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Presentation of Romanian Engineers who Contributed to the Development of Global Aeronautics – Part I

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Abstract: It is said that "the Romanian is born poet". And so it is, but we could say rather that "the Romanian is born and an engineer", having deeply embedded himself, the vocation of the builder, the innovator, the inventor. The great cathedrals, the beautiful monasteries built, or even the churches and churches (built or wooden) clearly show this vocation. After centuries, the "Voroneț blue" still retains its vivid colors, even on the outer walls, beaten by rain, snow and wind. Suveica, the loom of war, the potter's wheel, the water and windmills, the musical instruments, the wells or the fountains, the agricultural tools, the traditional Romanian houses with porch, are only some proofs of the folk craftsmanship (engineering) over time. Ever since the beginnings of civilization on today's territory of Romania, the inhabitants of these lands have been pioneers in the creation and have thought of things that others have found much later. Henri Marie Coanda (June 7, 1886 - November 25, 1972) was an Academician and Romanian engineer, aviation pioneer, physicist, inventor, inventor of the reaction engine and discoverer of the effect that bears his name. The first "Coanda" attested in the village of Strehaia was in 1630, Vlădoianu Coanda. From the same source (Strehaia City Hall), we learn that Matei Coanda was the protector of Iancu Jianu, the defensive hood of the orphans. Henri Coanda was born in Bucharest on June 7, 1886, being the second child of a large family (Henri had four brothers and two sisters, a total of seven children). His father was General Constantine Coanda, a former mathematics professor at the National School of Bridges and Highways in Bucharest and former Prime Minister of Romania for a short period of time in 1918. His mother, Aida Danet, was the daughter of French physician Gustave Danet. Even from childhood, the future engineer and physicist was fascinated by the miracle of the wind, as he will later remember. Henri Coanda was first a pupil of the Petrache Poenaru School in Bucharest, then of St. Sava High School in 1896 where he attended the first three classes, after which, at 13, he was sent by his father who wanted to guide him towards his career Military High School in Iasi, 1899. He graduated high school in 1903, receiving the rank of major sergeant and continuing his studies at the School of Artillery, Genius and Marine Officers in Bucharest.

Keywords: Romanian Engineers, Development of Global Aeronautics, Aerospace, Aeronautics, Energy

Introduction

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Ever since the beginnings of civilization on today's territory of Romania, the inhabitants of these lands have been pioneers in the creation and have thought of things that others have found much later.

Apolodor Bridge in Damascus is one of the ancient techniques of Romania. It was built between 102 and 105 AD by Christ of Emperor Trajan, Roman architect and constructor of Greek-Syrian origin, Apolodor (from Damascus) and "united" the Roman Empire with Dacia. The bridge was 1,135 meters long and 18 meters wide and was made of stone masonry with superstructure and oaken parapets. Among the last components were two small viaducts, also executed with stone masonry bolts and at each end of the bridge, above the grate, there was an impressive portal. One foot of this bridge is still preserved today in Drobeta Turnu-Severin.

Constantin Brancusi (born February 19, 1876, Hobita, Gorj - March 16, 1957, Paris) was a Romanian sculptor with overwhelming contributions to the renewal of the language and the plastic vision in contemporary sculpture. One of his most famous works is "The Infinite Column", which he made with the engineer Georgescu Gorjan.

The one who put into practice what Constantin Brâncuşi did on paper was the engineer Ştefan Georgescu Gorjan. The Infinity Column has a metal core, tubular cornier profiles and steel flats, assembled in the workshop.

The construction has three sections. The top section is just bumpy. In the main section, Gorjan also used rivets and concrete was poured into the column. The foundation of the column is 5 meters deep and is made in steps. The column was metalized by spraying brass wire.

Nicolae Vasilescu-Karpen (born December 10, 1870, Craiova - March 2, 1964, Bucharest) was a Romanian scientist, engineer, physicist and inventor. He has carried out important pioneering work in the field of elasticity, thermodynamics, remote telephony, electrochemistry and civil engineering. Member of the Romanian Academy.

