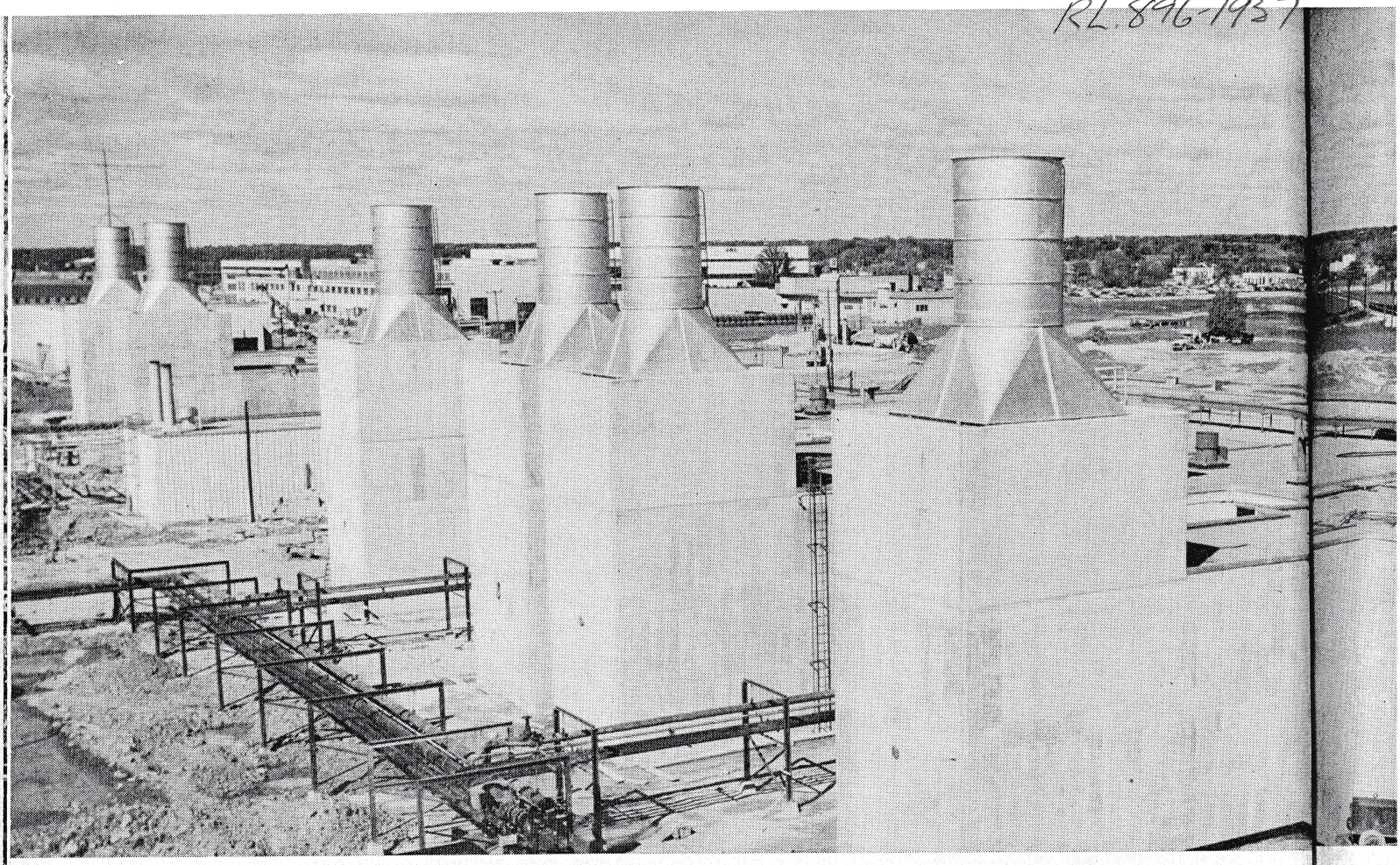


A Roar Becomes a Rumble

Test Beds for the Iroquois

With the furious roar of turbo-jets under test common place, the new low key rumble attracts little attention.

