Journal of Aircraft and Spacecraft Technology

Review

# History of Aviation-A Short Review

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*Article history*
Received: 14-04-2017
Revised: 09-05-2017
Accepted: 22-05-2017

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**Abstract:** The man has always wanted to be able to fly. The dream or although it has achieved, has not been reached yet fully. The fuse of the flight today is much higher than in the past, but is not yet complete. Although they have carried out the steps in the increase of the safety of a ship in flight, there are still many steps to do. For our passengers, but also for our pilots, these brave people and beautiful, it's time to do something in addition, something more. All those who are to get into a ship must be confident that they will fly absolutely without any problems, regardless of the weather, time, climate, brightness, weather conditions, temperature, altitude... In order to achieve a flight higher quality, it is first necessary to know the history of the flight of the man from its inception up today. The present paper wants to present history human flight, as she was in a vision as realistic as possible. The paper is addressed to in the first place to all those who contributed or still contribute to the achievement of this beautiful dream of the man, the flight. According to Aulus Gellius, Archytas philosopher of the old Greek, a mathematician, astronomers, law and political strategist, was considered that has designed and built around 400 B.C., first artificial device of the flight is self-propelled, a model in the form of bird propelled by an steam boost (an engine with the steamer) used as the reactor with steam, about whom they say he flew effectively to about 200 m altitude. This machine, named by its inventor "The Dove", could be suspended on a wire to fly securely on a path of feed. The inventor of the berbers from the ninth century, Abbas Ibn Firnas, is considered by John Harding to be the first attempt of the flight heavier than air in the history of aviation. In 1010 AD, a British (English) monk, Eilmer of Malmesbury, assumed the piloting of a primitive sliding boat from the Malmesbury Abbey tower. It is said that Eilmer flew over 200 m (180 m) before landing and breaking his legs. He later remarked that the only reason he did not fly further was that he forgot to design his flight instrument and a queue, for which he redesigned his aircraft more technically, but his ancestor took Forbidden any other experiments on the grounds that they are bad (Satanic inspiration) and lead to serious accidents.

**Keywords:** Aviation History, The Flight, History Human Flight, Fuse of the Flight, Spacecraft Propulsion, Chemical Rockets, Jet Engines, Satellites, Electric Propulsion

## Introduction

According to Aulus Gellius, Archytas philosopher of the old Greek, a mathematician, astronomers, law and political strategist, was considered that has designed and built around 400 B.C., first artificial device of the flight is self-propelled, a model in the form of bird propelled by an steam boost (an engine with the steamer) used as the reactor with steam, about whom they say he flew effectively to about 200 m altitude. This machine, named by its inventor “The Dove”, could be suspended on a wire to fly securely on a path of feed.

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Bartholomew of Gusmão, Brazilian and Portuguese, was an experienced model aircraft engineer. In 1709 he demonstrated an aircraft model in front of the Portuguese court, but never managed to build a large-scale model.

The pilgrims of Rozier, Paris, France, made the first voyage of a man in a free balloon (Montgolfière), built by Joseph-Michel and Jacques-Étienne Montgolfier, covering a 9 km flight in only 25 min October 15, 1783.

On December 1, 1783 at Charlieère, the pilots of Jacques Charles and Nicolas-Louis Robert made the first flight conducted with the help of a hydrogen balloon.

On September 19, 1784, at Caroline, an elongated boat (specially arranged after Jean Baptiste Meusnier's proposals in the form of a dirigible balloon), he completed the first flight of more than 100 km, from Paris to Beuvry.

The history of aviation can be divided into six periods.

The epoch of the precursors: Until the beginning of the seventeenth century men imagined-more or less realistically-what a flying machine could be. Then from the end of the eighteenth century, this period saw the beginning of the conquest of the air with the development of aerostation and numerous attempts of gliding.

The pioneers of the heaviest air: It is the period of the first flights of motor vehicles capable of taking off on their own. Almost every flight is a first or record attempt: A little faster, a little farther, a little higher. Aviators are most often designers or adventurers.

The First World War: Only a few years after the first flight, this period saw the emergence of a new weapon on the battlefield. There is an abrupt shift to mass production, with some aircraft models even being built to more than a thousand; the pilots become "professionals", even if the perfume of adventure has not completely disappeared.

The end of the First World War put on the market a surplus of pilots and aircraft which enabled the launch of commercial air transport and, in the first place, that of mail. Aviation develops and there is the creation of an air force in many countries. Military aviation drives builders to break new records. Advances in civil aviation are a spin-off from military studies (Petrescu and Petrescu, 2011; 2012; 2013a; 2013b; 2013c; Aversa *et al*., 2016a; 2016b; 2016c; 2016d; 2016e; 2016f).

The Second World War: Aviation is widely used on the battlefield. This period can be considered the climax of planes using a piston engine and a propeller as a propulsion means. The end of the war saw the birth of the jet engine and the radar.

The second half of the twentieth century: Once again, the end of the war put on the market a surplus of aircraft and pilots. This is the beginning of the regular commercial air transport "all-weather" able to free itself from weather conditions and to practice the flight without visibility. Military aeronautics drives the development of the reactor, this is called the era of the jet and then sets out to conquer the supersonic flight. Civilian spin-offs allow the development of the first four-jet airliners and air transport is open to all, at least in developed countries (Crickmore, 1997; Donald, 2003; Goodall, 2003; Graham, 2002; Jenkins, 2001; Landis and Jenkins, 2005).

The Wright Flyer (1903) is widely regarded as the first aircraft capable of performing a controlled and controlled flight (Fig. 1). The Wright Flyer (often retrospectively referred to as Flyer I or 1903 Flyer) was the first successful heavier-than-air powered aircraft. It was designed and built by the Wright brothers. They flew it four times on December 17, 1903, near Kill Devil Hills, about four miles south of Kitty Hawk, North Carolina, US. Today, the airplane is exhibited in the National Air and Space Museum in Washington D.C. (Wright Flyer, From Wikipedia).

The Flyer was based on the Wrights' experience testing gliders at Kitty Hawk between 1900 and 1902. Their last glider, the 1902 Glider, led directly to the design of the Flyer.

The Wrights built the aircraft in 1903 using giant spruce wood as their construction material. Wings were designed with a 1-in-20 camber. Since they could not find a suitable automobile engine for the task, they commissioned their employee Charlie Taylor to build a new design from scratch, effectively a crude gasoline engine SNASM (1899). A sprocket chain drive, borrowing from bicycle technology, powered the twin propellers, which were also made by hand.

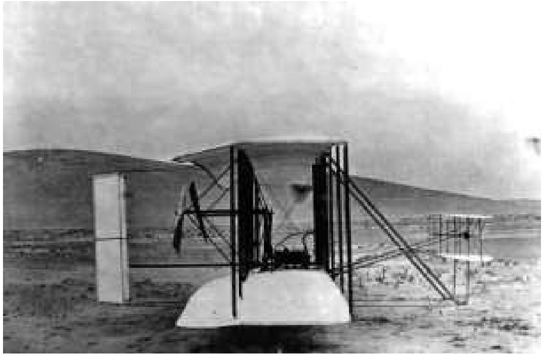


Fig. 1. The Wright Flyer (1903) Source: https://en.wikipedia.org/wiki/Wright_Flyer#/media/File:First_flight2.jpg

The Flyer was a canard biplane configuration. As with the gliders, the pilot flew lying on his stomach on the lower wing with his head toward the front of the craft in an effort to reduce drag. He steered by moving a cradle attached to his hips. The cradle pulled wires which warped the wings and turned the rudder simultaneously.

The Flyer's "runway" was a track of 2x4s stood on their narrow edge, which the brothers nicknamed the "Junction Railroad".

The engine Wright was a little gross, even after the standards of the day. It had four cylinders in horizontal line. Bore of 4 inches, travel of 4 inches, cast iron cylinders match in a cylinder of die-cast aluminum which extends toward the outside to form a mantle of water around the receptables the cylinder (Fig. 2), (SNASM, 1899).

The engine was cooled by water from a narrow vertical water reservoir mounted on a forward strut.

The system was not a radiator in the typical sense, for the water did not circulate. The reservoir simply replenished the water jacket as the water evaporated from it. The Wright engine, with its aluminum crankcase, marked the first time this breakthrough material was used in aircraft construction. Lightweight aluminum became essential in aircraft design development and remains a primary construction material for all types of aircraft.