In 1909, he proposed for the first time in the world, through a note addressed to the Paris Academy of Sciences, the use of high-frequency carrier currents for long distance cable telephony. He made the Karpen pile, which works exclusively using the warmth of the environment.

After Professor I. Solomon, President of the French Physical Society, Vasilescu-Karpen, "invented the combustion chamber half a century before people came to the Moon for it."

Nicola TESLA (10 July 1856 - 8 January 1943).

The great scholar Nikola Tesla was Romanian. He was a Romanian-born Istron and called him Nicolae Teslea, a Serb-Croatian citizen, descended from Romanian parents (Macedonian Romanians from Banat, or "Alexandro-Romanians" as they are also said to Romanian citizens of Macedonian ethnicity, or istro-Romanian, the istriotians come from the Croatian area of Serbia, from the Istrian Peninsula, situated in the north of the Adriatic Sea, the area was historically conquered and re-conquered. After first belonging to the Hunters, it passed to the West Roman Empire, was plundered by the Goths and Longobardi, annexed to the French kingdom, subject to the Carinthian dukes, then to Meran, Bavaria, after which he passed by the patriarch of Aquileia and belonged to the Republic of Venice and then passed under the power of the Austro-Hungarian Empire of the Habsburgs, with an interruption in the time of Emperor Napoleon who has been annexing it for a while. After the First World War he came under Italian protection and after World War II it was annexed by Serbia, when Tito, with the support of the Russian Communists, created the Serbian Yugoslav Empire. Several years after the "communist camp" broke down, the Croats returned to the island. Among the istriot communities, there are also the Istro-Romanians coming from Banat, Transylvania and Timoc).

Nicolae Teslea, or shortened Nicola Tesla (as it is generally known to Americans where the universal genius Nicola has remained and spent most of his life, making it difficult to pronounce "Teslea"), is considered the inventor of the generator alternating current and uncovered cableless power transmission. It is attributed to the transmission of energy through monophase, biphasic, polyphase alternating currents and transmission of non-wired energy by electromagnetic waves (oscillations) in the industrial alternating currents (102-109 [Hz]) band, overlapping band with radio frequencies (the radio band being even more extensive than that of alternative industrial currents).

A scientist and prolific inventor of electronics and radiotechnika, the discoverer of the spinning magnetic field (simultaneously with the Italian Galileo Ferraris, 1847-1897), Tesla invented both the biphasic and polyphase alternating electric currents and studied the high-frequency current. He built the first two-phase asynchronous motors, the electric generators, the high-frequency electric transformer and so on. In atomic, he researched the atomic nucleus fission, with the help of the high voltage electrostatic generator and was also a pioneer of nuclear power based on nuclear fission reactions. (Einstein was contacted and visited personally by his research in this field). By working permanently in industrial bands, Tesla has inevitably given over radio waves whose frequencies overlap with those of alternating currents.

Even though Marconi made the first radio broadcasts over the ocean, a little before Tesla, yet at the basis of his achievements were all the patents and works of Tesla, which Marconi had studied in detail. Tesla is the first and foremost builder of the world's first and largest radio stations. In 1899, Tesla builds a large 200kw radio station in Colorado, conducts wireless telegraphy transmissions over 1,000km and manages to get 12 million volts of volumes to produce the first artificial lightning (lightning).

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He drives the first unmanned ship by radio, from a distance to a public demonstration on the ocean, in New York.

Transmits concentrated energy through long-distance electromagnetic waves, the energy it uses to power remote consumers or remote control.

Tesla deals with natural energy, the production of artificial earthquakes based on huge energies using very low frequency waves (Tesla is the first to accurately determine the resonance frequency of our planet), acceleration of nuclear particles to very high energies and targeting them or microwaves concentrated in beam (deadly rays) capable of reaching and destroying a target at a great distance (airplane, rocket, ship, etc.).