In a way, it's anti-climactic. From what has been referred to unofficially as possibly the most powerful turbo-jet under development, one expects something more authoritative than the noise equivalent of a tractor trailer laboring up a distant grade.

Softening the thunder of Orenda Engines Ltd. Iroquois is one of the design specifications on a facility which has given the Malton company a composite of the latest in jet engine test cell development.

$11,000,000 Program

Part of an $11,000,000 expansion of research and development facilities undertaken last year, the new test cell centre is expected to be ready for full operation by mid-summer. Iroquois' have already been run in two of the six cells which will make up the completed facility.

A further addition to Orenda's Malton research and development potential is a new high altitude test chamber. When completed, the unit will permit an engine to be run through its paces under conditions simulating atmospheric temperatures and pressure conditions which would be encountered at altitudes just in excess of 100,000 feet.

At Orenda's extensive test establishment at Nobel, Ont., where afterburner test units were put in operation last summer, a device for probing the possibilities of internally cooled turbine blades went into service a short time ago.

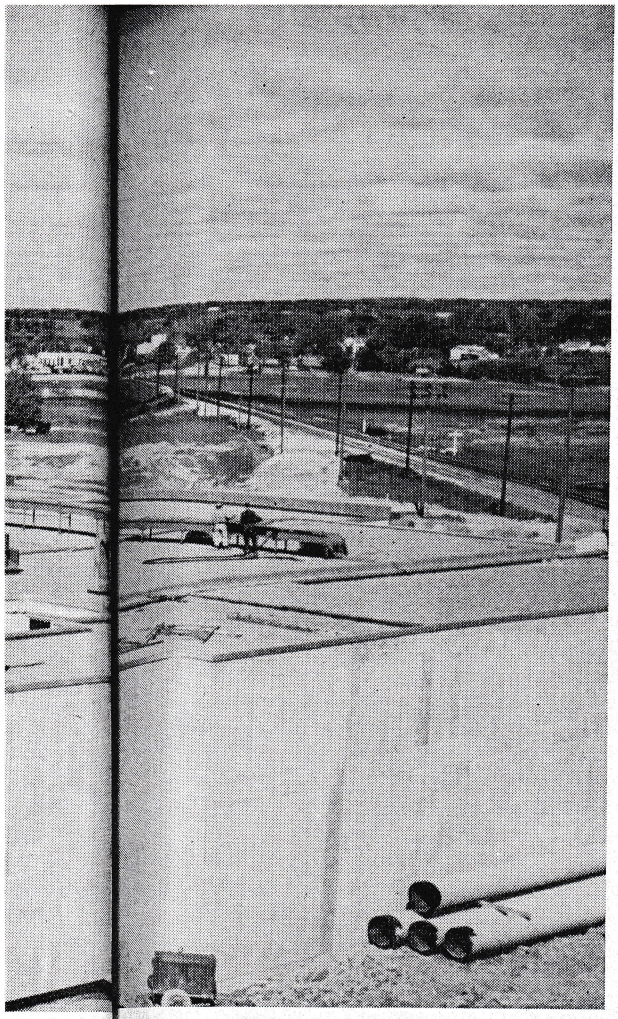
Completion of the present program, Orenda engineers say, will put the Canadian company's over-all research and development facility on a par with that of any other jet engine manufacturer.

With modifications, the altitude chamber and test cells will be capable of taking ram jet units under development, when such a program is launched.

Orenda's Chief Plant Engineer, Stan Cyma, describes capacity of each of the six new test cells as equal to that of any comparable facility. He should know. He inspected all the latest test cell centres in the United States and Europe when the Malton units were being designed.

High Capacity

Keyed to go into operation at the stage of the Iroquois development program for which they are most needed, the cells are large enough to handle future advanced versions of



the projected Avro Arrow power plant, as well as new engines of considerably greater size.

Rated capacity of the units is a matter of security. But the cells are said to be capable of running engines with a mass flow up to 50% greater than that of the present version of the Iroquois.

George Anderson, Orenda's Chief Technical Engineer, says that's more than any turbo-jet engine is likely to require in the next 10 years.

