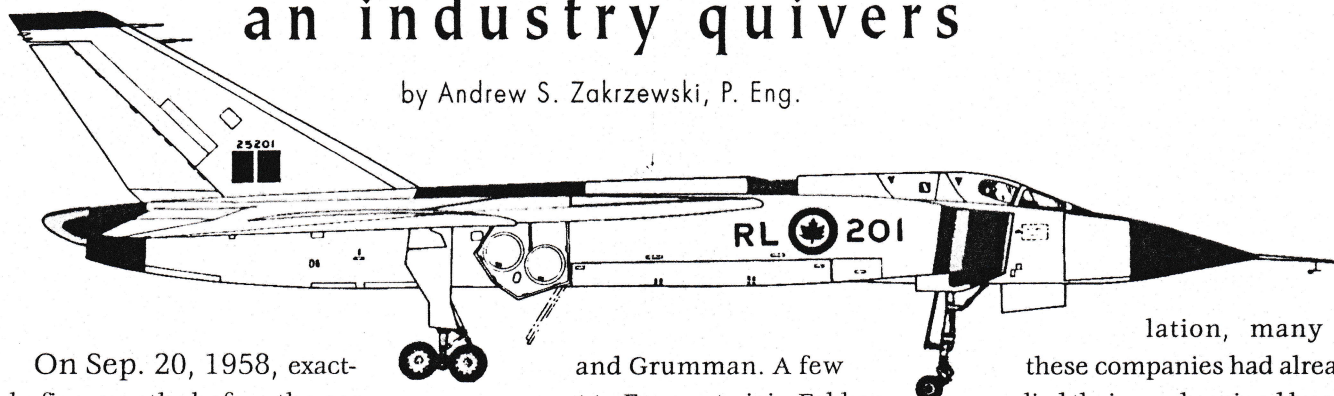


AFTER THE ARROW: an industry quivers

by Andrew S. Zakrzewski, P. Eng.



On Sep. 20, 1958, exactly five months before the cancellation of the Avro Arrow project, The Financial Post (FP) published a cautionary front-page article titled "Your Business and the Arrow's Fate." It predicted "a far and deep" impact if the federal cabinet doomed the Arrow. The authors, Franklin Russell and FP staff writers, estimated that about 650 suppliers to A.V. Roe Canada Ltd. would be affected, including 30 main suppliers (with about 8500 employees). The article stated that, above all, the cancellation would deal "a shattering blow to our entire scientific community." How prophetic.

Avro Aircraft Ltd. and Orenda Engines Ltd., the airframe and engine branches of A.V. Roe, employed more than 2000 engineers and scientists. There was no immediate demand for them in Canada after the government ordered the cancellation of the Arrow project.

Thirty top Avro engineers joined the National Aeronautics and Space Administration. More than 100 went to North American Aviation, and others went to such American firms as Boeing, Vertol, McDonnell Aircraft

and Grumman. A few went to Europe to join Fokker Aviation in Holland, or to work on such projects as the future Concorde.

To quote from the American book *Apollo, the Race to the Moon*: "As the space task group's burden was threatening to overwhelm it, the Canadian Government unintentionally gave the American space program its luckiest break . . . The contribution [of the Canadians] was incalculable . . . They had it all over us, in many areas." Not a bad testimonial for a team so maligned in Canada.

The workforce at Avro and Orenda (14,000) and their subcontractors included thousands of highly skilled trades workers and technicians. Many of them also left Canada and would be sorely missed later on, when the Canadian industry turned to more complex products.

From the moment British-owned A.V. Roe set-up shop in Canada, it pursued an aggressive "buy Canadian" policy. Subcontractors participated in the development of many complex components, hydraulic and electronic controls, and other sophisticated technologies. By the time of the cancel-

lation, many of these companies had already applied their newly gained knowledge to the development of other products and obtained initial export orders.

A new high-tech Canadian industry had begun to grow, nurtured by hundreds of highly entrepreneurial small companies. The sudden cancellation ruined many subcontractors and convinced others that there was no future in coming up with innovative ideas in Canada.

Subcontractor's plight

The plight of Pneuma-Serve Ltd., a small engineering and manufacturing company in Toronto, was probably typical of the fate of many small subcontractors. The company had obtained two orders relating to the initial 37 Arrows. The first order was for the development, testing and manufacturing of a control and release mechanism for the Arrow's landing parachute. The specification called for intricate tooling and very close tolerances.