He proposes to build a defensive shield to defend America, but even the planet, if needed (the current US defense shield of the Earth is a continuation of his work). It imagines, presents and designs wireless audio-video transmissions (but was too early to implement them massively, technologies were a long way from discovering it; the pieces were then lamps and tubes, there were no chips or integrated circuits, not even transistors).

We can certainly believe that Tesla is actually the true "Parent of Informatics" (Petrescu, 2016).

Methods and Materials

Henri Marie Coanda (June 7, 1886 - November 25, 1972)

Academician and Romanian engineer, aviation pioneer, physicist, inventor, inventor of the reaction engine and discoverer of the effect that bears his name.

The first "Coanda" attested in the village of Strehaia was in 1630, Vlădoianu Coanda. From the same source (Strehaia City Hall), we learn that Matei Coanda was the protector of Iancu Jianu, the defensive hood of the orphans.

Henri Coanda (Fig. 1) was born in Bucharest on June 7, 1886, being the second child of a large family (Henri had four brothers and two sisters, a total of seven children). His father was General Constantine Coanda, a former mathematics professor at the National School of Bridges and Highways in Bucharest and former Prime Minister of Romania for a short period of time in 1918. His mother, Aida Danet, was the daughter of French physician Gustave Danet (Petrescu, 2016).

Even from childhood, the future engineer and physicist was fascinated by the miracle of the wind, as he will later remember. Henri Coanda was first a pupil of the Petrache Poenaru School in Bucharest, then of St. Sava High School in 1896 where he attended the first three classes, after which, at 13, he was sent by his father who wanted to guide him towards his career Military High School in Iasi, 1899. He graduated high school in 1903, receiving the rank of major sergeant and continuing his studies at the School of Artillery, Genius and Marine Officers in Bucharest.

Fig. 1: Henri Coanda was born in Bucharest on June 7, 1886

Although many remarkable soldiers were in his family, he considered the military career as mediocre and had the desire to become an engineer. Following the voice of conscience, he left for Germany in 1904-1905 and enrolled at the Royal University - Technische Hochschule Charlottenburg, near Berlin, where he obtained the title of mechanical engineer, then attended university courses in Liège (Belgium) and the School Upper Electricity from Montefiore (Italy), where he obtained his degree in Electrical Engineering Specialist.

In 1908 he returned to the country and was an active officer in the 2nd Artillery Regiment. Due to his nature and inventive spirit, who did not agree with military discipline, he sought and obtained approval to leave the army, after which, taking advantage of the reclaimed freedom, took a long journey by car on the Isfahan - Tehran - Tibet route. On his return to France, he enrolled in the Upper Aeronautics and Construction School, newly established in Paris, 1909, whose graduate becomes the next year in 1910 as the head of the first aeronautical engineer's promotion.

After completing his studies he worked at the Nice sites, led by the famous engineer Gustav Eiffel. The Ph.D. in Engineering has been very successful in Charlottenburg. With the support of engineer Gustave Eiffel and scientist Paul Painlevé, who helped him get the necessary approvals, Henri Coanda performed the aerodynamic experiments and built the first reactive propulsion aircraft in Joachim Caproni's bodywork, a reaction plane, without a propeller, conventionally called Coanda-1910, which he presented at the second International Air Salon in Paris 1910 (Fig. 2).

During a flight attempt in December 1910 at Issy-les-Moulineaux airport near Paris, Henri Coanda's escapee was out of control because of his lack of experience, he hit a wall at the edge of the take-off land and it set on fire. Fortunately, Coanda was projected from the airplane before the impact, choosing only the fear and a few minor contusions on his face and hands. For a while, Coanda has abandoned experiments due to the lack of interest from the public and scholars of the time.

Between 1911 and 1914 Henri Coanda worked as technical director at the Aviation Factories in Bristol, England and built high-performance propellers of his own design. In 1912, one of them (a bimonthly aircraft project - until then the planes had a single engine) won the first prize at the International Aviation Contest in England (Fig. 3) (Petrescu, 2016).