The air intake on the new development test cells provides for straight through flow. A vertical air intake, which is standard for most cells, would have required a 90-degree turn in the air flow, with the attendant complications in building up the required mass flow.

The horizontal air intake on the Orenda cells has four banks of vertical splitter vanes filled with fibrous material which absorb the noise of the in-rushing air.

They are banked by a coarse debris screen on the outside and a fine insect screen on the inside to prevent any foreign bodies from being introduced into the engine run under test.

The test engine exhausts into a huge silencer tube, 45 feet in length and 11 feet in diameter. Weighing more than 40 tons, it was custom designed for Orenda by Industrial Acoustics Co. Inc.

The silencing equipment was built into the cells at a cost of about $1,000,000. It muffles the Iroquois' mighty roar to about the equivalent of a tractor trailer unit.

Before entering the comparatively delicate silencer system, exhaust gases must be cooled to prevent damage.

Old Faithful

When an engine is on test without afterburner, the cooling process is to flow air around the exhaust duct. With an afterburner in operation, however, up to 3,000 gallons of water per minute must be introduced into the exhaust duct itself to lower the temperature sufficiently. With an engine and afterburner test under way then, the new test cells will blow off huge clouds of steam reminiscent of a performance by Old Faithful in Yellowstone National Park.

The silencer equipment at the exhaust end of the cells has been built into a vertical stack. It is surrounded by four banks of horizontal splitter vanes through which air is induced as a part of the exhaust cooling process.

The cooled exhaust gases discharge into the atmosphere through cylindrical pipes which rise above the concrete stacks of the cells.

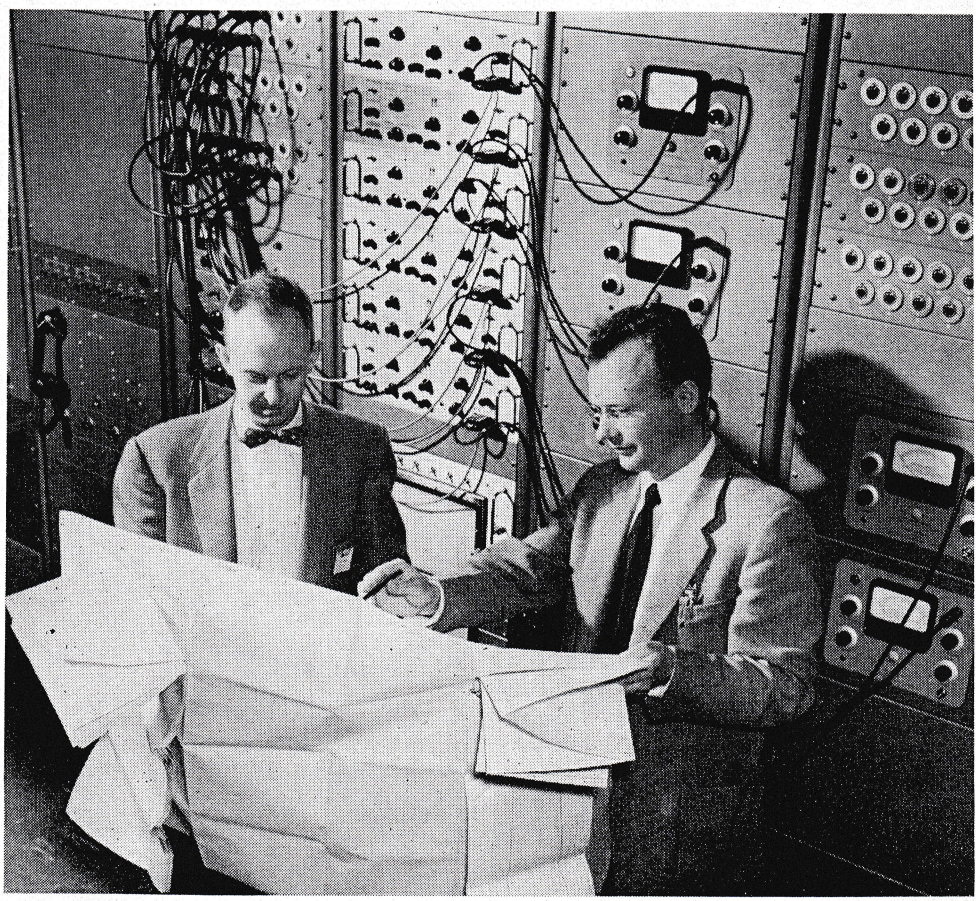
A specification of the new cells indicative of the advanced thinking which went into their design is the location of the engine mounting itself.

