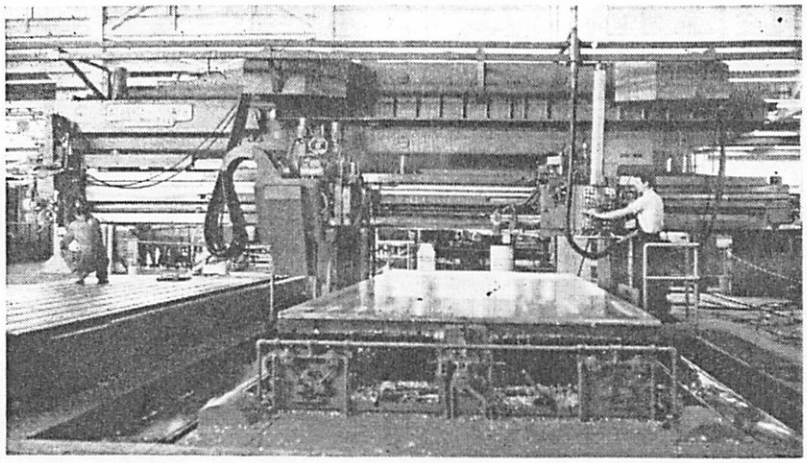


Avro's New Skin Mill

A 200-ton skin milling machine, biggest of a battery of new machines lined up for the production program of the supersonic CF-105, has gone into operation at Avro Aircraft Limited, Malton, Ont.

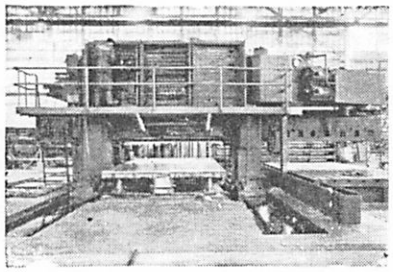
The only one of its type in Canada, and by far the most versatile in its field, the new mill is capable of carrying out skin milling work on all aircraft designs of the forseeable future.

With the advent of the supersonic era, the skin mill — which carves complete sections of aircraft wing skins and their stringers out of solid metal — has become increasingly important. First, because there are considerably fewer rivets required in the finished wings by using this method, it is much stronger and the wing surface much smoother. Second, under the tremendous stresses of ever higher speeds, fewer rivets and rivet holes decreases the possibility of fuel leaks in the areas of the wing tanks.

Alongside the 28 ft. x 9 ft. work table (centre of upper picture) of the Avro mill is another table on which the template (left of upper picture) is placed. A stylus is guided by the operator along the contours of the template. This stylus, under eight ounces of pressure, transmits its readings to an electronic centre (see platform above work table in bottom picture) which sends out the pattern to the large travelling head of the machine.

As the 70-ton head and gantry starts to move, the tool attached to it begins to trace the same pattern in a solid slab of aluminum, ripping the chips out at high speed. For example, during recent test runs a tool taking a cut 2¾" wide by 1¾" deep chewed through the metal at about 9 ft. a minute.

To keep the temperature down while running at these speeds, a flood coolant system pumps 75 gallons of coolant per minute. On a typical skin job, the machine will



start with a 3,300 pound billet of aluminum and end up with the finished product weighing less than 300 pounds . . . the machine having milled out over 90% of the weight in chips.

To keep the machine from burying itself, the chips are deposited on a conveyor belt, which in turn feeds them into mobile scrap bins. The volume of chips cut during one working day would fill four average-size garages.

The large slabs of aluminum are held in position on the work table by vacuum. The tool can be tilted and swivelled to facilitate the cutting of tapered skins and converging ribs.

The mill is also equipped with safety devices. If the vacuum holding the work drops below a certain minimum, the tool stops cutting and retracts. The same thing happens if the tool begins to overheat. To prevent a tool from cutting too deep and slicing into the harder metal of the work table, a two-inch slab of aluminum is permanently fitted over the whole table area.

The machine was built by Kearney & Trecker of Milwaukee to Avro specifications and cost over $1,000,000 to design and construct, though the price to Avro was only $325,000 because the Canadian firm was pioneering in this field. Kearney & Trecker expects to recover the development costs on future sales which will be approximately $600,000 per mill.

"to find that it is we who are leading the way in developing the collective approach to technology." He goes on to point out that we of the Western World are building up our collective approach by "the development of tortuously systematic management procedures for control of resources with which the individual must work," and "the making and review of managerial decisions by countless boards, committees, and *ad hoc* working groups."

The usual yardstick for comparing our system is, of course, the dictatorship of Russia. Here, for some reason which we find baffling, the Russians seem to be able to develop airplanes quicker than we can. Part of this speed is laid to the fact that they have shortened their administrative routines. I don't believe we know all the details of this Russian procedure. But I understand that a measure of coordination goes on by rotation of the key personnel between the training academies, the research institutes, the government aircraft ministries, and the major aircraft plants. Thus, they knit the whole upper echelon into a co-operative group. Each top man knows what the other is doing, and the general nature of the work since each has also done a similar job. This "multiple hat" system keeps the ruling group to a small circle who can get together and so cut out some of the paper work.

How well the Russian system really works, of course, we don't know. And the difficulties of determining how much paper work is really necessary are legion. The basic trouble is that we never know when we reach a mean. As Aristotle pointed out hundreds of years ago, "Matters concerned with conduct . . . have no fixity. The agents themselves must consider what is appropriate to the occasion." But one thing is certain. With a steadily rising tide of unrest with our paper pyramids in aviation in Canada we must be approaching a limit. Air Marshal Sir Basil Embry, in a recent radio talk, expressed the opinion that the U.K. has already passed the upper limit, and excessive paper work is cutting away the foundation of their technical genius. "We cannot afford," he says, "to consider everything and decide nothing," which is a product of a top-heavy paper pyramid. We should note his words. For the handwriting is already on the Canadian wall.