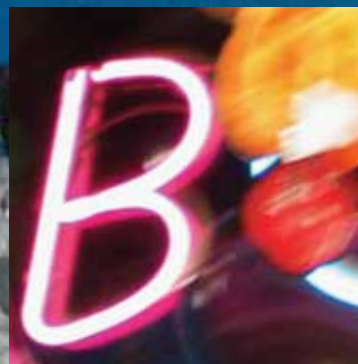


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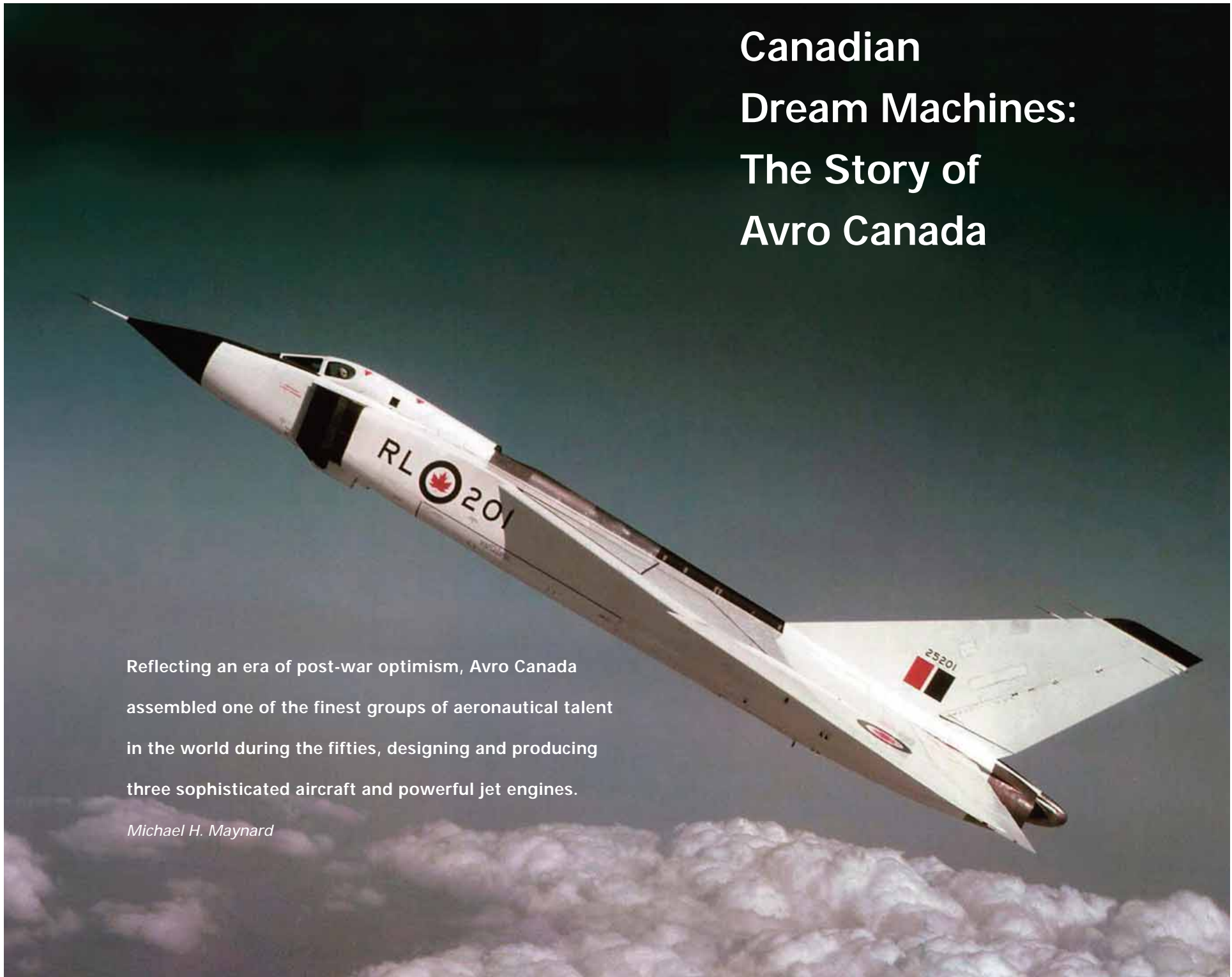


2012

Canadian Dream Machines: The Story of Avro Canada

Reflecting an era of post-war optimism, Avro Canada assembled one of the finest groups of aeronautical talent in the world during the fifties, designing and producing three sophisticated aircraft and powerful jet engines.

Michael H. Maynard



*The Arrow was designed by
Jim Floyd, Avro Canada's
Vice-President of Engineering,
with a Canadian design team
featuring aerodynamicist
Jim Chamberlin, project designer
Guest Hake and engineer
Bob Lindley.
(Preceding page)*

It's hard to imagine Toronto's Malton (Pearson) Airport fifty years ago. No towering passenger terminals, multi-lane access highways or high-speed monorails. Just a few low buildings, hangars, and three runways set in rolling farmland north of the city. But it was in this inauspicious setting on a bright spring morning in 1958 that Canadian aviation history was made. At the far end of Malton's longest runway a large white delta-winged aircraft stood out against the prevailing brown fields and bare trees waiting for take-off. With a thundering roar the plane began to move, quickly gathered speed and took off with half the runway to spare. The plane was the Avro 'Arrow', one of the most advanced aircraft in the world, and with this inaugural and successful flight on March 25, 1958, Canada led the world in aviation technology.