The engine had no fuel pump, carburetor, or spark plugs. Nor did it have a throttle. Yet the simple motor produced 12 horsepower, an acceptable margin above the Wrights' minimum requirement of 8 horsepower. Gasoline was gravity fed from a small quart-and-ahalf tank mounted on a strut below the upper wing. The gasoline entered a shallow chamber next to the cylinders and mixed with the incoming air. Heat from the crankcase vaporized the fuel-air mixture, causing it to pass through the intake manifold into the cylinders (Petrescu and Petrescu, 2011; 2012; 2013a; 2013b; 2013c).

Fig. 2. The engine Wright Source: https://airandspace.si.edu/exhibitions/wrightbrothers/online/fly/1903/engine.cfm

Ignition was produced by opening and closing two contact breaker points in the combustion chamber of each cylinder via a camshaft. The initial spark for starting the engine was generated with a coil and four dry-cell batteries, not carried on the airplane. A low tension magneto driven by a 20-pound flywheel supplied electric current while the engine was running.

## Materials and Methods; the Preecursors

The man probably dreamed of imitating the flight of the birds and the legend, such as that of Icarus, or many apocryphal tales claiming attempts of flight by men harnessed with wings and rushing from a man, a tower.

Whatever their identity, they tried to imitate a mechanism, that of the bird's wing, whose complexity they did not imagine. The Egyptians already make toys or models of balsa wood with the ability to climb and hover in the air.

Archytas of Taranto is credited with inventing a wooden dove capable of flying. Around 1500, Leonardo da Vinci drew and proposed several ideas of "flying machines", but they were based, for the most part, on the concept of swinging wings (Fig. 3), (LDVFM, 2008).

In 1655, Robert Hooke, an English mathematician, physicist and inventor, concluded that human flight was impossible without the assistance of an "artificial" engine (Robert Hooke, From Wikipedia).

In 1783, the Montgolfier brothers thanks to the hot air balloon and Jacques Charles thanks to the gas balloon allow the man to rise in the atmosphere but without control of the trajectory. The solution will come from the study of a toy, the kite, known in the East since antiquity but which will not be introduced in Europe until the thirteenth century (Montgolfier Brothers, From Wikipedia).

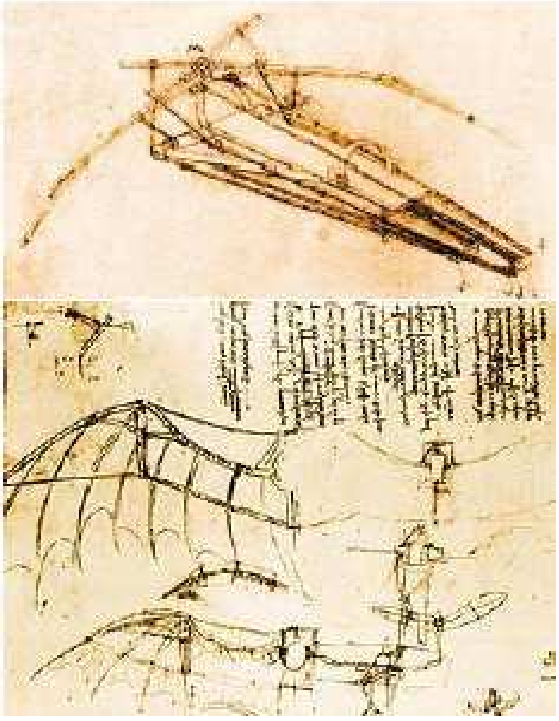
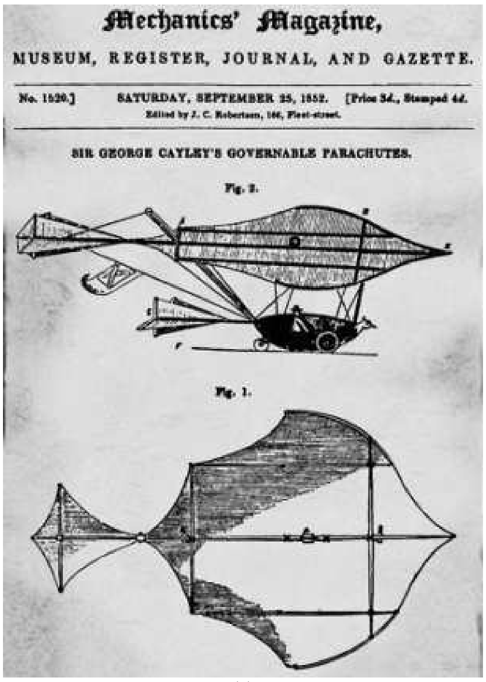


Fig. 3. Study of a flying machine by Leonardo da Vinci Source: http://www.flyingmachines.org/davi.html

The British George Cayley (1773-1857), is the true precursor of the aviation. He discovers the basic principles of aerodynamics and understands that weight and drag are the two forces that must be overcome (Cayley George, From Wikipedia). He also understands that it is useless to reproduce the beaten flight of birds and that the wings must be fixed. It provides for the need for a stabilizer to stabilize the flight. He thus establishes the basic shape of the aircraft. Inspired by the work of the French Launoy, he built a helicopter in 1796, then in 1808 an "ornithopter" on a human scale and in 1809 a glider that will fly without a passenger.

Sir George Cayley, 6th Baronet (27 December 1773-15 December 1857) was a prolific English engineer and is one of the most important people in the history of aeronautics. Many consider him to be the first true scientific aerial investigator and the first person to understand the underlying principles and forces of flight.

In 1799 he set forth the concept of the modern aeroplane as a fixed-wing flying machine with separate systems for lift, propulsion and control (Fig. 4). He was a pioneer of aeronautical engineering and is sometimes referred to as "the father of aviation." He discovered and identified the four forces which act on a heavier-than-air flying vehicle: Weight, lift, drag and thrust.



Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1520.] SATURDAY, SEPTEMBER 25, 1852. [Price 3d., Stamped 4d.

Edited by J. C. Robertson, 166, Fleet-street.

SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

Fig. 2.

Fig. 1.

(a)

(b)

Fig. 4. Cayley's glider (a) Cayley's glider in Mechanics Magazine, 1852 (b) Replica of Cayley's glider at the Yorkshire Air Museum Source: https://en.wikipedia.org/wiki/George_Cayley

Modern aeroplane design is based on those discoveries and on the importance of cambered wings, also identified by Cayley. He constructed the first flying model aeroplane and also diagrammed the elements of vertical flight. He designed the first glider reliably reported to carry a human aloft. He correctly predicted that sustained flight would not occur until a lightweight engine was developed to provide adequate thrust and lift. The Wright brothers acknowledged his importance to the development of aviation.

William Samuel Henson and John String fellow, taking over Cayley's work, have a model of a steam airplane flying. Nevertheless, powerful engines for real-size aircraft are far too heavy to allow them to take off.

Progress will therefore first go through gliders and the study of aerodynamics.

Between 1857 and 1868, the Frenchman Jean-Marie Le Bris successively tries two gliders of his invention (Fig. 5), first from the hills of the bay of Douarnenez (Finistère), then on the height of the Polygon of the Navy, near Brest (Finistère), thus resuming in France the work of the British pioneers of the previous decade (Le Bris Jean-Marie, From Wikipedia).

In 1863, the term "aviation" was invented by Gabriel de La Landelle.

Britain's Francis Herbert Wenham, in 1871, built what is probably the first wind tunnel, which will allow experimenting models (Wenham Francis Herbert, From Wikipedia).

Francis Herbert Wenham (1824, Kensington-1908) was a British marine engineer who studied the problem of manned flight and wrote a perceptive and influential academic paper which he presented to the first meeting of the Royal Aeronautical Society in London in 1866.

Wenham's report, "Aerial Locomotion," was published in the Society's journal and reprinted in widely distributed aeronautical publications in the 1890s, including Octave Chanute's "Progress in Flying Machines". The paper introduced the idea of superposed wings in a flying machine, a concept Wenham tested in 1858 with a multi wing glider, although it did not actually fly. In 1866 he patented the design, which became the basis for biplanes, triplanes and multi planes that took to the air as gliders in the 1890 s and as airplanes in the early decades of the 20th century. Superposed wings increased the lifting area and avoided the structural problems of excessive wing length.

The French Louis Mouillard is inspired by the wing of a bird to design gliders whose sails are curved. It proposes the warping of the wings.

Between 1857 and 1877, the French Félix and Louis du Temple tried out models with spring-loaded engines, helping them with an inclined plane and then perhaps a machine, equipped with a steam engine, mounted by a sailor.

The first airplane capable of standing on its own, was made by brother Victor Tatin in 1874. The plane was an unmanned airplane powered by a compressed air engine. For that time, the machine was a real aviation jewel (Fig. 8).

