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**The Walkway
of Time:
Highlights in the
History of
Canadian Aviation**



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National Aviation
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Introduction

As visitors enter the National Aviation Museum, they are greeted by an extraordinary, near life-size, bronze sculpture. With the body of a man and two pairs of bird's wings, the creature is stretching its wings into the wind, poised for takeoff. *The Falcon* was created in 1932 in the classical style of the Renaissance as a tribute to modern aviation by renowned Canadian sculptor, surgeon, and physical educator, Robert Tait McKenzie. It is a powerful depiction of humanity's age-old yearning to fly. While *The Falcon* stands in the foyer, representing humanity's longing to escape the bounds of earth, the aeronautical collection inside the Museum proper tells the other side of the story – the final realization of the dream of flight in the twentieth century's development of powered, heavier-than-air flying machines. The aircraft and exhibits in the National Aviation Museum are arranged chronologically to guide a visitor along a "Walkway of Time" that traces the history of aviation and highlights Canada's pioneering contributions. The visual effect of the exhibits is quite spectacular, with the original and often bright markings of the aircraft standing out against the stark white and gray background of the Museum interior, as they would on a snowy northern airfield or frozen lake. The aircraft are clustered in pools or islands of time, with each island representing a key period in aviation history. Visitors can view the entire collection from the second floor mezzanine. On the main level they can follow aviation history step-by-step from its beginnings to the present day. The journey back in time begins with the pioneer period.

Early Flying Machines

The first aircraft visitors encounter is the *Silver Dart*, Canada's first successful heavier-than-air flying machine.



A.E.A. Silver Dart

The story of the *Silver Dart* began in 1907, when the world-famous inventor of the telephone, Dr Alexander Graham Bell, and four promising young men interested in aviation formed the Aerial Experiment Association (A.E.A.). Bell had previously performed aerodynamic experiments with kites, but he was already in his sixtieth year, past the age for experimenting aboard untested and frail flying machines. The younger members of the A.E.A. included Glenn Curtiss, an American designer of internal combustion engines; Lieutenant Thomas Selfridge of the U.S. Army; and two Canadians, John A. D. McCurdy and Frederick W. "Casey" Baldwin, both recent engineering graduates from the University of Toronto.

The A.E.A.'s purpose was an ambitious one – no less than the construction of a "practical aerodrome or flying machine driven through the air by its own power and carrying a man." The Association operated alternately out of Hammondsport, New York, where Curtiss had a machine shop, and Bell's estate at Baddeck, a tiny Maritime village on Cape Breton Island, Nova Scotia. The A.E.A. was extremely successful, building and flying four airplanes in rapid succession. The last of these was the *Silver Dart*, designed by John McCurdy and considered one of the more advanced airplanes of its day.

On 23 February 1909, McCurdy made the first airplane flight in Canada in the *Silver Dart*, taking off from the ice of Baddeck Bay and flying for about 800 metres. Mabel Bell shared with us her account of this historic achievement: "Everybody came. School was let out and the children brought their skates. When the *Silver Dart* lifted off the ice they cheered and tossed hats and mittens into the air. After John landed we invited everybody in for sandwiches, tea and coffee, and Alex's favourite drink, raspberry vinegar." After forty-six successful flights in the *Silver Dart*, some covering distances as great as 32 kilometres, McCurdy and Baldwin attempted to raise funds for further experiments by demonstrating the airplane before military authorities at Camp Petawawa, Ontario, on 2 August 1909. Unfortunately, on the landing of the fourth flight of the day, the *Silver Dart* flipped over and was smashed beyond repair. That same year Louis Blériot made the first airplane flight across the English Channel and, in France, the first international aviation meet took place.



Maurice Farman S.11 "Shorthorn"

The French flyer who set the distance record at that first meet was Maurice Farman, the designer of the "Shorthorn." Many Canadians learned to fly in "Shorthorns," the basic trainers of their day. The name came from the wooden skids that stuck out in front of the wheels. They stopped the aircraft from nosing over on landing – there were no brakes in those days.

