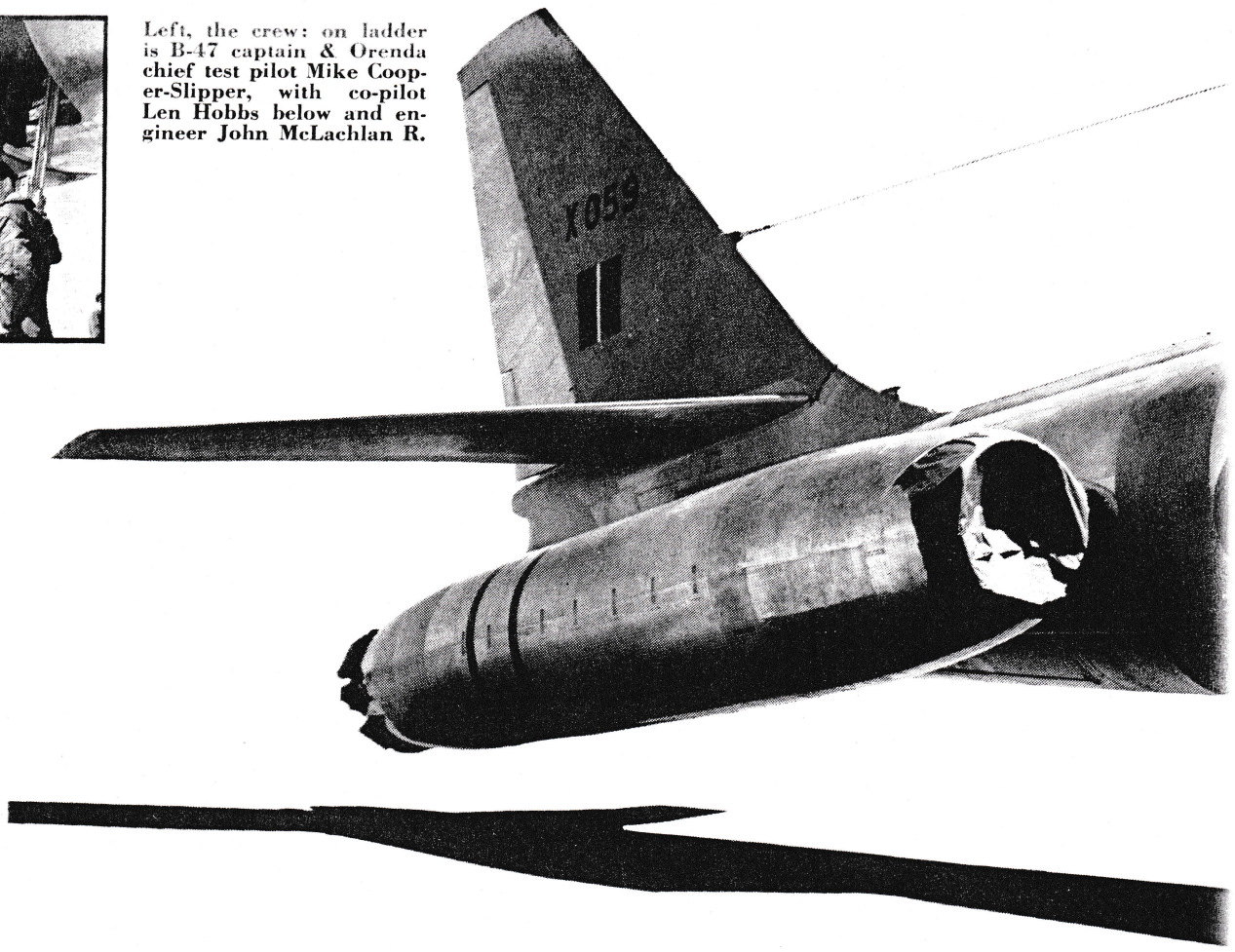
Left, the crew: on ladder is B-47 captain & Orenda chief test pilot Mike Cooper-Slipper, with co-pilot Len Hobbs below and engineer John McLachlan R.