The first man who flew while controlling the trajectory of his machine was Otto Lilienthal (Fig. 6), who carried out between 1891 and 1896 two thousand flights hovering from an artificial hill near Berlin (Otto Lilienthal, From Wikipedia).

The first flights on a rudder-controlled machine acting on all three axes (pitch, roll, yaw) were made by the Wright brothers on their glider in 1902.

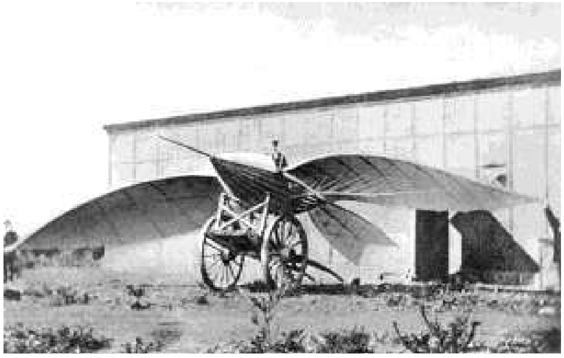


Fig. 5. Le Bris and his flying machine, Albatros II, photographed by Nadar, 1868 Source: https://en.wikipedia.org/wiki/Jean-Marie_Le_Bris#/media/File:LeBris1868.jpg

Fig. 6. Flight attempt of Lilienthal on the Derwitzer Glider, Derwitz, 1891 Source: https://en.wikipedia.org/wiki/Otto_Lilienthal#/media/File:MuehlenbergDerwitz.jpg

## The First Motorized Takeoff

The first man to say he flew with an engine is Frenchman Clément Ader, in command of his aircraft. The reality of these flights is discussed, due to the lack of witnesses and the lack of control of its craft.

The first attempt took place in 1890 at the command of the Éole; the marks left by the wheels in the loose soil would have presented a place where they were less marked and would have totally disappeared about twenty or fifty m. His flying craft would thus have jumped. There were no witnesses other than Ader's employees and the same machine, tried before official witnesses in 1891, gives no other results (Ader Clément, From Wikipedia).

The following tests of Ader were carried out at the military camp at Satory, at Versailles, where a circular area of 450 m in diameter had been established for an official demonstration. On October 12, 1897, Ader made a first round on this circuit aboard his Aircraft III (Fig. 7). He felt several times the apparatus leave the ground, then resume contact. Two days later, when the wind was strong, Clement Ader launched his machine before two officials from the War Department who said: "It was easy to see, from the wake of the wheels, that the aircraft had been frequently raised from the rear and that the rear wheel forming the rudder had not been constantly carried on the ground.

The two members of the committee saw him suddenly emerge from the track, describe a half conversion, bow to the side and finally remain motionless (it seems that the wheels no longer have enough grip due to the sustentation, the pilot lost directional control of his machine which then came out of the runway and then reversed under the effect of the wind).

To the question "... does the device tend to rise when it is thrown at a certain speed? "The answer is" ... the demonstration ... was not made in the two experiments that were carried out on the ground". In the face of this failure, the Ministry of War cuts the credits to Ader. It may be concluded that on October 14, 1897, the Frenchman Clément Ader could have carried out the first motorized but uncontrolled takeoff of a heavier than air.

Fig. 7. The plane III of Clément Ader Source: https://en.wikipedia.org/wiki/Cl%C3%A9ment_Ader#/media/File:Avion_III_20050711.jpg

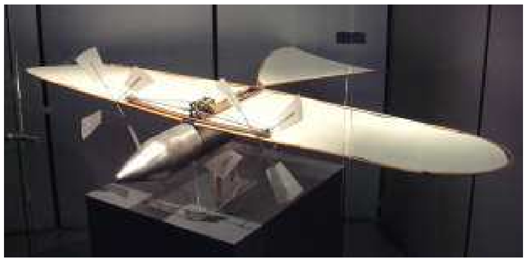


Fig. 8. First airplane able to lift itself under its own power, was made by the French Victor Tatin in 1874. Source: (Petrescu and Petrescu, 2011)

## The First Controlled Motorized Flight

After the gliders had developed their gliders between 1900 and 1903, with more than 700 flights in 1902, the Wright brothers experimented with their first plane, the Flyer, in the dunes of Kitty Hawk on December 17, 1903. The two brothers fly in their turn; they make four flights, the last being the longest: Orville flies on 284 m for 59 sec. These flights are generally considered the first motorized and controlled flights of a heavier than air. Their critics, especially the supporters of Alberto Santos-Dumont and Gabriel Voisin, blame them for having needed a rail fixed to the ground and a catapult against weight for take-off, the Flyer being devoid of wheels; the low power of the engine also did not allow take-off in low wind. The inventors' desire to protect their invention from the 1905 flight of the Flyer III, the absence of public demonstrations and the low number of witnesses of their flights played a negative role in their publicity. Wright's mastery of the flight technique was later recognized during the various demonstrations that the Wright made in France, notably at Auvours in the Sarthe in 1908.

Historical research reveals that the first motorized flight was carried out by German American engineer Gustav Weißkopf (or Gustave Whitehead) in 1899. The American journalist Stella Randolph published a book on this engineer in 1930: Before the Wrights flew (Before the Wrigths fly) and his work is being confirmed by the historian of aeronautics John Brown.

## The First Controlled Autonomous Motorized Flights

Traian Vuia flew to Montesson on 18 March 1906 with a heavier-than air-self-propelled airplane (no launch mechanism) over a distance of about 12 m at an altitude of one m (Fig. 9).

This flight ended in an accident, Vuia resumed its tests that from the month of July after having repaired and modified its apparatus. On 19 August 1906 he flew a distance of 25 m at an altitude of 2.5 m at Issy-les-Moulineaux (Vuia Traian, From Wikipedia).

Traian Vuia (August 17, 1872-September 3, 1950) was a Romanian inventor and aviation pioneer who designed, built and tested a tractor configuration monoplane. He was the first to demonstrate that a flying apparatus could rise into the air by running upon wheels on an ordinary road. He is credited with a powered hop of 11 m (36 feet) made on March 18, 1906 and he later claimed a powered hop of 24 m (79 feet). Though unsuccessful in sustained flight, Vuia's invention influenced Louis Blériot in designing monoplanes. Later, Vuia also designed helicopters.

By December 1905 Vuia had finished construction of his first airplane, the "Vuia I". This was a highwing monoplane constructed entirely of steel tubing.

The basic framework consisted of a pair of triangular frames, the lower members forming the sides of the rectangular chassis which bore four pneumatic-tyred wheels, the front pair steerable.

The wing was mounted on the apices of these frames and resembled those of Otto Lilienthal's gliders, with a number of curved steel tubes radiating outwards from centres at the apex of each of the side frames, braced by wires attached to a pair of kingposts and covered in varnished linen. Pitch control was achieved by varying the angle of attack of the wing. A trapezoidal rudder was mounted behind and below the wing. It was powered by a carbonic acid gas engine driving a single tractor propeller.

The 25 hp engine had to be adapted by Vuia himself as a suitable engine was not available. Liquid carbon dioxide was vaporized in a Serpollet boiler and fed to a Serpollet engine. The fuel supply was enough for a running time of about five minutes at full power. The aircraft was constructed for Vuia by the Parisian engineering company of Hockenjos and Schmitt.

Vuia chose a site in Montesson, near Paris, for testing. At first he used the machine without the wings mounted so he could gather experience controlling it on the ground. The wings were put on in March and on March 18, 1906, it lifted off briefly. After accelerating for about 50 m (160 ft), the aircraft left the ground and travelled through the air at a height of about 1 m (3 ft 3 in) for a distance of about 12 m (39 ft), but then the engine cut out and it came down.

Caught by the wind it was damaged against a tree. On August 9 a longer hop of 24 m (79 ft) at a height of about 2.5 m (8 ft) was made, ending in a heavy landing which damaged the propeller.

In 1907 Vuia built the Vuia II, using an Antoinette 25 horsepower (19 kilowatts) internal combustion engine. This aircraft had the same basic configuration as the Vuia I-bis, but was both smaller and lighter, with a total weight (including pilot) of 210 kg (460 l b) and a wingspan of 7.9 m (26 ft). Vuia succeeded in making a brief powered hop on July 5, travelling 20 m (66 ft), but damaging the aircraft and suffering slight injuries on landing (Fig. 10).

Between 1918 and 1921 Vuia built two experimental helicopters on the Juvisy and Issy-les-Moulineaux aerodromes (Fig. 11).

On October 30, 1908, Bouy aviation took off from Henri Farman at the wheel of his Voisin for the first inter-city flight. He reached Reims after a 17-min flight and traveled 27 km.