The network of control and bracing wires gave the aircraft the nickname "cage à poules" or "chicken coop." They said that to check the rigging you put a sparrow between the wings – if it flew out, a wire was missing. With their controls exposed to natural hazards and later enemy weapons, these aircraft were very vulnerable. Many other Canadians tried their hand at building and flying airplanes before the First World War. But the Museum's only original airplane from Canadian aviation's pioneer period – in fact, the only surviving Canadian aircraft from this period anywhere – is the McDowall Monoplane. Built by Robert McDowall, a municipal engineer from Owen Sound in Ontario, it completed a few "hops," but never flew successfully. Nevertheless, it remains a fascinating example of the efforts of early aviation enthusiasts.



McDowall Monoplane

Looking at these early birds made of wood, wire and cloth – even the propellers are wood – it's hard to believe that less than sixty years later a man would land on the moon. After the crash at Petawawa, McCurdy, Baldwin, and even Bell himself made repeated appeals to the government in Ottawa for financial support for aviation. But to no avail. Canada went into the First World War without an air service, and our main contributions were the provision of men and the manufacture of training aircraft.

Flying for the Allies in the First World War

On 4 August 1914 Britain declared war on Germany. Canada, as part of the great British Empire, was at war, a war in which the airplane changed forever the way nations do battle. The war brought new words to the aviation dictionary, among them: "dogfight," "ace," "bomber," "air raid." At first the airmen's main job was reconnaissance. They brought back "bird's-eye views" of the enemy and later photographs. The pilots didn't want enclosed cockpits. They would have ruined the view and hampered the use of their first weapons – hand-held rifles, pistols, bricks and even grappling hooks! These were soon replaced by mounted machine guns. The French Spad VII is one of the classic single-seat fighters – the wire, wood and fabric "Top Gun" of its time. Rugged and solid with good performance it was flown by the French, British, American, Belgian, Italian and Russian air forces.



Spad VII



Sopwith Triplane



Sopwith 7F.1 Snipe

The French called pilots of great skill and daring "aces." During the War, "ace" gained its present meaning: a pilot who has downed five or more enemy aircraft in combat. Pilots like Bishop, Ball, Guynemer, Rickenbaker, Baracca and the famous Red Baron, von Richthofen. The Sopwith Triplane, a three-wing fighter, is another classic example of fighter airplanes of that period. This aircraft so impressed the Germans that they developed their own triplanes. The Fokker Dr.I was made famous by von Richthofen and his "Flying Circus" fighter wing. It was the aircraft in which he died, shot down by Canadian A. Roy Brown.

Although there were some flops, well-designed triplanes were manoeuvrable, climbed "like homesick angels" and had good visibility for the pilot. The Museum's example, the *Black Maria*, is a reproduction of that flown by Raymond Collishaw, leader of the all-Canadian *Black Flight* of No.10 (Naval) Squadron. Between May and July of 1917 the Black Flight shot down eighty-seven enemy aircraft. As one historian put it, "The sight of a Sopwith Triplane formation often induced the enemy to dive out of range." It was in another Sopwith fighter, the Snipe, that Canadian ace William Barker engaged in one of the most amazing single-handed air battles of the war in October 1918.

Canada entered the war with a handful of airmen. By 1918 there were 22 000. A third of the pilots in the British air services who downed thirty or more enemy aircraft were Canadians. Our image of First World War aviators is one of flamboyant gallantry, but the truth is that hundreds of young men died horrible deaths in their flying machines. Some 1563 gave their lives, and well over half that number were decorated, three with the Victoria Cross – W. A. “Billy” Bishop, A. A. McLeod, and W. G. Barker. Of seven British pilots credited with fifty or more victories, four were Canadians, including the Empire’s two leading surviving aces – Bishop with seventy-two victories, and Raymond Collishaw with sixty. But the war did breed a generation of skilled airmen and aircraft that flew faster and higher with heavier loads. War, hot or cold, is a great developer of technology. The Museum’s Curtiss JN-4 (Can.) “Canuck” is one of 1288 machines produced by Canadian Aeroplanes Ltd of Toronto, a company established by the Imperial Munitions Board to meet the RFC (Canada), later renamed the RAF (Canada), and later the U.S. Air Service’s requirement for training aircraft.