The second order was for an electro-mechanical control device that was called the Dirpot. It was the brain-

child of two young Canadian engineers. Two Dirpots were required to remotely control the hydraulic activator steering the plane's front nose wheel. The company developed, built and tested two prototypes and submitted them to Avro, but the proposal was declined because Avro's mechanical nose wheel control was considered to be adequate.

In June 1958, after a mishap with the the landing gear, it was decided that a finer control of the nose wheel was advisable. Avro then placed an order for the Dirpots.

Because no additional development funds were available, Avro asked the supplier to divide the development and tooling cost among the 37 pairs of dirpots it was going to order. Since this was a firm order, Avro's request was accepted.

Only five pairs of Dirpots had been completed, when the cancellation was announced. This meant that the cancellation charges covered less than 14 per cent of this supplier's total research and development (R & D), tooling and test costs. Pneuma-Serve was almost broke and could not take any further risks. The company's dream to develop high-tech projects was over.

A bitter aftertaste

On Feb. 24, 1959, four days after the Arrow's "Black Friday," Canada's defence minister George Randolph Pearkes called a meeting that was attended by four other cabinet ministers (Donald Fleming, Michael Starr, Raymond O'Hurley and George Hees) as well as Crawford Gordon, president of A.V. Roe Canada Ltd., and Fred T. Smye, president of Avro Aircraft Ltd. Pearkes said that General Lauris Norstad, supreme allied commander in Europe, had indicated that

Canadian aircraft might be required for three different roles. The ministers wanted to know whether Avro could manufacture Grumman Super Tiger aircraft and whether Orenda could provide jet engines for them. Could 120 aircraft be produced by 1963? Remember the reason the Arrow was cancelled: "All manned interceptors are now obsolete."

None of the projects proposed by the government or A.V. Roe would result in the rehiring of employees within a short period, thus saving the company. Perhaps the most bizarre was the offer made by transport minister George Hees. He volunteered to arrange a meeting with Gordon McGregor, president of Trans-Canada Airlines (TCA), to revive the Avro Jetliner C-102 projects. The prototype of the Jetliner first flew in 1949, so it was a little late to try to revive the project 10 years later. (It had been scrapped in 1957.)

Lack of marketing savvy?

Switzerland, much smaller than Canada and even more dependent on exports, developed unwritten rules long before the First World War about how to support technical development and use it for export. Both the Swiss government and financial sector support R & D. Most importantly, practically all new products are first tried out in the home market. The Swiss people give preference to Swiss products, and all levels of government plus various institutions are usually willing to place initial orders for newly developed products. It is a certainty that the Swiss would not have abandoned the Arrow without first carrying out a thorough marketing study.

Basically, there are three avenues a company can take to export prod-



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ucts and ideas:

- (a) export their finished products;
- (b) enter into joint ventures with other companies; or
- (c) grant manufacturing licences to other companies.

This may all sound like Marketing 101, but in 1959 this was certainly not the course followed by the Canadian government agencies.

The Arrow

Had Canada equipped the RCAF with Arrows, it is likely that one of the export options described above would have succeeded, and not only in the United States. General Earle E. Partridge, commander in chief of the North American Aerospace Defence Command (NORAD), stated a few weeks after the cancellation that "the aim of the NORAD is to hit attackers as far away as possible," i.e. over the Arctic. They therefore needed "the fastest, highest-flying, longest-range interceptor available." By their

own admission, the Americans would not have a suitable aircraft for this purpose for many years.

There were strong indications that, had the program continued, the Arrow would have been purchased by the Americans. For example, the Americans ignored the British Harrier vertol aircraft until after it proved its worth during the war in the Falklands, at which time they bought the licence to manufacture it in the US.

The Iroquois

While Orenda's Iroquois gas engines were built specifically for the Arrow, their cancellation is difficult to comprehend because they might have been sold or licensed independently. The French aircraft company Dessault was interested for some time in acquiring 300 Iroquois engines from Orenda for its new Mirage IV aircraft. After the cancellation of the project, a representative of Dessault came to Canada to find out whether

Orenda would still be able to supply the engines.

In a memo sent on March 18, 1959 to Ontario premier Leslie M Frost, A.V. Roe pointed out that more than \$100 million had already been spent on the Iroquois, the engine was cleared for flying, and about \$4 million was still required to complete the final tests. Production of 300 engines by Orenda would have secured the employment of 3000 workers for three years.

Ottawa would neither relent nor help. The decision to destroy all prototypes, tooling and technical documentation slammed the door shut on any future orders.

Long-term consequences

The Avro Project Research Group had 20 projects under consideration for new products, mainly in the aerospace and advanced ground transportation areas. The sudden cancellation left neither the time nor the money to continue, and no project has survived.