It has been constructed to place the installed engine in the centre of the cell's 25-foot square cross sectional area. In this position, errors in performance data as a result of uneven air temperature and pressure around the intake are avoided.

The engine beds themselves are mounted on raised, reinforced concrete plinths.

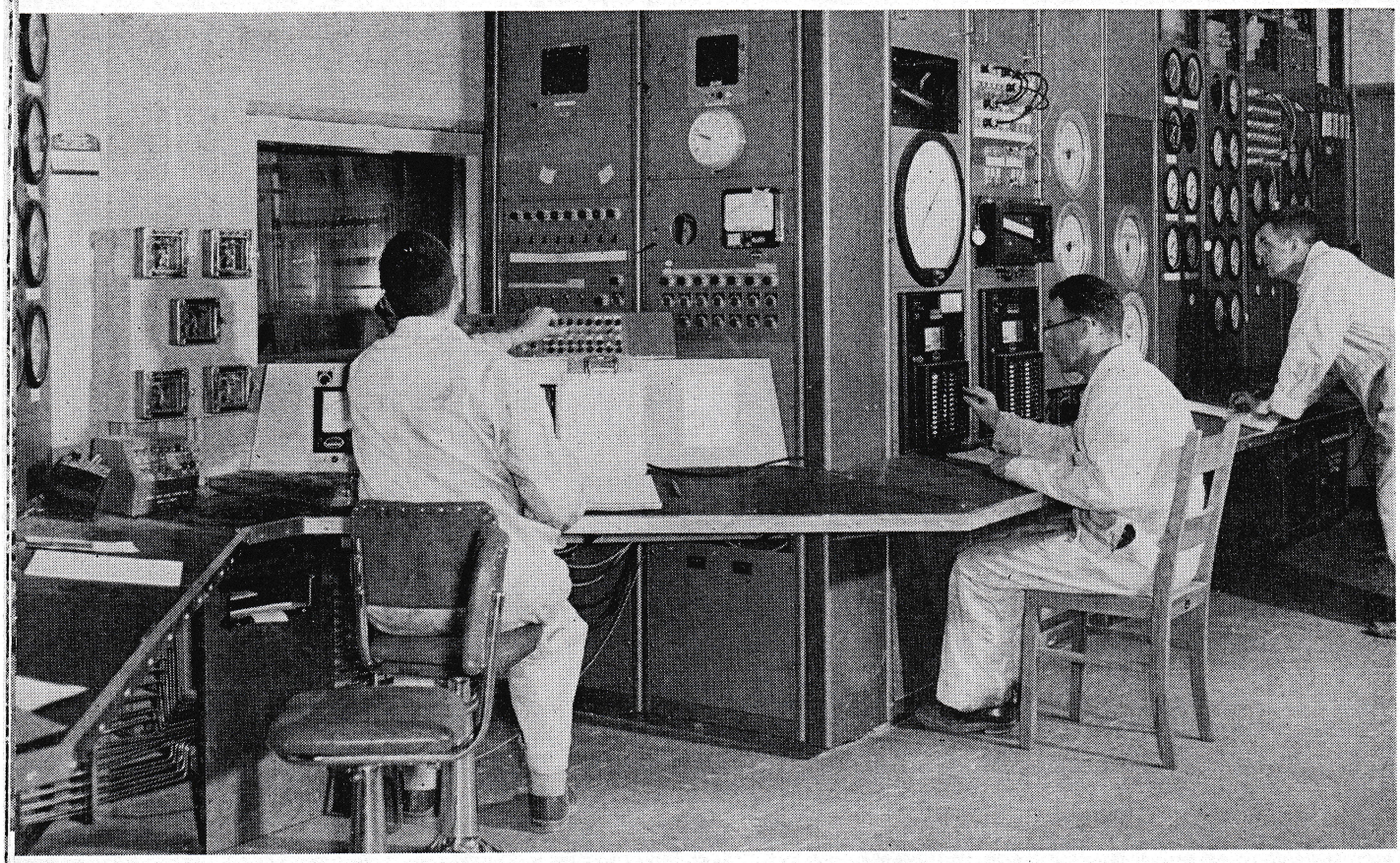
Another unique feature of the test cell engine mount and its superstructure is a platform which can be raised to provide easy access to the intake end of an engine during installation. It can then be lowered to floor level to be completely out of the way, giving a clear view of the engine during its test run.