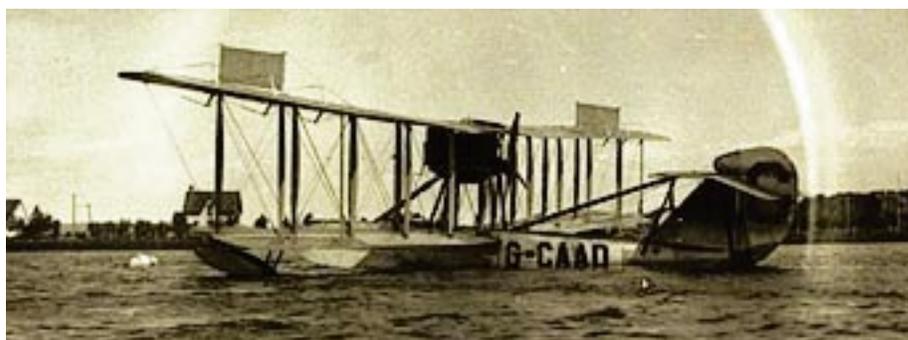
Curtiss JN-4 (Can.) “Canuck”

The “Canuck,” a modified American Curtiss JN-3, holds more “firsts” than any other Canadian aircraft. It was the first aircraft to be mass produced in Canada and first to be exported in large quantities. It flew the first Canadian air mail in June 1918 between Montreal and Toronto, and made the first aerial survey, in Labrador, in the summer of 1919. After the war, it entered into widespread civil use, where it became the preferred airplane of barnstormers, giving many Canadians their first sight of an aircraft and their first chance to fly.

Bush Flying in the 1920s and 1930s

During the First World War, Canadians acquired skills as aircraft mechanics, designers, builders, and pilots. Over 2000 returnees were trained combat pilots. The desire of some of these people to carry on in aviation provided a springboard for the development first of bush flying and later of Canadian commercial airline services in the years between the wars. In 1919 most of Canada's north was unexplored country. Flyers in aircraft like the ones on this island put the wilderness on the map. They were essential to the discovery and development of our natural resources. They made this country into a vast community linked by highways in the sky. The hair-raising experiences of Canada's bush flyers in some of the most inhospitable wilderness territory on earth have become legendary.

These were years of record-breaking flights – Alcock and Brown flew non-stop across the Atlantic and Lindbergh made his famous solo crossing aboard the *Spirit of Saint Louis*. In Canada we met the challenge of distance inside our borders. Flying boats like the HS-2L gave us access to thousands of ready-made airports – our lakes and rivers. One of the Museum's proudest acquisitions is *La Vigilance*, a Curtiss HS-2L flying boat. HS-2Ls flew coastal patrols from France, the United States, and Canada during the First World War. After the war, the Canadian forest industry began to consider the uses of aircraft in forestry patrol work. *La Vigilance* was one of two surplus HS-2Ls acquired by the St Maurice Forest Protective Association for spotting bush fires, mapping, and transporting firefighters and their equipment. In 1919, *La Vigilance* performed the world's first commercial bush flight in the St Maurice Valley north of Trois-Rivières, Quebec.



Curtiss HS-2L

In 1969, the Museum managed to salvage *La Vigilance* from the bottom of an unnamed lake near Kapuskasing, Ontario, where it had crashed on takeoff in 1922. Painstakingly restored using parts from two other HS-2Ls in addition to those from *La Vigilance*, it is on display in the Museum – the only surviving HS-2L in the world. During the 1920s and 1930s, many small bush flying companies operated right across the country. They carried people, equipment and supplies primarily for the natural resources industries, delivered the mail and performed aerial surveying and mapping. In 1934 Canada set the world record for freight carried – mail and machines, eggs and dynamite, cows and canoes, medicine and furniture. You name it, they flew it.

Other aerial workhorses were the Canadian Noorduyn Norseman, considered the finest bush airplane of its time, and the Fairchild FC-2W-2. Their enclosed cockpits made winter flying a lot more comfortable – no more hands frozen to the stick!



Noorduyn Norseman



Fairchild FC-2W-2



Boeing 247D

Growth of the Airlines

As the small bush companies grew, they became the precursors of Canada's modern airlines. Western Canada Airways, formed by Winnipeg businessman James A. Richardson in 1926, eventually became Canadian Pacific Airlines and more recently Canadian Airlines International. In 1937, the Canadian government established Trans-Canada Air Lines (TCA), now known as Air Canada, to provide transcontinental air transport service in this country. The Museum's collection includes a Boeing 247D. This aircraft was the world's first modern airliner. All the most up-to-date developments of the day were put into this machine. The prototype flew in 1933. It combined greater comfort and safety with much improved cruising range and speed. Advertised as the Club Car of the air it provided the comfort of sound-proofing, air-conditioning, reading lamps and, with a flight attendant for ten passengers, all the care and attention you could want.