Chickiwicki* for Orenda's Papoose

ON APRIL 15 at Toronto's Malton Airport, an interested crowd stood in warm spring sunshine watching the arrival of the B-47 which is to be the "flying test bed" for Orenda Engine's already famous Iroquois. The B-47, piloted by Chief test pilot Mike Cooper-Slipper and test pilot Len Hobbs, circled the field once before landing. Clinging to the starboard side of the rear fuselage and under the horizontal stabilizer, was a 22-foot long nacelle. Inside this was a mock-up version of the Iroquois later to be attached for in-flight testing.

Airborne testing of aircraft engines prior to installation in the aircraft they were designed for has always been a vital phase of development. With piston engines, extensive operational testing could be done on the ground, and fairly accurate calculations made of airborne performance. Installation of these engines in a flying test-bed gave engineers the opportunity to match the engine to the propeller and cooling systems for the particular requirement of the airplane.

Greater Importance: Jet engines are also test run extensively on the ground, but they are affected to a greater degree in flight because of their wider range of altitude and speed. As size and power of jet engines increase, the importance of airborne testing becomes even greater.

Choice of the B-47 as a flying test-bed for the Iroquois was dictated by several factors. It had to be available immediately, reliable, big enough to carry the necessary measuring and recording equipment, and have a high sub-sonic speed. It was necessary for the test-bed to be capable of altitudes of 45,000 feet, and to be of sufficient structural strength to take the high thrust of the Iroquois, and with sufficient air resistance to take this high thrust without entering dangerous speed ranges. It is interesting to note that the Iroquois develops more thrust than four of the B-47's own engines.

In their search, Orenda engineers studied eleven other U.S. and British aircraft before deciding tentatively on the B-47. Then they discussed their choice with engineers of the Boeing Airplane Company, designers and manufacturers of the B-47. After considering four other positions for mounting the Iroquois on the '47, it was finally decided to mount it in a pylon fastened to the rear fuselage under the stabilizer. This installation required a minimum of change on the basic aircraft, left adequate clearance on the ground, is easily accessible for service, and provides the test engine with an almost undisturbed airflow.

Conversion: Canadair Ltd., under contract to Orenda, began detailed engineering work for conversion of a production B-47 to this flying test bed configuration on February 19, 1956.

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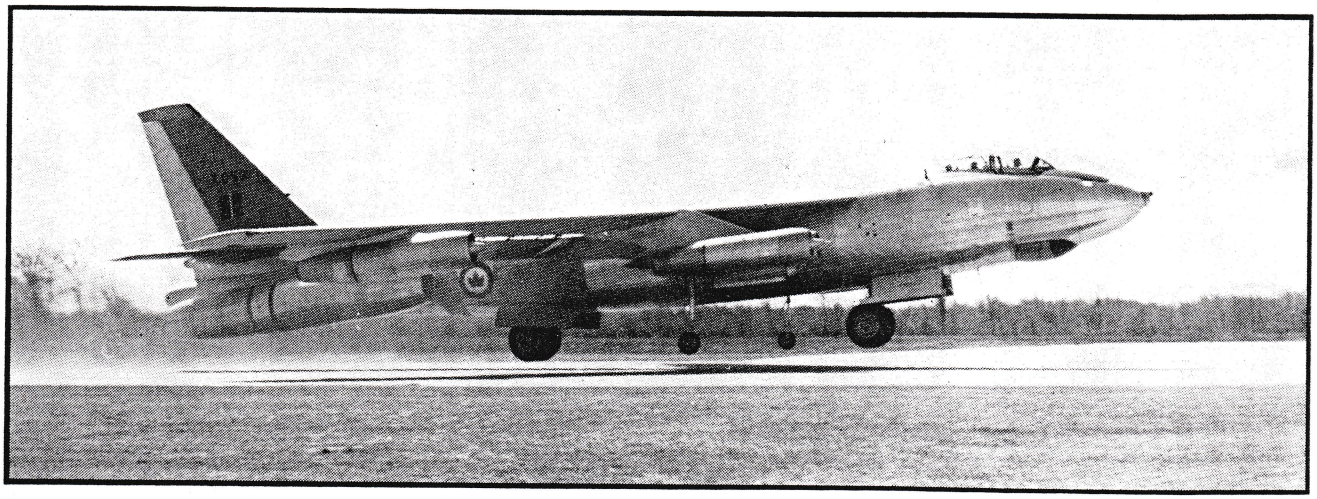
*"Chickiwicki" is an Indian word describing the cradle the squaw carries on her back and to which she fastens her papoose.