On July 3, 1909, at the Brayelle Airfield near Douai, the first air show in the world took place, Louis Blériot with his monoplane flies 47 km in 1 h 7 (Fig. 12), Louis Paulhan with his biplane beats the record of height with 150 m (Blériot Louis, From Wikipedia).

Fig. 9. Traian Vuia in his Vuia I flying machine in 1906 Source: https://en.wikipedia.org/wiki/Traian_Vuia#/media/File:Traian_Vuia_aircraft.jpg

Fig. 10. A postcard of Vuia and his 1907 airplane Vuia II, shown here with folded wings Source: https://en.wikipedia.org/wiki/Traian_Vuia#/media/File:Traian_vuia_flying_machine.jpg

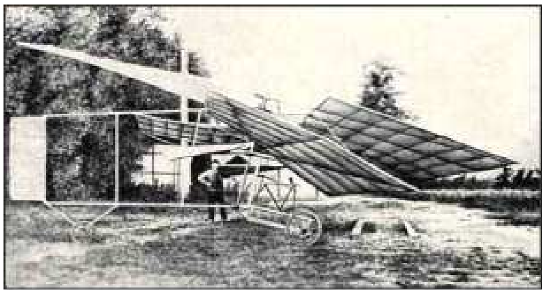


Fig. 11. Vuia helicopter 1918 Source: https://en.wikipedia.org/wiki/Traian_Vuia#/media/File:Vuia1918.jpg

On July 25, 1909, Louis Blériot crossed the Channel at the controls of his Blériot XI. The event has a great impact. The Daily Mail, organizer of the competition, headlines: "England is no longer an island".

The first autonomous flight of a seaplane was carried out by Henri Fabre, which took off on March 28, 1910 from the Etang de Berre in Martigues, France, with its "Canard" hydro-airplane (Fig. 13). The exploit was recorded by a bailiff (Fabre Henri, From Wikipedia).

The first autonomous flight of a single-engined airplane equipped with a jet engine, designed and piloted by the Romanian engineer Henri Coandă and built in the body shop of Joachim Caproni, took place in October 1910 (Fig. 14) at the Second International Motor Show And air space at Paris-Le Bourget.

## Results

The air was sucked in at the front by a compressor and then directed to a combustion chamber (one on each side, at the front of the aircraft) which provided the thrust. The compressor was driven by a conventional piston engine and not by a turbine as in modern reactors (Coandă-1910, From Wikipedia).

The Coandă-1910, designed by Romanian inventor Henri Coandă, was an unconventional sesquiplane aircraft powered by a ducted fan. Called the "turbopropulseur" by Coandă, its experimental engine consisted of a conventional piston engine driving a multi-bladed centrifugal blower which exhausted into a duct. The unusual aircraft attracted attention at the Second International Aeronautical Exhibition in Paris in October 1910, being the only exhibit without a propeller, but the aircraft was not displayed afterwards and it fell from public awareness. Coandă used a similar turbo-propulseur to drive a snow sledge, but he did not develop it further for aircraft.

## About the Coanda's Effect

An early description of this phenomenon (eCoanda) was provided by Thomas Young in a lecture given to the Royal Society in 1800.

The lateral pressure that excites a candle's flame to the air flow from a blowing blower is probably exactly the same as the pressure that relieves the inflection of an air stream near an obstacle. Mark the lawn that a thin stream of air makes on the surface of the water. Bring a convex body into contact with the side of the flow and the splash point will immediately show that the current is deflected to the body; and if the body is free to move in any direction, it will be urged to the current.

A hundred years later, Henri Coanda identified an effect application during his experiments with his Coanda-1910 aircraft, which mounted an unusual engine designed by Coanda. The engine turbine pushed the hot air backwards and Coanda noticed that the airflow was drawn to nearby surfaces.

Fig. 12. The Blériot V canard monoplane, built in January 1907 Source: https://en.wikipedia.org/wiki/Louis_Bl%C3%A9riot#/media/File:Bleriot_V.jpg

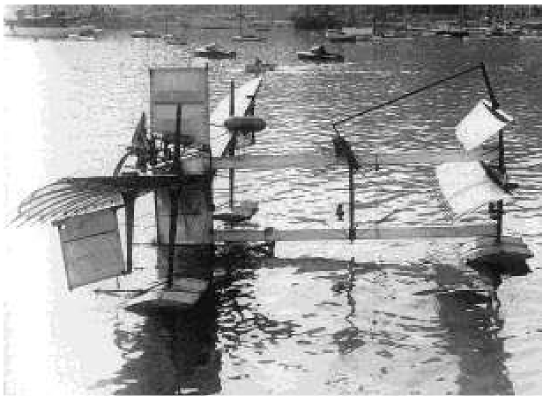


Fig. 13. Le premier hydravion, le Canard, en 1911 Source: https://fr.wikipedia.org/wiki/Histoire_de_l%27aviation#/media/File:Canard_fabre_1911.jpg

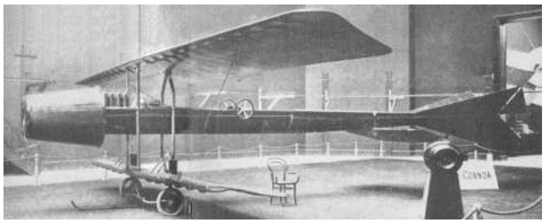


Fig. 14. The first jet aircraft at the second Paris International Air Show and Le Bourget in 1910 Source: https://en.wikipedia.org/wiki/Coand%C4%83-1910#/media/File:Coanda_1910.png

He discussed this issue with aerodinamic Theodore von Kármán, who called it the Coanda effect. In 1934, Coanda obtained a patent in France for "Method and apparatus for deviating a fluid into another fluid." The effect was described as "Deviation of a planar jet of a fluid that penetrates another fluid in the vicinity of a convex wall."

The effect of Coanda is the result of attracting the fluid around the liquid jet. When a nearby wall does not allow the surrounding fluid to be pulled in to the jet (i.e., to be trained), the jet moves to the wall. The jet fluid and the surrounding fluid should be essentially the same substance (a gas jet in a gas body or a liquid jet in a body of liquid). In one embodiment, an air jet is blown over the top surface of a profile, which can have a strong influence on the general elevator, especially at high attack angles when the flow is otherwise stall.

The Coanda effect has important applications in various aircraft lifters, where air moving on the wing can be "bent" to the ground using dampers and a jet that blows over the curved surface of the tip of the wing. The flow curve results in its acceleration and Bernoulli's main pressure is low; Aerodynamic is increased.

The flow rate from a high speed jet engine mounted in a wing support leads to a high increase by the dramatic increase in the gradient speed in the shear flow in the boundary layer. In this gradient of velocity the particles are blown away from the surface, thus reducing the pressure there. Carefully following Coanda's work on the applications of his research and especially his work on Lenticular Aerodine (Fig. 15), John Frost of Avro Canada also spent considerable time investigating the effect, resulting in a series of "Inside Out" hovercraft aircraft, where the air came out in a ring around the aircraft and was guided by being "attached" to a ring similar to the flap (Mirsayar *et al*., 2017).

This is different from a traditional hovercraft design where the air is blown in a central area in plenum and adorned with a skirt of material. Only one of Frost's models has ever been built, Avrocar.

VZ-9 AV Avrocar (often called VZ-9) was a Vertical Take-Off and Landing aircraft (VTOL) developed by Avro Aircraft Ltd. as part of an American military secret project deployed during the early cold war.

Avrocar intends to exploit the Coanda effect to provide lift and push from a single "turbocharger" that exhausts the exhaust at the edge of the disc-shaped aircraft to provide VTOL anticipated performance. In the air, it would have sown with a flying saucer. Two prototypes were built as test concepts for a "concept concept" for a more advanced USAF fighter and for an American military military.

The effect was also implemented during the US Air Force AMST project. Several aircraft, especially the Boeing YC-14 (the first modern type to exploit the effect), were built to take advantage of this effect by installing the turbofan on the top of the wing to provide high-speed air even at low speeds. So far, only one aircraft has entered production using this system to a large extent Antonov An-72 "Coaler".

McDonnell Douglas YC-15 and his successor, Boeing C-17 Globemaster III, also use the effect. The NOTAR helicopter replaces the conventional propeller rotor with a Coanda effect queue (Fig. 16).

Fig. 15. “Coanda Lenticular aerodyne”. Source: (Petrescu and Petrescu, 2011)

Fig. 16. The C-17 Globemaster III uses the Coanda effect for a comfortable ride at low flying speeds Source: (Petrescu and Petrescu, 2011)

An important practical use of the Coanda effect is for sloping hydraulic screens separating debris, fish, etc., otherwise in the flow to the turbines. Due to the slope, the sludge falls from the screens without mechanical cleaning and, thanks to the screen wires, optimizing the effect of Coanda, the water flows through the screen to the waves that lead the water to the turbines.