It had an automatic pilot, could fly safely on one engine and had retractable landing gear. The 247 made all other airliners obsolete. It even flew faster than the military aircraft of its time. The Lockheed 10A Electra was Trans-Canada Air Lines' first new airplane delivered in 1937. TCA started up with two second-hand Electras and a Stearman Model 4 mailplane.



Lockheed L-10A Electra



Stearman 4EM Junior Speedmail

One of the Electras was used for pilot training. Many would-be airline pilots had flown only by day, by sight and by the seat of their pants. In cloud or fog they gauged the angle of the aircraft by the pressure of the seat against their bodies. Without visual reference points a pilot may feel the aircraft is straight and level when really it's going into a turn or even a dive.

Imagine yourself in the two-seater cockpit, your windows covered with a canvas hood. Curtains around you block any view. You're taking off blind when suddenly one of the engines cuts out. It was in the Electra that many of TCA's first pilots learned instrument flying, night flying and radio-navigation. And, for emergency training, the instructors did turn off one of the engines, often during takeoff. When regular TCA passenger service began in 1939, the travellers welcomed by the stewardess at the bottom of the ramp were in expert hands. That year 1000 young women applied for twelve flight attendant positions. Pat Eccleston was one of TCA's first attendants: "To be a stewardess in those days you had to be a registered nurse. Many passengers were nervous about flying and the company needed people who were already trained to talk to strangers and make them feel at ease. You had to be aged 21 to 25, female and single. The minute you got married you lost your job. Because the cabins were so small you couldn't be over 5 foot 5 inches [1.65 metres]."

The luxury, performance, and safety improvements, plus a bigger passenger cabin, were incorporated into the Douglas DC transport, culminating in 1936 with the appearance of the Douglas DC-3, one of aviation's all-time greats.



Douglas DC-3

The first transport that could operate at a profit without subsidies, the remarkable DC-3 became the backbone of commercial airliners around the world. The aircraft on display is, appropriately, TCA's first DC-3. Acquired by the airline in 1945, it flew for thirty-eight years before Goodyear Canada donated it to the Museum.

Canada in the Second World War: "Aerodrome of Democracy"

One cluster of airplanes stands out boldly from all the others in the Museum collection. Their bright yellow colour identifies these machines as training aircraft used in the British Commonwealth Air Training Plan (BCATP). The plan produced airfields all across Canada and helped create a modern, mass-production aircraft industry in this country. All BCATP trainers in the Museum – the Harvard, the Anson, the Tiger Moth, and the Finch – were built in Canada.



North American Harvard 4 (2532)



Avro Anson V



Avro Lancaster X

As in the First World War, however, Canada entered the Second World War ill-prepared to fight an air war. The RCAF had only 270 aircraft on hand, almost all of them outdated. But Canadians responded to the challenge with overwhelming generosity. By the end of the war, Canada had produced over 16 000 operational and training aircraft. The huge Avro Lancaster bomber is particularly significant to Canadians. It was the most successful heavy night bomber of the Second World War. The "Lanc" X is one of about 450 built in Canada and ferried to the Royal Air Force's Bomber Command in Britain. After checking out an early Canadian built Mk.X, one British inspector told his staff to look it over if they wanted to see how an aircraft should be built.



Hawker Hurricane XII



Supermarine Spitfire IIB

Lancs carried the heaviest bomb loads of the war including the Grand Slam, also known as Ten-Ton Tessie. Lancasters were flown by the dam-busters, of the RAF's 617 Squadron, in their famous 1943 raid on the Ruhr Valley. Of the 133 dam-busters, 29 were Canadian. Their story is told in a British movie of the same name. But night fighters and anti-aircraft fire took a deadly toll especially when bombers flew their own route to target before the development of bomber streams, when up to 1000 aircraft flew in organized formations. However, Lancs could take incredible punishment. Many made it back to base riddled with bullets, with gaping holes in their sides and even parts of their wing and tail sections missing. The Hawker Hurricane was without a doubt the most important aircraft in the Battle of Britain of 1940. Since the war the Spitfire's glory has overshadowed the vital role of the Hurricane in this great strategic air battle, even though most of the victories were accredited to the Hurricane.