Yet within a year (February 20, 1959, a date remembered as 'Black Friday' by over 20,000 ex-Avro employees) the project was cancelled by Prime Minister John Diefenbaker and the Arrow was gone forever from Canadian skies. Citing the threat of Soviet espionage, the federal government ordered the destruction of all photos, drawings, models, production tooling and the aircraft themselves, including all five that had already flown. Today, Canada's premier contribution to aerospace history is represented by a remnant of nose cone, mounted ignominiously like some hunting trophy on the walls of the National Aviation Museum in Ottawa.

For years it was assumed that the Arrow had been scrapped – as government claimed – because of high costs and obsolete technology. But in the past few years renewed interest in the Avro legacy has led to books, articles, films, a stage play and even the construction of a full-scale replica, and the true story of the Arrow is emerging. Too late, Canadians are recognizing what a brilliant achievement it was, and in an era of branch plant closures, high unemployment and ballooning national deficit, questioning the wisdom of shutting down one of the country's largest employers and disbanding one of the world's most advanced aeronautical design teams.

The Arrow was the last of three aircraft designed and built at Malton. In fact, the story of Avro Canada is as much about dynamic and colourful personalities as about these three aircraft. It all began in 1943 when Roy Dobson, President of A.V. Roe, a British aircraft manufacturer, established a Canadian plant far removed from the threat of German bombing raids. Avro's founder, Alliott Verdon Roe (1877-1958) had been the first Englishman to construct and fly his own airplane, and he founded his company in 1911. During World War I over eight thousand Avro 504 biplanes had been built for the Royal Flying Corps, making it the most successful of any military aircraft of the war and paving the way for the growth of Britain's post-war aerospace industry, including A.V. Roe.

Dobson established his operation at the government-owned Victory aircraft plant, located adjacent to the runways of Toronto's Malton Airport. It was here that Canadian workers set new standards for craftsmanship and production schedules in the manufacture of the legendary Avro 'Lancaster' bomber.

With Germany's surrender in 1945, C.D. Howe, Canada's Minister of Reconstruction and Supply (but known as 'Minister of Everything'), faced the prospect of empty factories and thousands of unemployed, highly-skilled workers. He met with Dobson, who shared his faith in Canada's post-war potential. They shared a no-nonsense manner, decisive management style, and an appreciation of good cigars and fine brandy. Together they drafted plans for A.V. Roe to take ownership of the Victory factory at Malton. Generous government financing was arranged, and Avro Canada was in business.



The Avro Canada C-102 'Jetliner' was North America's first commercial jet airliner, designed by Jim Floyd to Trans-Canada Airlines (Air Canada) specifications for medium-range inter-city flights. Here the only prototype lands at Winnipeg's Stevenson Field in January 1951 with Don Rogers, Avro Canada's chief test pilot at the controls. The flight from Malton had taken two hours and forty minutes, a record at the time. The Jetliner was cut up for scrap in December 1956.

It was an exciting time to be working in the aviation industry and the new company had no difficulty in recruiting top design talent. Speed and altitude records were being rewritten with every new aircraft design. In Britain, Reginald Mitchell's classic Supermarine Spitfire had set new aerodynamic and performance standards. Frank Whittle's inventions, the turbo jet and afterburner, had been developed and proven in air combat during the war. Industrial nations on both sides of the Atlantic were competing to solve the riddle of the elusive 'sound barrier' and in 1947 U.S. test pilot 'Chuck' Yeager (b.1923) would be the first to fly faster than the speed of sound in a rocket-powered experimental aircraft.

In early 1946 Avro began negotiations with Trans-Canada Airlines (T.C.A.) – the government-owned national airline founded in 1936 by C.D. Howe – to produce a 30-seat medium-range jet transport. This was followed by a firm contract to produce an all-weather twin-engined jet fighter for the Royal Canadian Air Force (RCAF). With these two projects the government was acknowledging that Avro Canada had the potential to provide thousands of jobs, spin-off technologies and valuable export earnings.

One of the first designers to join Avro was Jim Floyd (b.1914), recruited from A.V. Roe in Britain. He came to Canada for the opportunity to fulfill a dream, sole responsibility for the design of a brand new aircraft. His creation was the Avro Jetliner, a pioneering passenger aircraft designed to T.C.A.. specifications. Floyd's design was conventional and construction was straightforward, but the plane was powered by new British Rolls-Royce jet engines enabling it to fly on intercity routes at speeds faster than almost anything in the air and far above the turbulence associated with contemporary flight paths. By contrast, T.C.A.'s primary intercity aircraft at the time was the aging Douglas DC-3, plunging 21 passengers through inclement weather at half the speed.

But as work progressed, T.C.A. (renamed Air Canada in 1965) changed their original requirements to include trans-continental capability, and they became increasingly nervous about being the first North American airline to operate jet aircraft. Expressing concerns about excessive fuel consumption and maintenance problems associated with such new technology (both proven to be groundless), they ultimately withdrew support for the project. Nonetheless, work on the Jetliner continued with hopes of selling the plane to airlines in the U.S. and Europe. It flew for the first time on August 10, 1949, just missing the honour of being the world's first commercial jet transport to fly – Britain's long-range de Havilland 'Comet' had earned that distinction only two weeks earlier. Compared to contemporary propeller-driven aircraft the Jetliner was fast, vibration-free, quiet and a pleasure to fly. The plane broke all previous records on promotional flights between Los Angeles and Chicago, New York and Tampa, Toronto and Winnipeg, and National Airlines, Trans World Airlines and the U.S. Air Force (U.S.A.F.) were prepared to place orders. But by 1950 war was erupting in Korea and Canada was a member of the U.N. Security Council, obligated to provide military assistance. C.D. Howe ordered Avro to abandon the Jetliner project altogether and concentrate instead on producing the new R.C.A.F. fighter, in quantity.