The Coanda effect is also used to make automotive windshield washers work without moving parts and to create pneumatic logic circuits.

The operating principle of the oscillating flow meters is also based on the Coanda phenomenon.

The liquid entering a room containing 2 islands. Due to the Coanda effect, the main stream breaks and passes under one of the islands.

This current is then fed back into the main stream, dividing it again, but in the direction of the second.

This process is repeated as long as the liquid circulates in the chamber, resulting in an oscillation induced directly by the velocity of the fluid and, consequently, by the volume of substance flowing through the counter.

A sensor picks up the frequency of these oscillations and turns it into an analog signal that gives the volume that passes.

In the air conditioning system, the Coanda effect is exploited to increase the casting of a ceiling speaker. Because the Coanda effect causes the exhaust air from the loudspeaker to "drop off" from the ceiling, it moves before falling for the same discharge speed as if the loudspeaker was mounted outdoors without the neighboring ceiling.

Lower trigger speed means lower noise levels and, in the case of Variable Air Volume (VAV) systems, allows higher declines. Linear speakers and speakers that have longer contact with the ceiling have a higher Coanda effect.

In meteorological theory, the theory of Coanda effect has also been applied to the flow of air flowing from mountain ranges such as the Carpathian Mountains and the Alps of Transylvania, where effects on agriculture and vegetation have been observed. It also appears to be an effect in the Rhône Valley in France and near the Alaska Great Delta.

YC-15 was McDonnell Douglas, an AMST competitor of the Advanced Medium STOL Transport (Fig. 17) to replace the C-130 Hercules as standard STOL USAF tactical transport. Eventually, neither the YC-15 nor the Boeing YC-14 was ordered in production, although the YC-15 base design would have been used to form the success of the C-17 Globe master III.

Hercules C.4 Feather Elicens C.4. The NOTAR helicopter replaces the conventional propeller rotor with a Coanda effect queue (Fig. 18).

Several aircraft, especially the Boeing YC-14, were built to take advantage of this effect by installing the turbofan on the top of the wing to provide high-speed air even at low speed Corps Fig. 19).

Avro Canada VZ-9 Avrocar was a VTOL aircraft developed by Mufti Avro Ltd. (Canada) as part of a project the American military secret carried out during the first years of the cold war (Fig. 20).

Avrocar intends to exploit the effect Coanda to provide the elevator and pushing from a single "Turbocharger" which existing dischargers exhaustul at the edge of the aircraft in the form of a disc to provide the best performance VTOL early.

In the air, the next one might be hell with a plate flying.

Two prototypes were constructed as vehicles for testing "Concept" for a fighter USAF most advanced and for a coup against the Combat Air tactics of the American military.

During the tests of the flight, Avrocar has proven to have problems unstable the pushrod and stability which have limited to an envelope of degraded flight; later, the project was canceled in September 1961.

Fig. 17. The McDonnell Douglas YC-15 uses the Coanda effect for a comfortable ride at low flying speeds Source: (Petrescu and Petrescu, 2011)

Fig. 18. The NOTAR helicopter replaces the conventional propeller tail rotor with a Coanda effect tail. Source: (Petrescu and Petrescu, 2011)

Fig. 19. The Boeing YC-14 use the Coanda effect. Source: (Petrescu and Petrescu, 2011)

Fig. 20. The Avro Canada VZ-9 Avrocar was a VTOL aircraft developed by Avro Aircraft Ltd. (Canada). The Avrocar intended to exploit the Coanda effect to provide lift and thrust from a single "turborotor" blowing exhaust out the rim of the disk-shaped aircraft to provide anticipated VTOL-like performance. Source: (Petrescu and Petrescu, 2011)

Through the history of the program, the project has been referred to numerous names. Avro mentions efforts as the Y project, with individual vehicles known as Spade and Omega. The Y-2 project was later funded by the US Air Force, which called it the WS-606A, the 1794 Project and the Silver Bug Project. When the US military joined the efforts of its final name "Avrocar" and the name "VZ-9", part of the US Army VTOL VTOL series.

Avrocar was the result of a series of blue research projects made by designer Jack Frost, who joined Avro Canada in June 1947 after working for several British companies. He was with Havilland in 1942 and worked at Havilland Hornet, Havilland Vampire and Havilland Swallow, where he was the chief designer of the supersonic research project. At Avro Canada, he worked on Avro CF-100 before creating a research team known as the "Special Projects Group" (known as GSP). First, Frost surrounded himself with a collection of "mind" engineers, after which he arranged a job. Originally installed in the Penthouse of the administration building, the GSP was later moved to the company's headquarters, the Schaeffer building, which was secured with guards, locked doors and special passports in a second world war. Sometimes, GSP also worked from the Experimental Hangar, where it shared space with other Avro esoteric teams.

At that time, Frost was particularly interested in the jet engine design and ways to improve the efficiency of the compressor without sacrificing the simplicity of the turbine engine. He discovered that Frank Whittle's "reverse flow" design was too complex and he was interested in ways to "clean" the look. This caused him to design a new type of engine structure with flame boxes located directly outside the outer edge of the centrifugal compressor, pointing outwards like the spokes on a wheel. The power of the compressor has been extracted from a new type of turbine centrifugal fan, unlike the most typical propeller-like turbine, which drives the compressor by using a mechanism rather than a shaft. The resulting engine did not have a conventional drive axle and was arranged like a large disk, which he called a "pancake engine". The jet force came out of the engine and this was a problem to try to adapt the design to a typical aircraft.

At the same time, the aerospace industry as a whole has become more and more interested in VTOL aircraft. It expected that any future European war would start with a nuclear exchange that would destroy most bases so that airplanes operate from airbases, roads or even unprepared fields. Considerable research efforts have been made in various solutions to ensure a second strike capacity. Some of these solutions included rocket launchers, such as the zero launch concept, while many companies started to work on VTOLs as a more appropriate solution in the long run.

Frost considered that the excellent performance of his new engine would be a natural match for a VTOL aircraft due to the high power-to-weight ratio expected. The problem was how to use the ring force to drive the aircraft forward, as well as the problem of mounting the very large engine in a proper aircraft structure. Frost has suggested using a series of holes to redirect the force that comes out of the front of the engine, although it was well known that long sewerage leads to a loss of strength. To keep the pipe as short as possible, the design pushed the force along the attack edge of a very wide delta wing. As the engine was disk-shaped, the triangular shape was "pushed" close to the front, producing a plan form almost like a cotton wool. For this reason, the design was also called "Avro Ace", a likely reference to Ace of Spades. The compressor's inlet was in the middle of the engine, so the engine air intakes were located only at the front of the center on the top and bottom of the aircraft. The cock was positioned over the main bearing behind the connectors. A "backbone" on the top and bottom ran from the cockpit area to the rear edge of the aircraft. Other versions of the basic layout, including "Omega", which was more than one disc, were studied because they cut the back portions of the delta wing.

For VTOL operations, the aircraft was expected to stand, sustained by long landing feet extending from the backbone. The landing will be at a very high angle, making visibility during the very difficult approach. A number of other VTOL experiments in the era have tried different solutions to this issue, including rotating pilots and pilots, but none have proven to be very effective. Another problem with the various VTOL experiments was that stability in a hover was difficult to arrange, although it was not completely unexpected. A solution to this problem would force the force to be lowered from a larger area, as in a helicopter, where the elevator is fed over the entire area of the rotor disk. Most designers have turned to bleeding the air in the engine compressor and directing it through pipes around the aircraft. Frost's design used so many nozzles that such an arrangement would not be easy to build.

In 1952, the design was advanced enough that the Canadian Defense Research Board funded the effort with a $ 400,000 contract. In 1953, a wooden model of the Y Project was completed, of which only images remained (Fig. 21).

It seems that the project was considered too expensive in the military unit, which at that time involved several expensive defense projects.

On February 11, 1953, a story about the project was transmitted to Star Toronto, along with Omega design images, apparently for additional funding (a strategy widely used in the US at that time).

Five days later, the Minister of Defense informed the House of Commons that Avro is really working on a plate model of a flying saucer capable of flying at 2400 km/h and climbing vertically. However, there was no additional funding.

While Project Y continued, Frost was in the meantime interested in the effect of Coanda, where fluid flows would follow highly convex shapes, something that could be unexpected at first glance.

Frost felt that the effect could be used with his engine design to produce a more practical VTOL aircraft, the exhaust gas flowing to the upper surface of the aircraft and then downward down ward through a flap-like arrangement.