There were far more Hurricanes than Spitfires. Both powered by Merlin engines, the Hurricane was simpler to build, could take more punishment and be repaired more quickly – of vital importance in the three-and-a-half month battle when the Royal Air Force would lose 915 aircraft. Day and night the Luftwaffe attacked following Hitler's instructions to "with all the means in their power and as quickly as possible destroy the English air force." The life expectancy of a British fighter pilot during the battle in terms of flying time was eighty-seven hours. Exhausted men flew sortie after sortie. Squadron Leader J. R. A. Peel tells us the story: "Looking down, we saw a large formation of Junker 87s approaching with Messerschmitt 109s stepped up behind. We approached unseen out of the sun and attacked the Junkers before the enemy fighters could interfere. I gave a five-second burst to one bomber and broke off to engage two 109s. There was a dogfight. The enemy fighters half rolled, dove and zoomed in diving turns. I fired two bursts at one and saw it fall into the sea. Then I followed another up in a zoom and got him as he stalled." In Sir Winston Churchill's words, the pilots were "one of the few to whom so much was owed by so many." During the war, 1400 Hurricanes were built in Canada under the direction of Canadian Car and Foundry's chief engineer Elsie MacGill. Seven RCAF squadrons flew Hurricanes beginning in that crucial July of 1940.

Canadian Aviation in the Jet Age

Immediately after the war, commercial aviation mushroomed. From nine million passengers worldwide in 1945, the number climbed to twenty-four million in 1948. The widespread introduction of jet transport beginning in the late 1950s created a revolution in speed, comfort, and efficiency similar to that of the first modern airliners in the 1930s.



Avro Canada CF-105 Arrow



Avro Canada C-102 Jetliner

Most Canadians are aware that, for a brief period before the program's cancellation in 1959, the supersonic Avro Canada CF-105 Arrow interceptor made this country a world leader in jet fighter aircraft. Few Canadians know, however, that Canada had established similar leadership in jet airliners, with the Avro Canada C-102 Jetliner.

When it took off for the first time on 10 August 1949, the Jetliner was the first jet transport to fly in North America; it was only two weeks behind the first in the world, the British de Havilland Comet. Within a few flights, the Jetliner exceeded 800 km/h whereas the most advanced transports of the day achieved about 450 km/h.

With the advent of the Korean War, the Canadian government ordered Avro Canada to concentrate on production of the CF-100 interceptor. The prototype Jetliner made its last flight in November 1956, after which it was cut up and sold for scrap.

The Museum tells the bittersweet story of postwar jet design and manufacture in Canada with an exhibit that includes the only remaining major parts of the Arrow and the Jetliner – nose sections from each.



Avro Canada CF-100 Mk.5 (100757)

The CF-100, first flown in January 1950, met a happier fate. The only one of Avro Canada's jets to reach production, it was considered the best all-weather fighter of its day and was used by the RCAF and the Canadian Armed Forces until the last one was retired in 1981.

The Korean War was the first time jet fighters met in combat. In the air, it was essentially a duel between the American F-86 Sabre and the Soviet MiG-15. They both have the swept-wing design developed from German research during the Second World War.

Although the MiG-15 was in some ways superior, the final score in Korea was 800 MiG-15s lost, 78 Sabres lost. Pilot training and experience made the difference. Unlike the North Koreans, many of the allied pilots were Second World War veterans.

Canadair acquired the licence to build the F-86. Later it developed the Sabre 6 powered by the more-powerful Canadian designed Orenda engine, which gave it even better performance.



Canadair Sabre 6

The RCAF flew them from the early 1950s to 1962. It was their golden age. Sabre 6 pilots walked tall knowing they flew one of the best fighter aircraft in the world. For three years running they won the NATO air-to-air gunnery prize defeating crack teams from five countries, including Britain, Germany and the United States.