The Jetliner was ten years ahead of the competition and Canada was poised to become a world leader in civil aviation, but without government support Avro had no alternative but to turn its back on commercial ventures. North America's first and only operational jet transport was offered to Canadian and U.S. aviation museums, without success, and was sold for scrap in 1956 (the cockpit section survives at Ottawa's National Aviation Museum). Ironically, the R.C.A.F. subsequently chose the British deHavilland Comet for transport duty and T.C.A. introduced intercity jet service in 1966 with the Douglas DC-9, a U.S. aircraft with flight characteristics strikingly similar to those of Jim Floyd's 1949 Jetliner.

John Frost designed the Avro Canada CF-100 'Canuck' to Royal Canadian Air Force specifications as a front line all-weather jet interceptor. During the fifties almost seven hundred were built at the company's factory at Malton. Powered by Avro's Orenda jet engines, the CF-100 was the world's first straight-winged jet aircraft to break the sound barrier, with test pilot Jan Zurkowski at the controls (December 1952). It served in Canada and Europe from 1953 until its retirement in 1981. (Following page)



During World War II completion of Canadian-built aircraft (including the Lancaster) had often been delayed because of sporadic engine delivery from British and U.S. suppliers. To resolve the problem National Research Council fact finding teams had been sent to England to report on the work of Frank Whittle, and by the end of the war a Canadian jet engine, based on a Whittle design, had been built in Winnipeg. Work was underway on an improved design at Turbo Research in Toronto, but by 1946 and the end of hostilities the government wanted out of the jet engine business. Sir Roy Dobson (he'd been knighted for his successful Lancaster design) bought the firm and hired its design team. One of the more enthusiastic team members was Winnet Boyd (b.1916), a brilliant young Canadian-born design engineer, and he was given responsibility for designing a jet engine. The result of the team's efforts was the 'Chinook', even more advanced than contemporary engines produced by established aircraft companies such as Rolls-Royce and General Electric. Further development resulted in the 'Orenda', an Iroquois word chosen by Boyd to celebrate its Canadian design and development. It had its first test run on February 10, 1949, starting up dramatically on a test bed to an audience including the engineering team and high-ranking RCAF officials. A solid yellow flame leapt out of the tailpipe (measured at 650 Celsius) with a deafening roar as the engine accelerated to operating speed. The Orenda was the world's most powerful turbojet and would be used as the primary powerplant for almost two thousand Canadian-built fighter aircraft throughout the fifties. Tragically, the pressure of creating such revolutionary engines took its toll and Winn Boyd suffered a nervous breakdown later that year, but once recovered he moved from aerospace into the world of nuclear fission, and his design of the National Research Universal nuclear plant at Chalk River, Ontario is still considered one of the world's finest research reactors.

The Orenda had been produced to power the Avro CF-100, the first jet fighter to be designed and built in Canada. Edgar Atkin, a quiet mathematician from A.V. Roe in England, had conceived the original design, but it was the team of John Frost, a cultured Briton, and Jim Chamberlin, a brash young Canadian design engineer, who delivered the final drawings. The CF-100 flew for the first time on January 19, 1950. Belying its traditional appearance and straight wings, with Floyd's powerful engine it was capable of intercepting the fastest Soviet jet bomber, day or night, in any weather conditions. In spite of early setbacks due to structural failures (attributed to miscalculations and feuding between designers Frost and Chamberlin) the CF-100 would come to be regarded as one of the best jet fighters of the decade, with a production run of nearly seven hundred. In 1954, with Avro test pilot Janusz Zurkowski at the controls, a CF-100, powered by Orenda engines, became the first straight-winged plane in the world to break the sound barrier (1,240 km/h). Rugged and versatile, it was sold to the Belgian Air Force as their front line fighter (beating aggressive bids from U.S. and European manufacturers) and served the R.C.A.F. in various roles for twenty-five years.

Zurkowski (1914-2004) had seen action as a pilot with the Polish Air Force when Germany invaded in 1939, and as a Royal Air Force Squadron Leader he flew Spitfires in combat throughout the war. In 1945 he became a test pilot and established a reputation as one of Britain's finest aerobatic pilots. 'Zura' moved to Canada in 1952 with his family to become Chief Development Pilot for Avro Canada.

Mixed Emotions

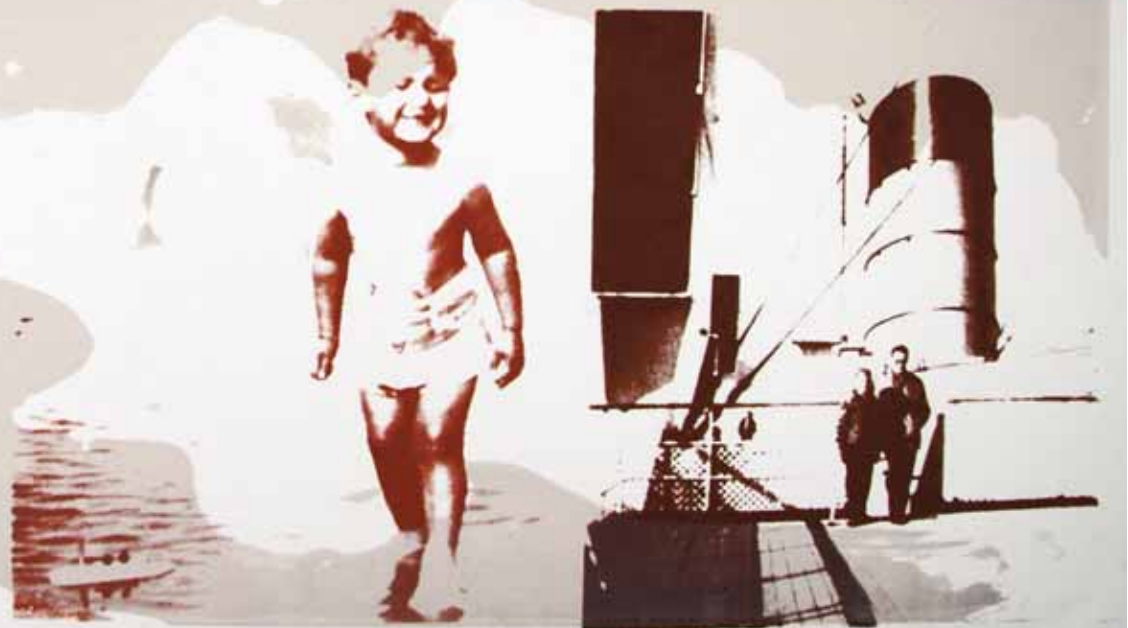
*Photo-silkscreen, 21 x 29 inches,
Michael Maynard, 1978.*