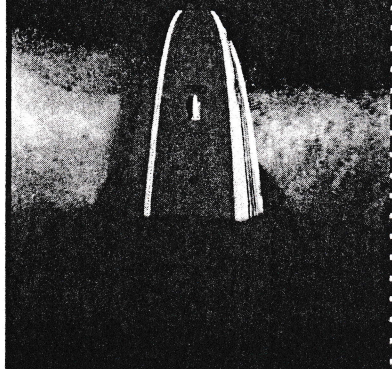
The Jetliner, the Arrow and the Iroquois engine had one thing in common: They were all high-tech, highly innovative products. Unfortunately, in the 1950s, the correlation between innovation and economic growth was not fully recognized.

One of the first economists who drew attention to this link was Paul M. Romer, professor of economics at the University of California and Fellow of the Canadian Institute for Advanced Research. Over the last 10 years, he has developed a "new growth theory" that clarifies these relationships.

If the role of R & D had been appreciated more, the Arrow and Orenda projects would not have been cancelled so hastily.

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The aircraft industry today

Forty years ago, many critics were of the opinion that Canada could not compete successfully with the United States and Europe in the development and marketing of new aircraft. In the April 1997 edition of *The Globe and Mail's* Report on Business Magazine, an article by Bruce Livesey proved that Canada can compete. Livesey described how Bombardier Inc., a relative newcomer to the aircraft industry, had become Canada's largest aircraft developer and producer since A.V. Roe Canada Ltd. Bombardier's success is due mainly to its outstanding management team, business acumen and excellent engineering. But, as Peter Boag, director of operations at the Aerospace Industries Association, freely admits in the article: Without government funds "we would have lost the industry."

Canada now has the world's fifth biggest aerospace industry, which is poised to become the fourth biggest by the year 2000, overtaking Germany. The Canadian industry's annual sales are expected to reach \$15.3 billion this year.

Boag says, "The federal government learned its lesson after cancelling the Avro Arrow." No matter whether Ottawa really learned its lesson or was motivated by political considerations, Bombardier got support and its aerospace division became a huge success.

Bombardier is successfully applying a gamut of management tools, including:

- *identifying a suitable niche in the aerospace business: regional and business planes;*
- *acquiring companies with either experience or production capaci-*


ty in this field (Canadair and de Havilland in Canada, Learjet Inc. in the United States, Short Brothers PLC in Northern Ireland);

- *sharing financial risk with major foreign contractors (suppliers of engines, avionics, flight controls, etc.);*
- *keeping up with competition through constant development and introduction of new aircraft; and*
- *sharing engineering work with subsidiaries and suppliers.*

This business strategy is working well. In 1997, Bombardier had 41 per cent of the world market share in regional jets, and this ratio is expected to increase.

It is interesting to note that A.V. Roe's Jetliner was also a medium-range passenger jet aircraft. Not all the business techniques described above were known 40 years ago, but A.V. Roe, given a chance, would no doubt have gone the same route as Bombardier.

Pratt & Whitney Canada Inc., a wholly owned subsidiary of United Technologies Corp. of Hartford, Connecticut, reportedly received a \$14.7 million, interest-free loan last year from Ottawa's Technology Partnership Initiative. The loan was granted for the development of its new PW-150 gas turbine engine.

Is it not ironic that, in 1959, the government would not loan the Canadian-owned Orenda \$4 million to complete tests on a similar gas turbine engine for which it already had large export offers? 

Editor's Note: The above article is reprinted by courtesy of the Professional Engineers Association of Toronto and first appeared in 1998 in "Engineering Dimensions" the association's publication



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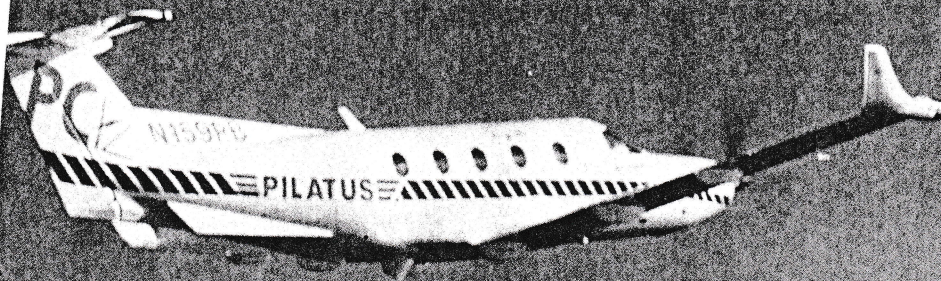
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