In 1953, flying a Canadair Sabre, Jacqueline Cochran proved she had the "right stuff" by setting a new women's speed record and becoming the first woman pilot to break the sound barrier. Her wing man on that occasion was Chuck Yeager, the first pilot to fly faster than Mach one, the speed of sound. In a tribute to the Sabre the Chief of Canada's Air Command had only good things to say: "Only the fighter pilot can know the fighter aircraft for what it is... A graceful living thing, instantly responsive to the slightest touch, yet an instrument of shattering power... Its full measure is known only to those who fly alone."



Lockheed F-104A Starfighter

The RCAF eventually replaced the Sabre with the Lockheed F-104, also known as the Starfighter. It could fly at twice the speed of sound. Called the "missile-with-a-man-in-it," the Wingless Wonder and Silver Sliver, it set many world records for speed, altitude and climbing time.

It was flown by RCAF and Canadian Armed Forces squadrons in Europe with NATO. At home, the one you're looking at set the Canadian altitude record in our centennial year, 1967.

In interceptors like the CF-104, pilots no longer had to get on the tail of the enemy. They didn't even need to see an enemy aircraft except on radar. Missiles did the rest.

The outstanding success of the Canadian aviation industry in the postwar period is the Beaver, first flown in 1947. The Beaver is also the precursor of de Havilland Canada's advanced short takeoff and landing (STOL) aircraft such as the Dash 7.



De Havilland DHC-7 Dash 7

Many innovations found in the Beaver were based on the answers to a questionnaire de Havilland Canada sent to bush operators across the country. The result? The best small utility aircraft in the world! Its all-metal structure was a first for Canadian-designed bush aircraft. Its effective wing and flap design gave it excellent STOL performance. The floor hatch and wide doors handled rolled-in fuel drums and bulky cargo, saving time and money.



De Havilland DHC-2 Beaver

In 1950 and 1951 the U.S. Air Force and Army held competitions for aircraft of this type. The Beaver won over more than thirteen American entries. It was the first time a foreign-built aircraft had been purchased in peacetime for the U.S. military. The U.S. forces ordered more than nine hundred. Operators in sixty-two countries bought the Beaver.

They operated in the Middle East, high in the Andes and in the polar regions. A lake, an island and a glacier in Antarctica are named Beaver after this rugged little flyer.

They served in Korea and Vietnam, dropping supplies and evacuating casualties. In Korea they were the favourite "taxis" of the top brass and were known as the "general's jeep." Not widely publicized is the fact that in Korea they also made excellent ice-cream machines! They churned the ingredients by flying tight circles in the winter sky with a cargo of cream.

Eventually, the Beaver became the most numerous of all Canadian-designed aircraft with 1691 manufactured. Hundreds of Beavers are still flying more than fifty years after the first one took off. The Museum's specimen is, appropriately, the prototype Beaver, acquired in 1980 after almost thirty-three years of rugged flying.

Conclusion

The National Aviation Museum is of special significance to this country and its people. Aviation has profoundly influenced the lives of Canadians and holds a special place in their hearts. Since Canadians began the world's first commercial bush flying operations shortly after the First World War, aircraft have played a critical role in opening up this vast, rugged, and sparsely populated land. Perhaps no other nation on earth has relied as heavily as Canada on aviation. Moreover, our pilots, mechanics, designers, and aircraft industry have made pioneering contributions to the development of world aviation that are out of all proportion to this country's population. The aircraft, artifacts, and exhibits in the National Aviation Museum attest to this fact.

But the juxtaposition of the aircraft from the *Silver Dart* to modern jets also tells a more fundamental and universal story. The astonishing successes and noble failures of aviation have been achieved by individuals responding to the powerful allure of flight. Because of their insatiable desire to participate in this great adventure, they have propelled aviation from the halting experiments of the pioneers to the sophistication of the jet age.

If you had been nine years old in 1909 and lived at Baddeck you might have seen the first flight of the *Silver Dart* in Canada. At age thirty-nine you could have been a passenger on Trans-Canada Air Lines' first commercial service. At age sixty you could have flown to Europe in six hours. And if you lived to be seventy-seven, you could have taken the Concorde from Washington to London in just over three hours, where you could have turned on the television to watch the first Space Shuttle launch. All in the span of a lifetime.

Recognizing and celebrating this proud history is the National Aviation Museum's mission. Ultimately, this Museum is a legacy for future generations. We want to ignite the imaginations of young people with the knowledge they live in a country with an aviation tradition of excellence and extraordinary achievement.