By manufacturing the apparatus called Bristol-Coanda, the plant has become one of the world's largest airplane manufacturing plants, selling its appliances in Germany, Italy, Spain and even Romania.

In the following years, he returns to France. In the years 1914-1918, Henri Coanda worked at Saint-Chamond and SIA-Delaunay-Belleville in Saint-Denis. During this period he designs three types of aircraft, the most famous of which is the Coanda-1916 reconnaissance plane, with two propellers close to the tail of the aircraft.

Coanda-1916 is similar to the Caravelle transport plane, whose design actually took part. It gives life to a car-powered car powered by a reaction engine and a first aerodynamic train in the world (Petrescu, 2016).

In 1926, Henri Coanda, in Romania, puts in place a device for the detection of liquids in the soil, used mainly for petroleum prospecting.

In 1934, he obtained a French patent for process and device for deviating a stream of fluid flowing into another fluid, which refers to the phenomenon called today the "Coanda Effect", consisting in the deviation of a stream of fluid flowing through along a convex wall, a phenomenon first observed by him in 1910, on the occasion of the test of the engine with which his reaction plane was equipped.

This effect has and still has precious applications in flight technology today. Thus, the most modern flight machines use the Coanda effect for improved flight sustainability at low speeds and for increased comfort and safety.

In the picture below (Fig. 4) there is a modern super heavy designed by Coanda (the C-17 Globemaster III) (Petrescu, 2016).

And the Hercules C4 models use the Coanda effect today (Fig. 5).

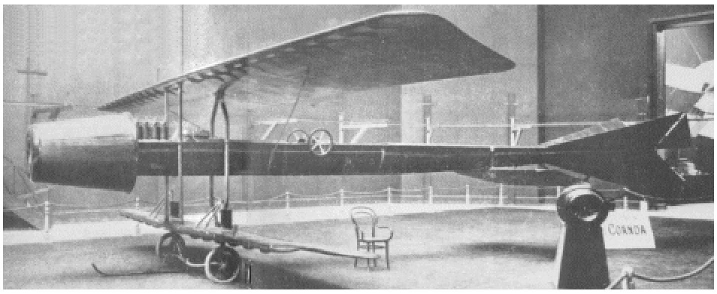

Fig. 2: Henri Coanda performed the aerodynamic experiments and built the first reactive propulsion aircraft in Joachim Caproni's bodywork, a reaction plane, without a propeller, conventionally called Coanda-1910, which he presented at the second International Air Salon in Paris 1910

Fig. 3: Between 1911 and 1914 Henri Coanda worked as technical director at the Aviation Factories in Bristol, England and built high-performance propellers of his own design. In 1912, one of them (a bimonthly aircraft project - until then the planes had a single engine) won the first prize at the International Aviation Contest in England

Fig. 4: A modern super heavy designed by Coanda (the C-17 Globemaster III)

Fig. 5: And the Hercules C4 models use the Coanda effect today

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McDonnell Douglas YC-15 also uses the Coanda effect to make a comfortable trip at low speeds (Fig. 6).

NOTAR helicopters have replaced the classic tail along with the classic rotor with a tail designed according to the Coanda effect (Fig. 7).

Several aircraft, especially the Boeing YC-14 (the first modern type to exploit the effect), were built to take advantage of this effect by turbofan mounted on the top of the wing to provide a rapid flow of fluids besides fuselage, balance stability and better ship dynamics even at low speeds (Fig. 8) (Petrescu, 2016).

Fig. 6: McDonnell Douglas YC-15 also uses the Coanda

Fig. 7: NOTAR helicopters have replaced the classic tail along with the classic rotor with a tail designed according to the Coanda effect

Fig. 8: Boeing YC-14 aircraft also use the Coanda effect

Results

This discovery led Coanda to major applicative research on aerodynamic hypersurance, sound attenuators and more. Coanda has been directly and indirectly involved in the development of various secret projects in the USA, Canada and the United Kingdom since the Second World War (the funds received for the completion of these strictly secret projects have even increased over the period cold war).