The B-47 flying test bed for Orenda's Iroquois turbojet is shown flying over Malton preparatory to landing. Flight from Cartierville was aircraft's first following conversion work by Canadair. Take-off from Cartierville appears below.



Photograph below gives indication of size of Iroquois nacelle. On this flight, mock-up of Iroquois identical in size, weight, and shape to actual engine, was installed in the nacelle. B-47 is on free-of-charge loan from USAF.

began sliding toward the centre.

"Okay. Turn that heading marker on to the inbound heading."

Too Easy: As we came out of that last turn, the dials were all lined up again. Since everything had been so easy, I couldn't help but feel that there were harder things ahead. After a minute or so of flying the steering needle, I noticed a light flash on the panel.

"That's the outer marker passage. Flip that knob on the Approach Horizon to ILS function. That's it, when that pointer coming down reaches the pitch bar, you just keep them lined up. That's all you got to do."

Now we were into the descent. With wheels and flaps down there was a change of trim. The altimeter unwound smoothly, the steering needle remained upright, and keeping the pitch bar in line with the glide slope pointer was easy. Then I noticed that the Course Bar had slipped out.

"There's a bit of wind drift down here. Set that heading marker off whatever you think it needs. Into the wind; now fly the needle again."

The Course Bar came back into alignment and stayed. This was too easy. Maybe something else was to happen. I heard Mr. Rountree call the tower: " . . . by the inner inbound at zero nine."

Sneaking a Look: As the altimeter wound downwards through the 500-foot level, I sneaked a look ahead. The business end of the runway was dead-ahead. We were high.

"Now you know you can't fly good instruments and look out at the same time. You get your head down there. I'll tell you when to look."

The sweat began to break out on my palms as the altimeter closed with the field elevation figure. The IFS instruments remained stoic; it felt as though they were bent on taking me right through that runway.

"Okay, look."

Fifteen feet or so over the blacktop, about a third of the way down the runway. Halfway down it when the wheels touched with a gentle screech of rubber and Mr. Rountree opened the throttles to overshoot. Climbing, with wheels and flaps coming up, he said:

"Change that knob to heading function. Then turn the marker around to the overshoot heading and follow the needle again."

Two Firsts: And that was all there was to it. Follow the two dials down to the runway and round-out. It was the easiest trip "on the gauges" that I'd ever flown. To say nothing of the event being two big firsts for this writer: first ILS approach, and first landing in a twin-engined aircraft.

Believing always that honesty is the best policy, it must be pointed out that there is a drawback to the whole arrangement. The TCA Viscount pilots who will be flying the Collins' AP-101 Auto Pilot with the FD-104 Integrated Flight System will have to face up to the problem. What will become of their instrument flying if they are transferred to another type of aircraft? One without the IFS?

ORENDA IROQUOIS

(Continued from page 25)

Orenda test pilots Mike Cooper-Slipper and Len Hobbs were sent to McConnell Air Force Base in Kansas for flying training on the B 47. Orenda ground crews were trained at the Boeing plant at Wichita.