*Stanley Maynard immigrated
to Canada with his family in
1956, leaving their home near
Southampton, England to
travel on the transatlantic liner
RMS "Queen Mary" to North
America and a new career with
Avro Canada.*

(Following page)



MALTON • CANADA



With a ceasefire in Korea the renewed threat of war with the Soviet Union preoccupied military planners. Simple but effective Soviet jet fighters would soon be flying at supersonic speeds, intercontinental missiles were being tested and long-range Soviet jet bombers such as the Tupolev 'Badger' were capable of carrying nuclear weapons to North America by flying over the North Pole. Responding to the Soviet threat, the U.S. and Canada formed the North American Aerospace Defense Command (N.O.R.A.D.). Canada was already a signatory to the North Atlantic Treaty Organization (N.A.T.O.), so in addition to the defence of North Atlantic shipping lanes and continental Europe, its air force would now be expected to share responsibility for the defence of North American airspace. Seeing a growth market for new aircraft, Avro assembled a design team to find a replacement for the CF-100.

Designers John Frost and Jim Chamberlin had been taken off the CF-100 project because of their failure to solve its early structural problems (finally resolved by Polish-born Avro engineer Wacław Czerwinski). Frost had been relegated to a vertical take-off 'flying saucer' project funded by the U.S.A.F., and Chamberlin had been retained as an internal project consultant. Jim Floyd, now Avro's chief designer, led the new team of Chamberlin, Bob Lindley (another ex-A.V. Roe engineer) and production manager Guest Hake.

Under Crawford Gordon Jr., appointed President of Avro Canada in 1951 by C.D. Howe, the company improved its production capabilities and entered a phase of rapid expansion. Gordon (1914-1967) had worked for Howe as leader of wartime production and had a similar knack for cutting through red tape and getting things done. Moving beyond the Jetliner setback and early problems with the CF-100, nearly 20,000 people were now employed by Avro Canada and an additional 30,000 were working for sub-contractors across the country. The Avro plant at Malton was turning out one CF-100 a day, while at Orenda, supplying engines to Avro as well as several U.S. aircraft companies, production was at capacity. Gordon further diversified

the company, acquiring several Canadian corporations outside the sphere of aeronautics. To promote the company's range of products and services, Avro Canada was one of the first North American aircraft manufacturers to establish an in-house public relations department. Joe Morley and his team of sales representatives were backed up by professional photographers, copywriters, illustrators and layout artists. As a result, Toronto newspapers featured regular and glowing reports on the company.

Thousands of designers and draughtsmen were recruited from aircraft companies in Europe. Frustrated with post-war job opportunities and anxious to build a brighter future in the New World, they found a special atmosphere among Avro's management and staff, almost a sense of family. Whether or not they were born in Canada, they shared confidence in the country's future, a common enthusiasm for aircraft and recognition that Avro's projects were cutting edge. Responding with a willingness to work long and hard, most ex-Avro employees look back on those years as the high point of their careers.

As expected, in April 1953 the R.C.A.F. issued specification requirements for a new jet interceptor. The requirements called for a supersonic twin-engined all-weather aircraft with short takeoff and landing capability, able to execute tight maneuvers at 15,000 m. (50,000 ft.) and a weapons bay larger than a contemporary B-29 bomber. This was beyond the realm of anyone's thinking at the time. Existing aircraft flew at supersonic speeds only at peak performance parameters for short periods of time. At 15,000 m. the air is so thin that even maintaining control is difficult, let alone turning quickly in combat situations. Not surprisingly, the R.C.A.F. had been unable to find an aircraft to meet their requirements anywhere in the Western world. They are hard to find even today. The 'Arrow' would meet or exceed them all.

Jan (Zura) Zurakowski was a brilliant Polish pilot who flew Spitfires with the Royal Air Force during World War II. Avro Canada's chief experimental test pilot after the war, here Zura climbs into the cockpit in early 1958 to take the Mark 1 Arrow out onto the Malton runway for the first time under its own power, for low speed taxi trials.



Aeronautical engineers of the fifties faced unique challenges in the design of interceptors such as the Arrow. These aircraft were designed for a singular mission: to fly as quickly as possible to engage and destroy a hostile intruder and then return safely to base, to fly again. Designers achieved fast speeds by combining light airframes with powerful engines; a quick return to action was facilitated through ease of maintenance and servicing. Canadian operations added other design hurdles because of our vast, uninhabited northern landscape and harsh four-season climate. The final challenge was to meet all these performance criteria with an aesthetically pleasing shape that was easy to fly. Working overtime, Floyd and his team presented several finished designs and by July 1953 the R.C.A.F. had approved their most ambitious concept, a large twin-engined delta-winged design, designated CF-105, the 'Arrow'. The aircraft's size would allow it to carry extensive and varied internal weapons systems; two engines would ensure a margin of safety over Canada's expansive northern wilderness; delta (triangular) wings had proven successful in contemporary supersonic aircraft designed in England, Sweden, the U.S. and France. Avro proposed using two new jet engines of its own design in the Arrow, but to meet R.C.A.F. deadlines the first few aircraft would be powered by U.S. turbojets already in production.