Canada "Avro VZ-9 Avrocar" was a VTOL aircraft developed by Avro Aircraft Ltd. (Canada) as part of a secret US military project in the early years of the Cold War.

Avrocar was designed to exploit the effect of Coanda to provide lift and traction from a single "turbo-engine" and blowout from the edge of the disk-shaped aircraft to provide extreme and quick (instantaneous) handling of the VTOL to greatly increase its performance.

In the air, he would even sow a flying saucer.

Two prototypes were built as "proof-of-concept" testing vehicles for a more advanced USAF fighter and also for the US Army (tactical combat aircraft), Fig. 9.

In the flight test, Avrocar proved to have some unresolved problems in the traction force, but also some stability problems, so the number of ships built was very limited and later the project was canceled in September 1961 (Petrescu, 2016).

Through the history of the program, the project was mentioned by a number of different names (Other Projects). Avro referred to efforts as a Y project, with individual vehicles, known as Spade and Omega. The Y-2 project was later funded by the US Air Force, which referred to it as the WS-606A, the 1794 project and the Bug Silver project. When the US Army joined the efforts to complete the AVRO project, the project got its final name "Avrocar" and the name "VZ-9" for a part of the US VTOL VTOL projects on the VZ series.

Avrocar was the end result of a series of Blue Sky research projects designed by designer Jack Frost, who joined AVRO Canada in June 1947 after working previously with Coanda for several British companies. He was with Havilland in 1942 and worked together on Havilland de Hornet, Havilland Vampire and Havilland the Swallow and he was the chief designer for supersonic models. At Avro Canada, he worked on Avro CF-100 before creating a research team known as the "Special Projects Group" (better known as the GSP). First of all, Frost has created a special team of smart engineers and then has created a new job. Initially arranged in the "Penthouse" of the administration building, the GSP was then moved to a structure opposite the Schaeffer building, which was secured with maximum security (guards, locked doors and special cards for each pass, etc.). However, the GSP also operated in a separate, specially designed hangar, far from any potential viewers, experiments being done together only with other AVRO teams (who were also working on similar projects).

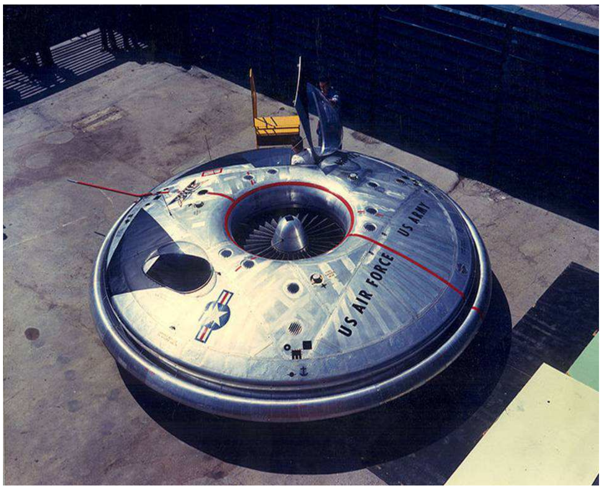

Fig. 9: A more advanced USAF fighter and also for the US Army (tactical combat aircraft)

At that time, Frost was particularly interested in designing reaction engines and ways to improve the efficiency of the compressor without sacrificing the simplicity of turbine engines. He discovered Frank Whittle's reversed flow and was also interested in the new ways of "cleaning." This led him to design a new type of engine that sent the flames directly off the outer edge of the centrifugal compressor, pointing outward like the spokes of a wheel. The power of the compressor was obtained from a new turbine-like type with a centrifugal fan, unlike the most typical propulsors (such as the turbine), thus causing the compressor to use gears rather than a shaft. The resultant engine thus had no conventional pushing axis, being arranged in the shape of a large disk, for which Frost referred to it as a "rinse engine." The thrust came out (gushing) all around the motor, which had problems in trying to adapt the engine to a typical aircraft (Aversa *et al*., 2017a-e, 2016a-o; Berto *et al*., 2016a-d; Mirsayar *et al*., 2017; Petrescu and Petrescu, 2016a-c, 2013a-d, 2012a-d, 2011a-b; Petrescu, 2012a-c, 2009; Petrescu and Calautit, 2016a-b; Petrescu *et al*., 2016a-c).