This would produce a lifting force around the entire edge of the aircraft, allowing them to land "flat".

He produced a series of small experimental models using compressed air instead of an engine to select a suitable flat shape and ultimately decided that a disc is the best solution.

Continuing these experiments, he discovered that the same focused steering system he intended for VTOL operations worked well for the front flight. In this case, the shape of the disc itself was not a good lifting surface because it was neutral in the lifting direction-it would fly sideways as easily as before.

However, by modifying the flow of air by applying a small amount of jet pressure, the overall airflow on the craft can be dramatically modified, creating a kind of "virtual roadmap" of any required configuration.

For example, by directing even a small amount of jet pushing downward, a large mass of air would jump over the top surface of the wing and dramatically increase the flow on the wing, creating lift.

This seems to provide a solution to one of the most difficult problems of the era, designing an efficient aircraft at subsonic and supersonic speeds.

The subsonic junction is created by the airflow around the wing along the streamlined lines, but supersonic lifting is generated by shock waves at critical bending points. No single design could provide high performance for both regimes. The blown disk could attack this problem being designed only for supersonic performance and then using the jet force to modify the subsonic air flow in the appearance of a normal wing. The resulting design will be adjusted for high performance, will have a reasonable sub-season performance and would provide VTOL, all in one model.

At the end of 1953, a group of American defense experts. He visited Avro Canada to see the new CF-100 combat aircraft.

Somewhere along the way, Frost coopted the tour and redirected it to the special project area where the Y model was presented and the models and drawings (some of which the company's officials had not seen before) for a Complete air circulation As "Project Y-2". USAF agreed to take over the Frost Special Projects Group and in 1955 signed a $ 750,000 contract. In 1956, Avro's leadership was interested enough to hire $ 2.5 million to build a prototype of private risk. In March 1957, the air forces added additional funds and the aircraft became the 606A Weapon System (Fig. 22).

A wide variety of models has been studied for a VTOL battle aircraft that revolted around the shape of the disc, which led to the 1794 project involving a supersonic aircraft battling large discs. The concept followed air tunnel testing with a variety of scalable models. It had a high section in the middle of the engine, the intake covered with a series of shutters that would have been shut down before the flight. Estimates of the Frost performance for the concept were for the Mach 3 potential at 30,000 m altitude.


Fig. 21. VTOL aircraf project Y was capable to fly with 1,500 miles per hour (2,400 km/h) and climbing vertically. Source: (Petrescu and Petrescu, 2011)


Fig. 22. Avro company models of the Y-2 (right) and the Avrocar (left). Source: (Petrescu and Petrescu, 2011)

There was a debate about this concept in the USAF, as many groups were trying to get funding for their own pet projects, such as nuclear-powered bombers. In a repeat of Star Toronto's previous release in 1955, an extended article appeared in the Look magazine, which, among other allegations, speculated that the current UFO views were Soviet plaques. The article continued to describe such an aircraft with diagrams that were clearly influenced by the Avro design.

A new engine was designed as the Avro PV-704 (PV for a private company) powered by six Jet Armstrong Siddeley Viper engines that blow over the outer edge of the central rotor. PV-704 was a "stop-gap" design built in a bunker building behind Avro's experimental testing facility. It was designed to test different concepts of the 1794 project and provide USAF test data to show the viability of the concept.

The initial plan to initially test the "Viper Engine Rig" was to continue in the "free" tests. Unfortunately, testing was good; The test pattern suffered leaks of dangerous oils, resulting in three fires.

Eventually, he got to the point where the staff was afraid of the car, even if he was safely placed in a cabin built of anti-dirt glass and 4 m thick steel. A final, disastrous and almost lethal test of the 1956 engine, involving a "wild" Viper engine, convinced Frost that a less dangerous test vehicle is needed.

To gather flight data on the basic concept while engine development continued, in 1958 Frost proposed the construction of a smaller test vehicle "proof of concept" that he called Avrocar. In this regard, the US military was involved in a wide range of experiments on smaller VTOL aircraft, which would act as a "flying jeep," and became interested in the Avro concept. Frost has demonstrated its smaller design, both as the prototype of a vehicle suitable for the needs of the army and as an aerodynamic test for the WS-606. The initial performance requirements for Avrocar represented a ten min change in soil effect and a 25 km radius (40 km) with a payload of 1000 kg (450 kg).

The new plan appears to be happy and a $ 2 million air services contract passed to Avro to build and test two lawyers, which the army called VZ-9-AV "Avro" unusual abnormality of the normal US Army) A series of "VZ" planes. The interest of the army in the Avrocar program was apparently very high. Bernard Lindenbaum remembers a trip to Washington in the late 1950 s to request additional funding for a study on reducing helicopter firing.

Although the funding was approved, he heard a general remark from the military that Huey would be the last helicopter the army would buy to replace it on the Avrocar helicopter.

The Air Force funding of about $ 700,000 (untapped from the 606A program) was also transferred to the Avrocar project. In March 1959, an additional contract of $ 1.77 million was received for a second prototype. At launch, the projected performance far exceeded the requirement, with a maximum speed of 225 knots (417 km/h), a 3000 m ceiling, a mileage of 209 km with a payload of 1,000 kilos and the landing effect of Land with a payload of 1,101 kg.

The maximum takeoff weight, with the off-slope effect, was calculated at 2560 kg, the maximum ground weight (GETOL) was 3160 kg.

Just as the first test models were manufactured, the disaster struck. The Canadian government canceled the "Avro CF-105 Arrow" program at Black Friday on February 20, 1959. The result was the disappearance of almost all Avro Canada employees, including those in the Special Projects Group.

However, three days after the announcement of the Arrow cancellation, many employees of the special projects were requisitioned. But it was not as good as usual. The team included people from the CF-100 and CF-105 teams and the group of special projects was moved to the main building, almost empty. The company "brass" has also become more involved in group operations.

Air Force USAF has recommended that the WS-606A and all related work (including Avrocar) be canceled. A stop/go command went down and Frost was forced to rescue the project. In an elaborate effort, Frost has made a reasonable case for continuing US military funding. In May 1959, USAF authorized Avro to continue flat flight programs (Fig. 23).

Avro VR-9 Avrocar was a "dead" VTOL designer (Fig. 24), according to Russell Lee, curator of the National Air and Space Museum, but his technological innovations have intrigued other designers. One of the design elements it has incorporated, the use of fans has led to other experimental programs. Dr. Paul Moller, a Canadian expatriate who worked at Avro Canada as a young engineer, has created an initial series of VTOL experimental vehicles on plate technology using an à-Avrocar fan. The XM-2, the first in the series, looked remarkably like a miniature flight plate. After successful attempts, disguised dishes published as "discojet" were abandoned and their latest project, Moller Skycar, has a flying car look.

NASA's Aeronautical Research Division (ARMD) strives to meet the challenges that still persist in our nation's air transport system: Air traffic congestion, safety are and environmental impact.

NASA's four aeronautical research programs are conducting state-of-the-art research into new aircraft technologies as well as systems research that integrates new concepts and operating technologies into the new Next Gen air transport system. A fifth program manages a portfolio of wind tunnels and other test facilities (windows, propulsion), research plans and support planes and the evolution of testing technologies at NASA centers throughout the country.

Dryden Flight Research Center is NASA's main research and aircraft center. NASA Dryden is essential for missions to the space exploration agency, space operations, scientific discoveries and aeronautical Research and Development (R and D).

Located in Edwards, California, in the western Mojave desert, Dryden is set in a unique location to take advantage of excellent weather throughout the year, from a distance and visibility to test some of the nation's most exciting aerial vehicles.

In support of space exploration, we manage the testing and integration of abortive systems in partnership with the Johnson Space Center and Lockheed Martin for the crew to replace the space shuttle.

Dryden is the main alternative landing space for space shuttle and orbital support for the International Space Station.

In support of the scientific discovery, we manage Stratospheric Astronomical Astronomy (SOFIA) - a flight telescope aboard a Boeing 747-in partnership with the Ames Research Center and the German Aerospace Center.

In support of aeronautical research and development, we are involved in many aspects of the main aeronautical and aviation safety programs, including the X-48 Wing Blended and Ikhana (Predator B), to support sub-flight and adaptive flight controls in support of Aviation Safety.

Fig. 23. US Army Avrocars depicted as "flying jeeps" in company literature. Source: (Petrescu and Petrescu, 2011)

Fig. 24. First Avrocars 1958 (left); the second model 1960 (right). Source: (Petrescu and Petrescu, 2011)

For 60 years, Dryden projects have led to major advances in the design and capabilities of many top civilian and military aircraft. The newest, the fastest, the highest-all made their debut in the giant and desert sky above Dryden.