Avro decided to dispense with building prototypes to cut development costs and drastically shorten the time between concept and delivery. This unusual step, never attempted before with such a complex aircraft, meant that Floyd and his team had little margin for error. Tooling changes deemed necessary during production would be prohibitively expensive. It also meant that all costs would be borne by the first few aircraft, although once a production line was up and running those costs would drop proportionally. Eventually five hundred engineers, technicians and draftsmen were producing thousands of technical drawings required for production. As a testament to the designers' expertise, the first completed Arrow weighed in at 22 tonnes (49,040 lbs.), an error of only 28 kg. (62 lbs.) compared to original estimates.

Avro's Jetliner and CF-100 had used new technologies and increasingly sophisticated production methods, but with an aircraft capable of sustained supersonic flight the Arrow designers were moving into uncharted territory. Wind tunnel tests of wooden mockups, flight simulators and huge IBM 704 computers (Canada's largest at the time) helped determine optimal performance characteristics. A 'fly-by-wire' flight control system was developed, the first time this technology had been used in a production aircraft. Responding electronically to the pilot's commands, it enabled the Arrow to be flown automatically and it would be twenty years before another production aircraft (the Panavia 'Tornado') would use such a system. An innovative weapons pack was designed so that air-to-air missiles could be carried within the aircraft, resulting in cleaner aerodynamic lines than most jet fighters with their armament slung below wings or fuselage. Although a Canadian-designed air-to-air guided missile had been built by Canadair in Montréal and tested successfully, that project was cancelled in favour of a complex U.S. missile system recommended by the R.C.A.F. (over Avro's objections). The Hughes control system was still at the conceptual stage, and as development dragged on and costs soared this directive would haunt Avro.

At Orenda the Canadian design team was having more success, creating a powerful engine that was being developed to take the Arrow into new realms of supersonic performance. Charles Grinyer, Harry Keast, Dr. Muraszew and Burt Avery incorporated many firsts into their 'Iroquois' engine, including the use of titanium, a new metal proving to be stronger and lighter than steel. The engine was fired up on December 15, 1954 and extensive tests over the next three years confirmed that Avro had made a quantum leap from the pioneering technology of Winn Boyd's Orenda. Rated at an incredible 25,600 ft. lbs. of thrust (with afterburners), the Iroquois could accelerate from idle to full power in less than three seconds, guaranteed to give pilots the ride of their life.

If Only

Photo-silkscreen, 28 x 20 inches.

Michael Maynard, 1978.

Stanley Maynard with fellow Avro Canada workers, all immigrants like himself from Hampshire, England, together with a class photograph from J M Denyes Public School in Milton, Ontario, including his son Michael.

(Following page)



IF ONLY WE ALL COULD FLY



A/p



Maynard '78

The first Arrow was completed in just twenty-eight months from release of final drawings. Fitted with American Pratt & Whitney J75 engines (producing only half the Iroquois' power), Jan Zurakowski flew the Arrow for the first time that spring morning in 1958. He flew conservatively, accompanied by CF-100 chase planes in the event something should go wrong. But the flight was an unqualified success. In spite of flying with interim engines Zura reported the Arrow was easier to handle than other delta-winged fighters he'd flown such as Britain's Gloster 'Javelin' and the Convair F-102 'Delta Dagger' from the U.S. Upon landing he taxied back to the Avro hangars where he was hoisted on the shoulders of ecstatic colleagues as thousands of cheering employees waved from the rooftop and crowded around the aircraft. Roy Dobson's faith in Canadian aviation prowess was confirmed.

Unfortunately, that day was the high point of the Arrow saga because already there were dark clouds on the horizon. Fatefully, on the day of the Arrow's official rollout on October 4, 1957, the U.S.S.R. had launched their 'Sputnik' rocket, beginning a critical debate in the West over the future of defence systems reliant upon manned aircraft (felt to be ineffectual against incoming Soviet missile forces). Later that year the British government ominously curtailed work on all new military aircraft, believing that missiles had made the role of traditional interceptors obsolete. In the U.S., eager to bolster a slack aerospace industry and alarmed that a Canadian jet fighter was more advanced than anything in their arsenal, military planners proposed a continental air defence system using U.S.-built nuclear surface-to-air missiles. Radar stations strung across the Arctic would warn N.O.R.A.D. of incoming Soviet bombers or missiles, and U.S. nuclear missiles would be launched from sites in Canada. This Distant Early Warning (D.E.W) Line meant the battle for North America would be fought over Canadian soil. Canada's senior military advisors knew that if they didn't agree with this proposal the U.S. could locate missile bases just south of the Great Lakes, resulting in interceptions in the skies over densely populated southern Ontario.

Concerned that future Arrow research and development costs would mean reduced army and navy budgets, they accepted the logic of this cost-effective but frightening scenario. Abandoning their own plans featuring long-range manned interceptors designed and built in Canada, they moved towards a continental defence strategy driven by U.S. interests.

Avro was also losing critical support in Ottawa, where John Diefenbaker and the Conservatives had been elected in 1958 with the largest majority in Canadian parliamentary history. C.D. Howe, first elected to parliament in 1935 and arguably the most powerful man in the country for over twenty years, had been swept from office along with the Liberal party. Diefenbaker was a small-town lawyer from northern Saskatchewan, looking for any reason to cancel the Arrow which he saw as C.D. Howe's personal project benefitting central Canada. His cabinet accepted the British prognosis that manned interceptors were obsolete, and agreed with the advice of senior military officials who recommended the purchase of unproven U.S. military hardware as part of the proposed continental defence strategy. Compounding concerns over the Arrow's future were development problems with the U.S. missile system. Hughes was having difficulty meeting R.C.A.F. specifications and there were more delays and budget overruns.