At the same time, the aerospace industry as a whole has been increasingly interested in VTOL aircraft, or in their similar models. It was expected that any future European or Asian war would start with an exchange of nuclear attacks that would initially destroy most air bases so that new types of aircraft should be able to operate from any limited, roads or fields, even unprepared bases (areas). Considerable research efforts have been put into various solutions that are capable of taking over and launching the second blow. All of these solutions included ships capable of launching anywhere, without the need for an airport or even a launching line, vertical take-off aircraft, missiles, etc. The second blow (the second impact after the first nuclear impact) was to be done with all nuclear missiles, some

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of them launched from flying planes (such as the launch of the zero-length concept), while many companies started to work on VTOL aircraft as a more appropriate long-term solution.

Frost felt that the excellent performance of his new engine would be a natural match for a VTOL aircraft due to his very high power/weight ratio. The problem was how to use the circular pull force to drive the ship forward (right), as well as the problem of mounting the very large engine in an appropriate frame (structure). Frost suggested using a series of holes to redirect the flow of the engine's "face" to its rear, although it was well known that long sewerage leads to a loss of pushing power. In order to keep the pipelines as short as possible, the project pulled out the force along the edge, resulting in a very large delta wing. As the engine was disk-shaped, the triangular shape was "pushed out" near the face, producing a platform like a splinter. For this reason, the design was also referred to as "Avro Ace", a likely reference to the Ace of Spades. The intake compressor was located in the middle of the engine, so the engine air intakes were right in front of the center on the top and bottom of the aircraft. The cockpit was positioned above the main camp behind the sockets. Several versions of other core structures were also studied, including "Omega," which was more on disk.

For VTOL operations, the aircraft was expected to stand upright with long legs, which descended from the backbone (from the ship's axis). The landing would have taken place at a very large angle, making visibility in this very difficult time. A number of other VTOL experiments at that time have attempted various other solutions to this problem, including the rotation of pilots and the cabin, but none proved to be very effective. Another problem with the various VTOL experiments was that the stability of the vessel during floating was rather low, being difficult to achieve (including balancing it especially at low speeds or at stops in the air at a certain height). A solution to this problem would require the traction force to be directed downward to a larger helicopter area (surface) where the ascent is provided by the entire surface of the rotor (main propeller). Most designers have called to stop the air from the engine compressor and drive it through multiple pipes around the ship.

Frost's engine design used such a large number of side nozzles for sustainability that it was not easy to build practically.

In 1952, the design was quite advanced, so the Canadian defense research council, through a supplementary effort (with a $ 400,000 contract), managed to refinance the project by keeping it alive. By 1953, a Y model layout was completed (figure above). It seems, however, that the Y project was considered too costly within the military unit on which it was directly dependent and which was at the time involved in many such extremely expensive (air defense) projects. On February 11, 1953, a story about the project along with images of the Omega project was extensively presented by Toronto Star (apparently in order to obtain additional funding, a widely used strategy in the US at that time, known under the name of the press policy). The result: Five days later, the Defense Minister informed the House of Commons that Avro was indeed a "flying saucer" model capable of flying at 2,400 km/h and climbing vertically. However, the additional financing of the project has not existed.