Once the Iroquois flight test program begins, Cooper-Slipper and Hobbs will be flying the test-bed. The Iroquois is controlled in flight by the co-pilot, while the captain flies the B-47. An operations engineer occupies the navigator's position in the nose. In the bomb bays are stowed the instrumentation packs.

Photo recorders take pictures of almost all the information appearing on the pilot's instrument panel. These recorders take readings as fast as four per second, or as slowly as desired. Oscillograph recorders are incorporated. The latest telemetry (frequency modulation radio) techniques are used to explore vibration characteristics of compressor blades. This information is transmitted to ground stations up to 100 miles radius from the aircraft. New techniques in tape recording gather information later processed by electronic computers, which also aid in quick assessments of masses of test data.

By the time the Iroquois is ready to be installed in the Avro Arrow for its Third Stage of testing, (that is, supersonic), most of the answers will have already been obtained from the B-47 program. At the present time, this program is scheduled to continue

for 18 months. The B-47 is on loan to the RCAF from the USAF, on a free-of-charge basis.

SCIENTIFIC STREAM

(Continued from page 22)

Aura of Omniscience: Just how the scientist has built up this omnipotent reputation for being listened to, is hidden in history. But there is no doubt that he has it. A short time ago the Division of Educational Reference at Purdue University interviewed 15,000 high school students to determine their personal feelings about becoming scientists. Although 25% thought that scientists were "more than a little odd", and smaller percentages thought there was "something evil about scientists", or "you cannot be a scientist and be honest", it is interesting to note that nearly half of those questioned recognized the high educational standard, and over a third felt you had to be a distinct genius to be a scientist. There seems no doubt, then, that in the public mind the scientist is accepted as a man with lofty intelligence, no matter what subject he chooses to speak on.

As long as the scientist sticks to scientific subjects he's on safe ground. Still some scientists will not. And the result can be an intolerable turbulence in the scientific stream. Friction can develop between the scientists and the engineers, or the scientists and the operators. And the result is a lack of coordination and cooperation, poor engineering policies, and a general slowing down of our technical efforts. Fortunately there are many in the scientific business that recognize the limitations of the scientist in the down-to-earth business of the engineer. These same people fully appreciate the importance of having a skilled engineering organization to call on. For example, what could be more shrouded in science than nuclear energy? And who employs a taller tower of talent than Atomic Energy of Canada, Limited?

Yet in spite of all this scientific know-how J. L. Gray, vice president for Administration and Operations for Atomic Energy, said recently that the lack of experienced development engineering departments in Canada's heavy industry is slowing down the adaption of nuclear energy for commercial purposes. As he put it, "We had great difficulty in getting satisfactory development work completed and with few exceptions the manufacturers grossly underestimated the magnitude and the complication of the work they undertook."

Scientific Influx: While Atomic Energy of Canada Ltd., has a hard core of scientists at the base of their organization, our aircraft industry is mainly buttressed with engineering

COMING EVENTS

May 22-24—Annual Convention, American Society for Quality Control, Masonic Temple, Detroit.

May 27-28—Annual General Meeting, Canadian Aeronautical Institute, Chateau Laurier, Ottawa.

June 8 — Air Force Day across Canada.

June 9-14 — ASME Semi-Annual Meeting, Sheraton Palace Hotel, San Francisco, Calif.

June 24-25—29th Meeting, Aviation Distributors & Manufacturers Assoc., The Broadmoor, Colorado Springs, Colo.

September 6-7—Canadian International Air Show, Exhibition Park, Toronto.

September 9-13—IATA Annual General Meeting, Madrid, Spain.

Sept. 30-Oct. 4—Canadian National Materials Handling Show, Show Mart, Montreal.

October 2-4—Annual Meeting and Forum, National Business Aircraft Assoc., Cosmopolitan Hotel, Denver, Colorado.

October 16-18—Inst. of Radio Engineers, Convention and Exposition, Automotive Bldg., Exhibition Park, Toronto.