Diefenbaker had all the justification he needed. In late 1958 the government approved U.S. construction of D.E.W. Line radar sites across northern Canada and the installation of short-range missile bases near North Bay and Ottawa. Although the Arrow's fate was effectively sealed, Diefenbaker postponed making a final decision on the future of the project, fearing the impact of more than 20,000 layoffs in the fragile Canadian economy.

*The first 'Arrow' was officially rolled out on October 4, 1957. Dignitaries among the 13,000 invited guests included Avro Canada President Crawford Gordon and Executive Vice-President Fred Smye, and Minister of National Defence Major-General George Pearkes. Fatefully, the same day the Soviet Union launched 'Sputnik', the world's first satellite.
(Following page)*



Meanwhile, the strain of creating one of the largest industrial empires in Canadian history was wreaking havoc with Crawford Gordon's personal life. His total commitment to Avro and his frustration with Ottawa's lack of confidence and support, combined with too many extra-marital affairs and heavy drinking, had led to the breakup of his family. Recognizing that Avro's future was on the line, he travelled to Ottawa in September 1958 to meet with the Prime Minister. Close friends had advised Gordon to fly, but he took the lengthy train journey and by the time he arrived on Parliament Hill he'd been drinking steadily for hours. The corporate executive, used to power and privilege, faced a stubborn and determined political leader (and a purported teetotaler) who sat behind his desk secure in the knowledge that eighteen million voters approved of his policies. Gordon demanded that the Arrow project continue. Diefenbaker held his ground and finally threatened to have Gordon forcibly removed from his office, a very different reception to those Gordon had come to expect from previous meetings with his mentor C.D. Howe.

He returned to Malton desperate to get more Arrows into the air to prove the aircraft's cost-effectiveness, exceptional performance and reliability. Another four were completed and test flown, and at the time of cancellation another twenty-nine were nearing final assembly. The first Arrow broke the sound barrier on its third test flight (while climbing and still accelerating) and in subsequent tests Zura reached speeds approaching twice the speed of sound. Realizing at last that developing a new airframe, engine and weapons system – simultaneously – was overly ambitious, the R.C.A.F. allowed the problematic Hughes weapons control system to be replaced with a proven, more economical U.S. system. Flight and engine testing proceeded on schedule and although there were fears the project might be reduced in scale, no-one at Avro was expecting total cancellation of such a promising aircraft. Fourteen Iroquois engines had been built and the first was being installed in the next Arrow to fly, but before the awesome potential of engine and aircraft could be demonstrated, Diefenbaker pulled the plug. He announced the termination of Avro Arrow and Orenda Iroquois projects in the House of Commons the

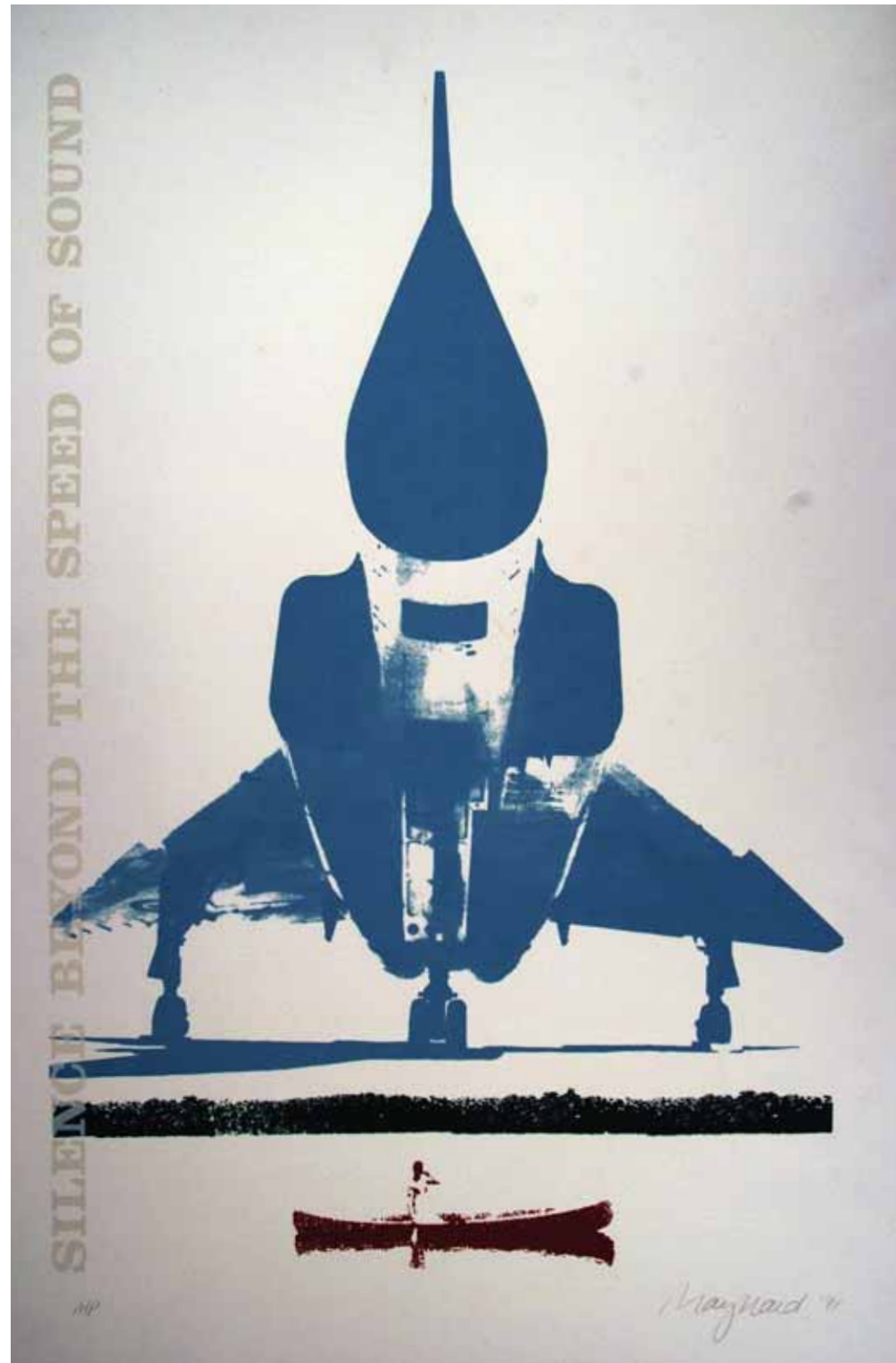
morning of Friday, February 20, 1959. Gordon was in no mood for conciliation, and in a last attempt at frightening the government, authorized the immediate layoff of all design and production staff, announced over the Avro intercom later that afternoon. Stunned Avro and Orenda employees gathered their personal belongings in silence and cleaned out desks and toolboxes. It was over.