Dryden Flight Research Center plays a vital role in advancing technology and science through flight. Here, we demonstrate America's leadership in aerospace technology and space, continuing to push the envelope to revolutionize aviation and pioneering aerospace technology.

NASA operates two aircraft from Lockheed ER-2 Earth Resources as flying laboratories within the suborbital science program within the Agency's Scientific Missions Division. The plane, based on NASA's Flight Dryden Research Center, Edwards, California, collects information about our surroundings, including Earth resources, celestial observations, chemistry and atmospheric dynamics and ocean processes. Airplanes are also used for research and development of electronic sensors, satellite calibration and satellite data validation (Fig. 25).

The F-15B tests are two-engine powered aircraft that provide NASA, industry and universities with the long-term ability to perform an effective flight test of aerodynamic, instrumentation, propulsion and flight experiments. This aircraft is a unique aviation resource and is considered by the researchers to be an "aerodynamic flight tunnel" and a reliable supersonic test. In addition to Flying Missions, F-15B Dryden is also used to prepare the crew to support for other research aircraft.

Fig. 25. Lockheed ER-2 Source: (Petrescu and Petrescu, 2011)

With NASA 836, the F-15B has a length of about 64 feet and has a length of under 43 feet. It is powered by two Pratt and Whitney F100-PW-100 engines that can produce nearly 24,000 pounds of traction, each pulling. It is capable of reaching 2.3 Mach speeds or 2.3 times the speed of sound at altitudes of 40,000 to 60,000 feet. With an external flight test device mounted under the fuselage in place of the external fuel tank, the speeds are limited to Mach 2.0. The aircraft has a total take off weight of about 42,000 pounds and a landing weight of about 32,000 pounds. It has the ability to supply air fuel for long-term research missions.

The aircraft data acquisition system makes the F-15B one of NASA's most versatile testing plans. A onboard video system, monitored from the rear of the cabin, provides high-speed video and high-speed video that can be disconnected by field researchers. The data system includes an air-breathing data system as well as a Global Positioning System (GPS) navigation package; A random with a nose arm containing an air probe; A digital data recorder; And telemetry antennas.

Recent activity in 2008, 836 hosted numerous research projects to understand and overcome the challenges associated with suprasonic civilian transport and advanced propulsion. LaNCETS Launches Efficiency Impact Changes (LNCETS) have quantified how changes in lift distribution and nozzle area ratio affect the structure of supersonic shock at the back of NASA's highly modified F-15 (837) research aircraft.

The Propeller Flight Test (PFTF) was designed to quantify the flux field around a research contribution (to be carried out in early 2009). This project brings the PFTF one step closer to full operational capacity, which will allow the F-15B to demonstrate and study advanced propulsion concepts during the flight.

In 2006, Gulfstream Aerospace and Dryden collaborated on a project called Quiet Spike TM to investigate the suppression of sonic weapons. The project focused on a retractable 24-foot, mounted on NASA's Dryden Research F-15B (# 836). The spike, made mainly of composite materials, created three small waves of parallel shock with each other on the ground, producing less noise than the typical shock waves built on the front of the supersonic jets.

This highly successful project has put the peak-induced sonic suppressor test on the real-world flight test provided by the NASA F-15B supersonic (Fig. 26).

NASA's Dryden Research Center has acquired two Northrop Grumman aircraft operated by Global Hawk to be used in high-altitude missions over long distances. Global Hawk measures 44 feet in length, with a wingspan of 116 feet. NASA expects to operate Global Hawk with payloads of up to 2000 pounds and at altitudes of up to 65,000 feet. Its range is more than 10,000 nautical miles and the resistance is longer than 31 h (Fig. 27).

NASA from Ikhana's unmanned airplane finalized Thursday, on the central and southern part of the country, its fourth series of demonstration firefighting. The 10 h flight left NASA's Dryden Research Center at the Edwards Air Base just after 6 AM PDT and returned at 16:00 (Fig. 28).

The flight is part of the NASA and US Forest Service deployments of the Western States, demonstrating improved imaging and mapping capabilities of a sophisticated infrared sensor and real-time communications equipment developed at the Ames Research Center. Previous flights up to 20 h in August and September led Ikhana and his imaging cargo to a series of fires in the southern and central California, Oregon, Idaho, Washington, West Wyoming and southwest Montana.

Thursday's flight included images from previously burned areas in Central and South California for Rehabilitation and Stabilization of Burned Areas (BAB), while Ikhana sailed around 23,000 m in the national airspace. The aircraft then returned to the restricted area of the military airspace near Edwards and climbed to over 40,000 m high in Ikhana's high performance capabilities of 420 kilograms. Instrument held under the left wing.

NASA Dryden Pad Kevin Mount and Jeff Doughty are preparing to run the platform carrying the Orion flight crew into the C-17 cavern after returning to NASA's Dryden Research Center on June 15, 2010 (Fig. 29). The boilerplate module was not damaged when launching the launch of PA-1 on the White Sands missile range on May 6, 2010.

The steam-jet airplane test module is in the desert, following a Pad-Abort-1 flight test on May 6, at the White Sands missile range in New Mexico.

Media representatives and media representatives launch a Orion crew test module and its failure system during the NASA Pad Abort 1 test on 6 May on the White Sands missile range, NM PA-1 was the first test the Orion crew.

Fig. 26. The supersonic F-15B. Source: (Petrescu and Petrescu, 2011)

Fig. 27. The global hawk. Source: (Petrescu and Petrescu, 2011)

Fig. 28. Ikhana unmanned aircraft. Source: (Petrescu and Petrescu, 2011)

Fig. 29. NASA Dryden Pad Abort-1 flight test team technicians Kevin Mount and Jeff Doughty prepare to roll the platform carrying the Orion flight test crew module from the cavernous interior of a C-17 cargo plane. Source: (Petrescu and Petrescu, 2011)

Boeing Phantom Works has partnered with NASA and the Air Force Research Laboratory to study the structural, aerodynamic and operational benefits of the Blended Body, a cross between a conventional plan and a wing design. Air Force has designated the prototype X-48B based on its interest in design potential as a high capacity, long-range and high-capacity military aircraft. The 8.5% scale, the X-48B remote control, is dynamically calibrated to fly just like mid-flight aircraft (Fig. 30).

After completing the installation of test tools, one of the two X-48B Blended Body demonstrators began testing at the Dryden Research Center at NASA in early 2007 and these tests continue in 2008. Researchers from the Langley Research Center in Hampton, Va. The prototype of the second prototype X-48B from the Langley Historic Wind Tunnel in spring 2006 and the flight tests are intended in part to validate the results of these wind tunnel tests.

Advantages of the combined wing concept include high fuel efficiency, low noise and large cargo volume for aircraft size. NASA Dryden Flight Test will focus on low and low altitude flight characteristics for the combined wing configuration including engine control, stand characteristics and handling qualities. The short flight test program aims to demonstrate that the new project can be as safe as current transports that have a traditional configuration of the fuselage, wings and tail.

The two demonstration bodies of the combined X-48B technology body were built by Cranfield Aerospace in the UK in accordance with Boeing's specifications. The prototypes of the subclasses have a 20.4 m ladder with protruding vertical fins and a rudder at the tip of the wings and the students along the wings of the rear wings. The natural weight is powered by three small turbochargers that offer a combined maximum traction of approximately 160 kg. The X-48B has an estimated maximum speed of 118 knots, a maximum altitude of about 10,000 feet and a flight time of about 40 min.

According to NASA, "ERAST is a multi-year effort to develop aeronautical technology and sensors for a new family of remote-controlled aircraft destined for advanced atmospheric space missions for long-distance cruises for long rounds at altitudes of 60,000-100,000. Identify and monitor environmental data to assess global climate change and assist in meteorological monitoring and forecasting, could also serve as airborne telecommunication platforms, Lofting Satellite in Space (Fig. 31).

"The ERAST program is sponsored by the Space and Space Technology Office at NASA headquarters and headed by NASA's Dryden Research Center." NASA, Ames Research Center, Moffett Field, California, heads the Sensor Technology Development Center, Cleveland, Ohio and the Center for Aerospace Technology. NASA Research Langley, Hampton, Virginia, has extensive experience in propulsion, structure and system analysis. Several small-scale aeronautical development companies, including

ALTUS Developer General Atomics Aeronautical Systems, Inc., are associated with NASA within the ERAST Alliance. "The ERAST Alliance's industrial partners included Aurora Flight Systems, AeroVironment, General Atomics, Scaled Composites, Thermo mechanics, HyperSpectral Sciences and 122 West Longitude.