The Y project continued slowly only with the initial funding and Frost became interested in the Coanda effect in the meantime, where fluid flows would follow the highly convex forms. Frost felt that Coanda's effect could be used in conjunction with his engines to produce a more practical, more stable, VTOL aircraft by a cheaper and simpler solution by straightening outward fluid flows to track the convex profile of the ship and then to escape (to be pointing down). This would produce a higher lifting force and evenly distributed on the edge of the entire aircraft, allowing it to land "flat". He produced a number of small models, then experimented with compressed air instead of an engine in order to select a form of platform as appropriate as possible and ultimately decided that a disc would be the best solution.

As Frost continued these experiments, he found that the same VTOL steering system worked as well for the forward flight. In this case, the disk shape was not a good lifting surface itself, as it was neutral with respect to the lifting direction since it would fly laterally as fast as it would fly forward. However, by modifying the airflow with the application of a small amount of jet pushing, the overall airflow on the craft could be dramatically modified, creating a kind of "virtual paddle" of any required configuration. For example, by directing even a small amount of traction jet down, a large mass of air would be drawn over the top surface of the wing and would considerably increase the flow over the wing by creating the lift effect.

This solution with the use of the Coanda effect appeared to provide a solution to one of the most troublesome problems of the era, the design of an aircraft that is effective at subsonic and supersonic speeds at the same time. The subsonic elevator is created by the airflow around the wings, but the supersonic lift is generated by the shock waves at the critical curve points. Only one design could offer high performance for both regimes. The blown disk could solve this problem, being provided for supersonic performance only and then use traction jets to modify the flow of air to subsonic regimes, thus creating a look of a normal wing. The resulting design will be adjusted for high performance in supersonic modes, while achieving subordinate reasonable performance, thus giving VTOL all the settings in a unique design.

At the end of 1953, an American Defense Expert Group visited Avro Canada to see the new CF-100 battle jet. Frost introduced the models AVRO VTO Y-2 (picture right-down) and Avrocar (picture from left to bottom), Fig. 10 (Petrescu, 2016).

The USAF agreed to take over Frost's Special Projects Group and immediately signed a US $ 750,000 contract valid until 1955. By 1956, Avro's management received another $ 2.5 million to build a prototype "private venture". In March 1957, Air Force added additional funding and the aircraft became the "System 606A" weapon, now manufactured in series (Fig. 11).

Fig. 10: The Avro VTO Y-2 (right) and Avrocar (left)

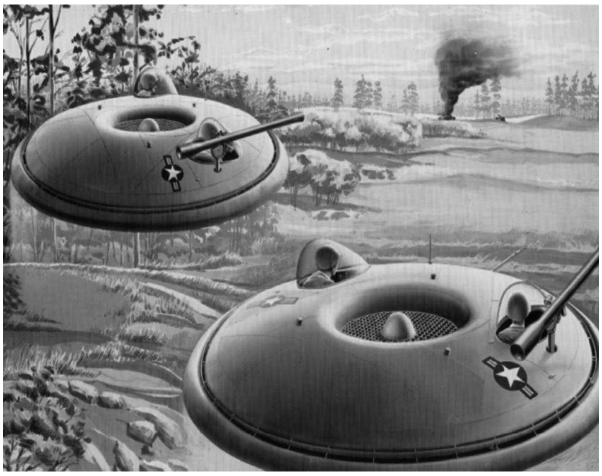

Fig. 11: In March 1957, Air Force added additional funding, and the aircraft became the "System 606A" weapon, now manufactured in series

Discussion

Returning to Coanda, who after World War II was involved in various military projects of the US Army, most of which are still inaccessible, we can say that his life has proved to be a talented musician, sculptor, inventor and discoverer of some natural laws that he has become known throughout the world. From childhood, he played the cello. As a student in Iasi, concert in a chamber music quartet and as a student in Berlin, he sang at the cello in the famous symphonic orchestra of the German capital. Also in Berlin, Henri Coanda was the student of the famous master, the German sculptor Rudolf Marcusse and in Paris, he worked in August Rodin's workshop where he made some sculptures and where he became friends with the great and brilliant creator of the modern sculpture, Brancusi.

