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Post-Arrow Brain Drain

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Avro's Arrow designers, from left to right: Robert Lindley, Chief designer, Jim Floyd, Vice President of Engineering, Guest Hake, Arrow Project Designer, and Jim Chamberlin, Chief Aerodynamist.

By the time Canada's advanced aviation dream aircraft, the Avro Arrow, was cancelled in 1959, Avro Canada had managed to put together a world-class team of engineers and designers. Many had come from Britain, where ailing post-war conditions sent many talented individuals looking for greener pastures. When the final curtain fell on the Arrow program, many bewildered ex-Avro employees were left with nothing to do but search for work. Work was to be found, but not always in Canada.

Efforts were made to keep the teams together in the event that work resumed at Avro. Jim Floyd, Avro's Vice President of Design, was one of the people trying to maintain some cohesion in the ranks of the now-aimless engineers. "After the cancellation, I first of all went out to the West Coast to try and find jobs for my people, because I had 150 very qualified engineers and I had 1,500 other draftsman and engineers in the design office," he remembers. "I went out ... and talked to a number of companies like Boeing and Lockheed so we could place teams of our people there, and get them back again when sense broke out and we got back into business at Avro, which of course we never did." In the end, Jim Floyd returned to his native Britain and helped develop supersonic transport with the Concorde, a fitting follow-up for a man who helped design the Avro Jetliner as well as the Arrow.

There had already been a long history of contact with NASA's predecessor, the National Advisory Committee for Aeronautics. This organization had been called on before to review the project, and

Avro had been testing Arrow models at their Wallops Island facility in Virginia. During the early days of the Mercury program, Bob Gilruth, then-head of the Space Task Group at the newly-formed NASA, had an urgent need for engineers. He entered into discussions with Jim Chamberlin, Avro's Chief of Design, and Robert Lindley, Chief Engineer. Again, the idea was to keep the Canadians together as a team, to be returned should the climate improve in Canada. That was not to be.

NASA moved fast. By early March, only weeks after cancellation, the Americans were conducting extensive interviews in Toronto. Some thirty-one designers and engineers were chosen, some from the upper echelons like Chamberlin, while others, such as computer experts or heat transfer specialists, for their specific skills. By late April they were working.

The Kamloops-born Chamberlin made an impressive mark on NASA's space program, receiving a NASA gold medal in recognition for his contributions. He became Gilruth's advisor and played a major role in the final design of the Mercury capsule that put John Glenn in orbit on the 3rd anniversary of Black Friday, February 20th, 1962.



Jim Chamberlin

"Chamberlin was basically the guy who designed the Gemini spacecraft," says author Christopher Gainor, who is working on an upcoming book about the contribution of the ex-Avro engineers to NASA. "He was the project manager at the start, but he kind of dreamed up the whole concept. The Mercury capsule was limited in what it could do. NASA started to talk about an improved and souped-up Mercury. Chamberlain went to work on this and he came up with a radically different spacecraft from Mercury."

Chamberlin started to work on the capsule in 1961, but by 1963, after most of the design work had been done, he was removed as manager and replaced by Chuck Matthews, who brought the program to fruition. His removal appears to have been initiated by a variety of problems. "I guess he wasn't the world's greatest communicator, that's the best way to put it," says Gainor. "There were some personality issues there. The budget was going haywire but a lot of it was not his fault. Sometimes when the coach is fired, it isn't really his fault. I think this was one of those cases."

Chamberlin also made a significant contribution to the Apollo program through his support for the ideas of John Houbolt, who

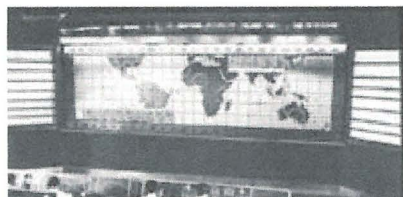
landing on and leaving the Moon. At the time of Kennedy's Moon challenge, the leading idea for the lunar landing was direct ascent, where a rocket would simply head for the Moon, turn around, land, and then take off again. This required an enormous amount of fuel. [A small but stubborn minority at NASA led by John Houbolt](#) held that LOR, where a mothership in lunar orbit would launch a small landing craft, was the only way to go.

"The first guy to listen to Houbolt was Jim Chamberlin," contends Gainor. "He drew up a plan to land a 'bug' on the Moon, to send one astronaut down to the Moon in something even smaller than the lunar module. In the context of what they were talking about, it looked kind of wacky, but it got people thinking about it. Chamberlin was a vital part of that whole decision." He died in 1981.

Chamberlin's original companion on the trip to see Gilruth, Avro chief of Engineering Bob Lindley, ended up at McDonnell Aviation in St. Louis where he worked as the production manager there for the Gemini spacecraft. Later, in 1970, he joined NASA as director of engineering and operations for manned space flight, and was heavily involved in the early days of the space shuttle, trying to sell the idea to Congress.

Owen Maynard was a middle-ranking engineer at Avro, and NASA put him directly into the then-nascent Apollo program. Maynard must have stood out. He soon became chief of the Systems Engineering Division. "He was one of the people at NASA who was really most responsible for the design of the lunar module," says Gainor. "Most of the credit rightly goes to Tom Kelly at Grumman aircraft, but Kelly says that the guy at NASA who he worked with the most at coming up with a design was Owen Maynard. The joke was that Maynard had a design in his desk drawer, and he just kept after Grumman until they agreed with his design."

Maynard's job was making sure that the entire system hung together. There were a lot of different components involved -- a lunar module in two parts, made by Grumman, a command and service module in another two parts made by another company, and many other ground-interface systems that were all made by a variety of subcontractors. Maynard also conceived the influential 'A to G sequence' of missions prior to landing in 1967. He left NASA after the first two lunar landings and worked at Raytheon on solar energy and satellites. He lives in Waterloo, Ontario, today.



A number of Canadians ended up working at Mission Control, the best known of which was John Hodge. Hodge served as a flight director through Mercury, Gemini and Apollo programs. He acted as flight director



John Hodges occupied the flight director's seat from Mercury, through Gemini, until Apollo.

during the first emergency in space, the Gemini 8, Neil Armstrong's first flight, which was the first docking of two spacecraft in space. One of the Gemini thrusters started spinning the spacecraft out of control, and it was Hodge who ordered the crew back early. He was also had the dubious privilege of sitting at the flight director's console when the Apollo launch pad fire took place which took astronauts Gus Grissom, Ed White and Roger Chaffee's lives in 1967, though since it took place during the countdown test, Hodge technically wasn't yet responsible for the flight. He subsequently left the flight director role, and went into planning.

Hodge and some of the other ex-Avro people brought their flight test experience to the mission control center, which upon their arrival was still very unformed. "When they were flying the Arrow," explains Gainor, "they decided that only one person should talk to the pilot, and that person should have experience as a pilot. At NASA, to this day, all the conversations with the crew are done through the capcom, which is always another astronaut."

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