The impact of closing down Canada's third largest corporation was devastating. Over the weekend literally thousands of homes went on the market, triggering a Toronto area real estate slump that would last for years. The U.S. and Great Britain, having watched an upstart Canadian company outperform them at every turn, reaped the benefits of cancellation as the Avro multi-national design team left Canada for senior positions within their own aerospace industries. Jim Floyd returned to England's Hawker-Siddeley Aviation where he conducted studies into supersonic commercial aircraft, leading to a position as senior consultant during the eight-year development of the Concorde supersonic airliner. Jim Chamberlin and several senior designers went to the National Aeronautics and Space Administration (N.A.S.A.) where he helped design astronaut John Glenn's space capsule, and then as Director of the Gemini and Apollo space programs he helped put Americans on the moon. Bob Lindley also ended up with N.A.S.A. as Director of Engineering on the space shuttle. John Frost accepted a senior position with Air New Zealand. Jan Zurkowski, the unassuming Polish immigrant who was regarded as one of the finest pilots of the jet age, retired to operate a tourist camp in the forests north of Ottawa. Crawford Gordon was less fortunate. Diefenbaker wasn't the only one who'd been appalled by his self-destructive and aggressive behavior. Within weeks Roy Dobson had personally negotiated his departure from Avro. Gordon died in 1967, a broken man at the age of forty-two. Avro Canada struggled on as a company for several years following the Arrow cancellation until its official demise in 1962.

Silence

*Photo-silkscreen, 18 x 25 inches,
Michael Maynard, 1991.*

*The supersonic Avro Arrow looms
over an image of Maynard taken
on a family camping trip in northern
Ontario. Cancellation of the Arrow
project impacted thousands of
talented immigrants and their families.
All had been attracted to Canada
by the opportunities associated with
such an amazing project.*



Adding insult to injury, the Boeing 'Bomarc' missile system purchased to replace the Arrow suffered a series of unsuccessful test launches in the U.S. and was rejected by the U.S.A.F. prior to Canadian delivery. With a range less than the Arrow, its trajectory was dependent upon an electronic guidance system which was susceptible to jamming, and of course when the missile was fired it could not return to base to fly again. What potential it did have could only be realized when fitted with nuclear warheads, an initiative expressly forbidden by the Diefenbaker government. In short, the \$520-million Bomarc missile system was a disaster, completely and utterly useless. Then, only two years after cancelling the Arrow on the grounds that manned interceptors were obsolete, the government reversed its official policy and ordered yet another mediocre product from the U.S. aviation industry, the McDonnell F-101 'Voodoo'. This was an outdated supersonic manned interceptor with performance characteristics inferior to the Arrow's, plagued throughout its service life by a faulty weapons system.

There have been many theories as to why the Canadian government abandoned the Arrow, putting Avro Canada out of business and thwarting any opportunity to capitalize on the design and engineering talent that had been attracted to work on three aircraft and as many engines. Was the Arrow really an expensive, obsolete aircraft as Diefenbaker and his ministers claimed? Developed from conceptual drawings to supersonic aircraft in only four years, each Arrow was to be delivered to the R.C.A.F. for about \$4-million (\$30-million in 2012 dollars), but this figure would have dropped with an extended production run and/or export sales. The Iroquois engine, one of the world's most advanced and most powerful, had been developed for a third of the cost of America's Pratt & Whitney J75. If cost were truly a factor, how does one explain Sweden, a country with a population of only 8.5-million, where Saab has been building advanced jet fighters since the 1940s? With respect to performance, flight logs and elec-

tronic data that survived the government's destruction orders prove the Arrow was as good or better than anything flying at the time, or for years afterwards. As for the theory that manned interceptors would become obsolete, they're now accepted as a critical factor in any air defence strategy (including Britain's) because unlike missiles their crews are able to discern friend or foe, fly beyond the limitations of an electronic guidance system, evade electronic countermeasures and fly multiple missions. From Vietnam to Bosnia to Afghanistan, manned jet fighters have figured prominently in every regional conflict over the past half century.