In this latter connection, the test crew are further facilitated in their view of units under test by location of the observation room which has



RECORDING CENTRE. All test runs in the new facility will be electronically monitored and logged in a specially designed central recording room. Left and right here are Jack Knott, central recording room supervisor, and Ron Bowman, former supervisor of instrument development who has since taken a position at Waterloo College.

An $11,000,000 investment keeps Canadian development in step



NERVE CENTRE. Complete electronic instrumentation monitors the jet's performance in this observation centre of one of the test cells. Direct visual contact can be made through the panel toward the left of the picture.

been elevated to be on the same level as the engine platform. This has the additional advantage of permitting direct access for installing and servicing lines leading from monitoring instruments to pick-ups at crucial points in the engine.

Recording Centre

At the heart of the entire test cell facility is the central recording room where engine performance in each of the cells is logged through a maze of electronic monitoring devices. It is here that upwards of 2,500 signals, transmitted from the test cells through 16 tons of electrical cable, can be handled simultaneously.

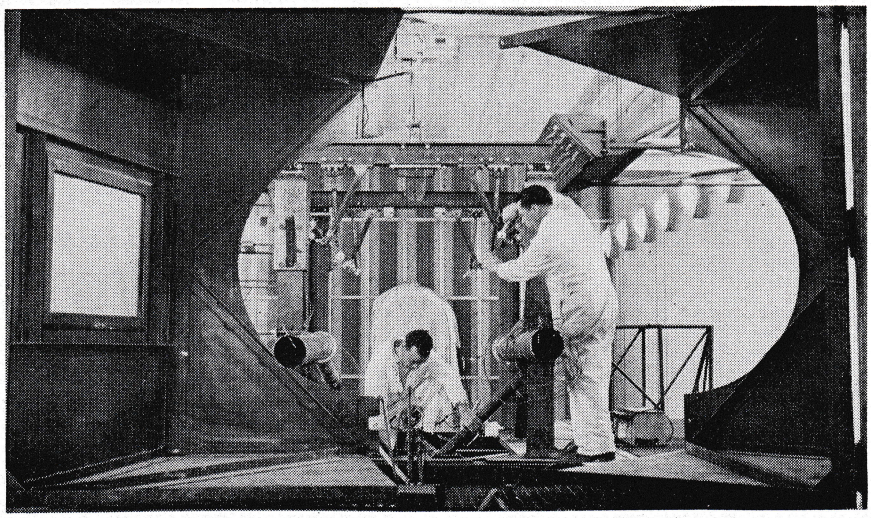
Automatic equipment provides photographic record of much of this data for detailed processing later on. But some of the monitoring is visual on cathode tubes, to permit in-progress observation of the test runs.

As the test cell program builds up, it is planned to introduce more automatic data handling units so that information can be processed and reduced to the answers sought by the power plant engineering team more rapidly than at present.

Some of the instruments in the central recording room are being used for the first time in Canada in connection with jet engine testing.

Orenda engineers say the test and development facilities now coming into use will insure the Iroquois reaches production on schedule. While some test running on the Iroquois was undertaken in the old test cell facility, only two of these units had silencing equipment capable of use with the new power plant.

Design of the over-all test facilities is described as a team effort. The knowledge of experts in a variety of specialized fields was pooled in arriving at final specifications.



ENGINE MOUNT. Only thing missing from this picture of the heart of the test cell is the security-cloaked Iroquois. Men are preparing the mounting to take a jet.