The types of scientific mission that ERAST prepares may include remote sensing for earth studies, hyper spectral imaging for monitoring agriculture, tracking severe storms and operating as telecommunication platforms.

A parallel effort led by Ames has developed simple micromanager sensors that can be worn by these aircraft for environmental research and Earth monitoring.

Additional technologies considered by the ERAST Alliance include light, avionic, aerodynamic and other propulsion, suitable for extreme altitudes and durations.

Although members of the ERAST Alliance were responsible for the development and operation of aircraft, NASA was primarily responsible for overall program management, major funding, individual project management, development and coordination of useful tasks. NASA has also worked on long-standing issues with the Federal Aviation Administration and has developed the technology to put these planes into the open air in the national airspace.


Fig. 30. X-48B Blended Wing Body. Source: (Petrescu and Petrescu, 2011)

Fig. 31. ERAST is a multiyear effort to develop the aeronautical and sensor technologies for a new family of remotely piloted aircraft intended for upper atmospheric science missions. Source: (Petrescu and Petrescu, 2011)

## Discussion

In the years leading up to the First World War, growing tensions in Europe prompted governments to take an interest in aviation as a weapon of war. Hence the organization by France of the famous competition of military airplanes in Reims (October and November 1911), the first competition of this type in the history of aviation world. The various manufacturers, especially French and British, are racing against the clock to try to get orders for export.

Léopold Trescartes, holder of the civilian certificate of the Aeroclub of France No. 842 issued on April 16, 1912, carried out the first flight over Porto (Portugal) on September 7, 1912 aboard a biplane manufactured by Maurice Farman. This plane, officially bought by a newspaper in Porto and whose exhibitions are used by the general public to finance the construction of a crèche, is in reality a model designed to convince the Portuguese government to buy French aircraft under the Of the creation of an air force. After numerous demonstrations, in the presence of the Portuguese Minister of War, the choice of the Portuguese authorities will ultimately be on a British aircraft of Avro brand.

Pioneer aircraft and pilots (volunteers detached from other units that kept their original uniform, especially recruited from the cavalry) are requisitioned for reconnaissance missions. Targets of both camps on the ground, they are decimated. The great nations quickly acquire a military aviation where the aircraft specialize: Reconnaissance, hunters, bombers.

A race to record is engaged to take the advantage over the enemy, the armament being improved with the appearance of the first synchronized machine guns. The parachute makes its appearance, but is only used by pilots of dirigibles, the planes flying too low for it to be effective. On the ground, aerodromes are built and the airplane is manufactured in series.

On October 5, 1914, near Reims, the first air combat in the world history of military aviation took place over the junction of the communes of Joncherysur-Vesle, Prouilly and Muizon. A plane shot down. The fight is won by the pilot Joseph Frantz and the mechanic Louis Quenault of the squadron V 24 on Voisin, against the Oberleutnant Fritz von Zagen on a German Aviatik. As a result, aerial duels multiply. If the first combats are very rare and dangerous (rifles on board, which require extreme dexterity), the development of synchronized machine guns (following the shielded propellers on the passage of bullets, invention of the French aviator Roland Garros) Battles (Notably because this device made it possible to fire the bullets of a machine gun through the propellers of the planes). Contrary to the horror of the trenches (mud, constant bombardments ...) air war is seen as a clean war (if at all possible). In the representations of pilots as well as of civilians and infantry, who follow the war of heaven with diligence, aviation possesses a noble and chivalrous side; Guynemer refused to kill Ernst Udet because his machine gun had stopped. There is a great competition between the "Aces", both between enemies and within the same camp.

The great figures of this period are the French Guynemer and René Fonck (the largest French Ace and war according to the method of calculation), as well as the Germans Manfred von Richthofen (nicknamed The Red Baron) and Ernst Udet.

On the evening of June 10, 1916, the first naval battle of history took place in Equatorial Africa! A British-built Netta-type seaplane, piloted by Belgian lieutenants Behaeghe and Collignon, successfully bombarded the German gunboat Graf von Götzen in the port of Kigoma (now Tanzania) on Lake Tanganyika using one of its two 65-pounder bombs which hit him to the quarter-deck putting his governor out of state. The ship is thus neutralized which breaks the German lock on the lake, between the Belgian Congo and the German East Africa which had been set up two years earlier. The German gunners could not retaliate against this air attack because their artillery pieces, intended for coastal or naval targets (we were only at the beginning of the aviation), did not rise at a sufficient angle to threaten aircraft (considered by the Germans as non-existent in Equatorial Africa). The seaplane rejoined its base nevertheless with 20 attacks of machine-gun bullets fired from Kigoma and a pierced float.

## Conclusion

The history of aviation can be divided into six periods.

The epoch of the precursors: Until the beginning of the seventeenth century men imagined-more or less realistically-what a flying machine could be. Then from the end of the eighteenth century, this period saw the beginning of the conquest of the air with the development of aerostation and numerous attempts of gliding.

The pioneers of the heaviest air: It is the period of the first flights of motor vehicles capable of taking off on their own. Almost every flight is a first or record attempt: A little faster, a little farther, a little higher. Aviators are most often designers or adventurers.

The First World War: only a few years after the first flight, this period saw the emergence of a new weapon on the battlefield. There is an abrupt shift to mass production, with some aircraft models even being built to more than a thousand; the pilots become "professionals", even if the perfume of adventure has not completely disappeared.

The end of the First World War put on the market a surplus of pilots and aircraft which enabled the launch of commercial air transport and, in the first place, that of mail. Aviation develops and there is the creation of an air force in many countries. Military aviation drives builders to break new records. Advances in civil aviation are a spin-off from military studies (Petrescu and Petrescu, 2011; 2012; 2013a; 2013b; 2013c).

The Second World War: Aviation is widely used on the battlefield. This period can be considered the climax of planes using a piston engine and a propeller as a propulsion means. The end of the war saw the birth of the jet engine and the radar.

The second half of the twentieth century: Once again, the end of the war put on the market a surplus of aircraft and pilots. This is the beginning of the regular commercial air transport "all-weather" able to free itself from weather conditions and to practice the flight without visibility. Military aeronautics drives the development of the reactor, this is called the era of the jet and then sets out to conquer the supersonic flight. Civilian spin-offs allow the development of the first four-jet airliners and air transport is open to all, at least in developed countries (Crickmore, 1997; Donald, 2003; Goodall, 2003; Graham, 2002; Jenkins, 2001; Landis and Jenkins, 2005).

The Wright Flyer (1903) is widely regarded as the first aircraft capable of performing a controlled and controlled flight.

Traian Vuia flew to Montesson on 18 March 1906 with a heavier-than air-self-propelled airplane (no launch mechanism) over a distance of about 12 m at an altitude of one m.

The first autonomous flight of a single-engined airplane equipped with a jet engine, designed and piloted by the Romanian engineer Henri Coandă and built in the body shop of Joachim Caproni, took place in October 1910 (Fig. 13) at the Second International Motor Show And air space at Paris-Le Bourget: The air was sucked in at the front by a compressor and then directed to a combustion chamber (one on each side, at the front of the aircraft) which provided the thrust. The compressor was driven by a conventional piston engine and not by a turbine as in modern reactors.

British company Reaction Engines Limited (REL), using SABRE, a combined-cycle, air-breathing rocket propulsion system, potentially reusable for 200 flights.

## Acknowledgement

We acknowledge and thank Mr Taher M. Abu-Lebdeh, Associate Prof at North Carolina A and T State Univesity, United States and Mr Muftah H. El-Naas PhD MCIC FICCE QAFCO Chair Professor in Chemical Process Engineering Gas Processing Center College of Engineering Qatar University and Ms Shweta Agarwala, Senior Research Scientist at Singapore Center for 3D Printing Nanyang Technological University Singapore for their suggestions and comments. The Authors acknowledge Liquid Metals Technologies Inc, Ca USA that kindly supply the samples for the characterization and Dr Francesco Tatti (FEI Company Application Specialist SEM-SDB) for its contribut in the preparation of this paper experiments and analyses. The authors would like to appreciate the facilities and assistance provided by the Advanced Technology Dental Research Laboratory, Faculty of dentistry, King Abdul Aziz University. The authors would also appreciate the research technicians, Basim Al Turki and Fahad Al Othaibi for their cooperation.

## Funding Information

This research was partially funded by Italian Ministry of University and Research with the project FIRB "Future in Research 2008", # RBFR08T83J.

## Author's Contributions

All the authors contributed equally to prepare, develop and carry out this manuscript.

## Ethics

Authors declare that are not ethical issues that may arise after the publication of this manuscript. This article is original and contains unpublished material.

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