The truth is that Canada couldn't afford a domestic aviation industry once the decision had been made to adopt a defence policy made in America. This decision was compounded by military advisors and senior government officials who lacked confidence in Canada's design and manufacturing capacity. They didn't believe this country could produce anything equal to that of the American military/industrial complex. The acceptance of a U.S. continental defence strategy, and the accompanying purchase of U.S. military equipment, rendered Avro's unique design and production capabilities redundant. Not surprisingly, today Canada is known less for original product design and more for its expertise in the manufacture and assembly of U.S.-designed products, a legacy of the Arrow's cancellation that most Canadians readily accept. In 1984 the electorate gave Brian Mulroney, a Diefenbaker protégé and advocate of even closer Canadian/U.S. relations, a larger political majority than Diefenbaker's own 1958 landslide. And Prime Minister Harper and his Conservative majority government are currently considering the purchase of U.S. designed and built F-35 fighter aircraft, each plane projected to cost \$279-million over its operational lifespan.

With the CF-105 'Arrow', Jim Floyd and his Avro Canada design team created one of the world's most advanced jet fighters. Five prototypes were built at Malton and flown by Polish-born test pilots Zurkowski and Wladyslaw 'Spud' Potocki, Briton Peter Cope and Canadian Flight Lieutenant Jack Woodman before government cancellation of the project on February 20, 1959.



Today, bearing Air Canada's visual identity designed by FutureBrand (a global design firm with its only North American office in New York City), American Boeing and European Airbus commercial aircraft dominate the tarmac at Malton's Pearson International Airport. Overhead, white contrails betray the presence of \$30-million McDonnell Douglas CF-18 'Hornet' jet fighters (designed in the U.S. as a carrier-based naval aircraft and built in Missouri), proudly defending Canadian airspace with performance capabilities only slightly more advanced than those of the Avro Arrow.

My father, Stanley H. Maynard (b.1918), served six years in the Royal Electrical and Mechanical Engineers during the war, and emigrated with the family from England in 1956 to work as a senior draughtsman on the Arrow. At the time of cancellation he was supervising twenty-five draughtsmen in a re-design of the Arrow's weapons bay, desperately trying to save the project by reconfiguring the interceptor as a high speed bomber. After government cancellation he reluctantly left Canada for work in the British and American aerospace industries, ending his career with General Electric as Quality Control Manager for their rapid transit trains servicing the New York City/Philadelphia corridor.

Retired and living in Colorado, he remembers the Arrow, and Canada, with a mixture of pride and profound disappointment. Like thousands of others, he saw Black Friday as not only the end of an advanced airframe, an incredible engine, a superb design team and visionary company, but the end of a dream.

	Avro Canada	MacDonnell Douglas
	CF-105 'Arrow'	F-35 'Lightning II'
Contract awarded	December, 1953	October, 2001
First flight	March, 1958	December, 2006
Crew	Two	One
Wingspan	50 ft.	51.4 ft.
Height	21.3 ft.	14.2 ft.
Empty weight	43,960 lbs.	29,300 lbs.
Loaded weight	68,847 lbs.	49,540 lb.
Dry thrust	38,500 lb.	28,000 lb.
With afterburner	52,000 lb.	43,000 lb.
Maximum speed	1,325 m.p.h.	1,200 m.p.h.
Range	1,300 mi.	1,200 mi.
Service ceiling	58,600 ft.	60,000 ft.
Armanent	Air-to-air missiles	Cannon and missiles
Unit cost	\$4-million <i>(\$30-million in 2012 dollars)</i>	\$133-million
Country of design and manufacture	Canada	U.S.A.

Auction Sale

of Modern Furniture, Etc.



The undersigned have received instructions from
MR. AND MRS.

STANLEY H. MAYNARD

to sell by public auction at their home, 247 Elmwood Crescent, Milton (Fallingbrooke Survey), on

WED. EVEG. JULY 29

AT 7 O'CLOCK THE FOLLOWING:

Admiral 21" Television, new last Christmas
3 large upholstered occasional chairs
Combination room divider and secretary
2 end table lights Floor Lights Studio Couch
Combination telephone stand and magazine rack
with large light W. A. Victor Mantel Radio
Chrome extension breakfast table with 4 chairs
Electric Refrigerator with large freezing compartment
Hoover electric vacuum sweeper
Electric Range, 21" Kitchen Linoleum, 9 x 8
Electric Washer with water pump and time clock
Electric Kettle Electric Iron Bookcase
G.E. Food Mixer Sink Drain Board and Pan
Bedroom Suite consisting of full size bed with
springs, spring mattress, dresser with 3 drawers
and full size square mirror and 2 chests of
drawers, all in sea mist finish Odd Pillows

Dresser and chest of drawers in light English Oak
Single metal bed in walnut finish with springs and
mattress Bedside Tables Bathroom Stool
Continental bed with spring and spring mattress
Folding Ironing Board, metal construction
Step-on Refuse Can Hand Sleigh Toboggan
Quantity of children's winter clothing Doll Crib
Camp Stool Doll Carriage Garden Tools
Swimming Pool 2 Tricycles Toys
3 Child's Study Desks Lawn Chairs and Table
Hand Lawn Mower Some odd dishes, knick
knacks and other small household effects
NOTE: This is a very clean and well kept offering
all new inside the past three years.

Terms: Cash Settlement with Clerk Evening of Sale
No reserve as the proprietors are leaving immediately after sale for U.S.A.

GEO. CURRIE, Clerk

Hindley & Elliott, Auctioneers

Maynard '78.

Auction Sale

Photo-silkscreen, 16 x 20 inches,
Michael Maynard, 1978.

Following cancellation of the Arrow
in 1959 and the layoff of 20,000 Avro
Canada employees, Stanley Maynard
sold vacuum cleaners door-to-door
until offered a contract position with
Lockheed Aircraft in Los Angeles,
working on their F-104 'Starfighter'.
The family home in Milton was
sold at a loss and all household
goods were sold at public auction
in their backyard.