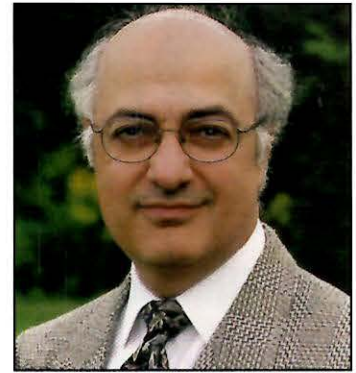


Rebuilding the Arrow?

by Palmiro Campagna, P.Eng



March 25th 2000 marked 42 years since the date of the first flight of the Avro Arrow. The debate on whether the decision to cancel the project was valid or not still rages. Lately though, in addition to the building of a static display for museum purposes, there has been a separate move afoot to rebuild and actually fly an Arrow replica. Funding for this venture is now being sought from "Arrowheads" or Arrow enthusiasts and support groups across Canada as noted in Canadian Newspapers.

Many will say that rebuilding the Arrow to fly should be possible, not realizing the technical complexities involved. The question is whether it is indeed feasible. From an emotional perspective, rebuilding a flying replica of Canada's pride of the aviation industry makes compelling news. Newspapers and magazines across the country have carried the story. Emotion aside though, issues must be addressed by anyone considering supporting such an endeavour.

Over the years, a number of components of the original Arrow prototypes have been unearthed. One plan was to use these to reconstruct the entire aircraft for flight. This idea was abandoned for good reason, mainly that not all the necessary parts are available. Additionally, refurbishing 41-year-old components, many of which were uniquely designed, would prove an impossible challenge without the necessary tools and dies, all of which were destroyed when the project was cancelled. Even if a warehouse full of brand new parts were to be discovered, each would need to be inspected to the original drawings and most would require testing to ensure integrity. Aircraft components have a definite shelf-life which cannot be altered.

The latest concept is to rebuild the Arrow using modern materials and the latest in computer design techniques. The contention is that a number of the original drawings exist. But it would not matter if all the blueprints existed as those drawings were devel-

oped based on engineering calculations and computations and thousands of hours of testing, for the characteristics of the existing materials of the day. Replacing those original materials with modern ones would obviate all those original drawings. Everything would have to be re-calculated and re-tested from scratch. Centres of gravity, weight, drag and thermal coefficients and load and stress factors would all change – to name just a few. It took over a thousand of the world's top engineers, technicians and technologists to design and prepare the original parts and drawings. If it were such a simple task using today's computing power, the major aircraft builders would not be spending hundreds of millions of dollars in aircraft development.

Engines represent the next dilemma. It has been suggested that modern engines would be used. One has only to recall the original Arrow to understand the cost and engineering impact on design with respect to altering the engine types from the originals. With different engines and new materials, the result could be made to look like an Arrow but it would not be an Arrow.

What would it cost to build a supersonic aircraft from scratch for a one-off prototype? The word "astronomical" springs to mind. According to audit records from 1959, the original research and development on just the airframe and engines was over \$200 million. One can only imagine what would be required today.

Assuming the money was available, who would redo the design and testing? Volunteers? How many specialists would it take? How many hours would be required? Who are the skilled artisans that would actually do the work of manufacture and assembly? There has been mention that engineering students would be allowed to donate their time and talent for the cause. Who would supervise them? What safety measures would have to be put into effect? If building a supersonic fighter was a simple task that one could complete with volunteer

assistance, why has Canada not begun rebuilding modern fighters for the world?

Rebuilding a flyable 77-foot-long supersonic aircraft requires a great deal of specialized tooling for final and sub-assembly, not to mention a great deal of floor space. Who would provide this workplace? The original Arrow required specialized wind tunnel testing. Where would this be done? What about the design, installation and testing of power, flight control, avionics and electro-hydraulic systems, to name just a few? Answers to these questions are crucial in seriously considering such a rebuild.

In such a scheme, funding is obviously an issue. There would no doubt come a time when the decision would need to be made to cut losses and not proceed. Has such a time been stipulated? What would happen to any accumulated funding to that point? Is there a back-up plan?

Finally, the aircraft would require flight certification. Proof would be needed that the aircraft was built to all pertinent Transport Canada requirements. Configuration control of the thousands of drawings needed to recreate the design would be required. In the end, the aircraft would not be the Arrow and what would be the consequence if it crashed on initial flight? Who would shoulder the responsibility?

Rebuilding a supersonic aircraft that looks like the Arrow is definitely possible, but anyone who might consider supporting such a venture should consider the points raised here as a minimum. And the doubts raised here should be resolved even before addressing the question of who would fly the aircraft. ☉

(Ed note: Palmiro Campagna of Ottawa is a federal civil servant and is the author of "Storms of Controversy: The Secret Avro Arrow Files Revealed.")