But he did not neglect the sport either. The young engineer doctor, employed at Krupp Plant in Essen, participated in riding competitions organized on the Berlin hippodrome, where he qualified for obstacle and speed tests for amateurs.

As a scientist and inventor, he is the author of 250 important inventions, for which he obtained 700 patents of intellectual property and protection in many countries of the world (Petrescu, 2016).

His greatest passion was aviation (aeronautics). In his youth aviation was at the beginning. He was 19 years old when he built a model of a rocket-propelled aircraft at the Spirei Hill Army Arsenal (Bucharest). At age 20, at Montefiore, together with a colleague, Caponi, he built a sailboat with which they flew.

At the age of 22, he made the non-propeller plane project, built with money from his father's savings.

This plane, the world's first non-propeller, was launched on December 16, 1910 (when Coanda was only 24 years old) on the aviation field at Yssy-les-Moulineaux, near Paris, after being watched with a great curiosity of the visitors of the aeronautical salon of that year. On an inventory drawn by the inventor, the term turbocharger also appears for the first time.

The aircraft designed and built by H. Coanda was a biplane with overlapped wings, joined by two pairs of steel pipe bars. The 1250-foot-long fuselage was cylindrical in shape, well-polished mahogany wood. The wings were made of a metal skeleton wrapped in mahogany plywood. The 50 hp engine was fitted to the front of the fuselage in a cylinder and operated the turboprop in which there were several sprockets on a common axis. The total weight of the appliance was 420 kg. It was bombed Coanda Airplane 1910. The plane flew, but it burned and burned. The pilot has been selected for body injuries, fractures on the forearm and since then he has been unable to sing or to carve the cello. But the whole world aviation has adopted it, perfected it and produces it industrially in tens of thousands of copies flying in the earth's atmosphere carrying millions of passengers and huge quantities of cargo every year. In 1914 he invented the first non-rebounded cannon destined for combat planes. In 1918 he designed the first prefabricated concrete elements for the construction of dwellings, a gold medal-winning invention at the Paris, Nice, Padua exhibitions. After a short visit to the country, after being in the Prahova Valley oilfield, he invented a gas-lift oil extractor, simpler and with greater efficiency than similar devices.

To desalinate seawater for use as drinking water in desert areas near the sea, he invented a solar energy device consisting of a 15m2 mirror that could purify 1500 l/day using an equivalent amount of energy with gasoline from a lighter.

In 1934, he discovered a physically unknown phenomenon until then, making an important contribution to the heritage of fundamental knowledge of mankind, which laid the foundations of fluid mechanics, quoted in the specialized treatises as the Coanda effect. The effect is found in fire retardation brake; the device for improving the internal combustion engine efficiency; propulsion of air vehicles; gas turbines; fluid amplifiers; noise silencers, a.a. This effect has been patented in France under the title "Procedure for deviating a fluid into another fluid".

In 1935, based on Coanda's effect, the inventor built the lenticular aerodynamics, the UFO flying fly, which then underwent many improvements and which is still experienced in secret by NASA, in more advanced forms than the projects taken over by USA from AVRO Canada.

Let us turn our attention to one of the most revolutionary inventions of H. Coanda - the lenticular aerodrome - the 21st century.

In the summer of 1969, on holiday in his native country, Henri Coanda said: "... I have many concerns ... now, of all the problems, the acutest for me are those related to the plane that will be built on lenticular aerodynes, the so-called flying saucers, also a result of applying this effect ... ". In fact, still in the article published in no. 32 of 1965 of the ICARE journal of French line-trackers, Henri Coanda, after describing the principle of the lenticular aerodynamics, underlined a revolutionary idea linked to the propulsion of the new means of flight: "... It may be that starting from the discovery of the plasma made by Langmuir, some are about to find a new means of directing and directing it than the magnetic field ... ". And recently, the Norwegian researcher Leik Myrabo of the Rensselaer Institute has (re) demonstrated that the optimal shape that best adapts to the very high-speed flight requirements is the lenticular aerodynamics, in the conceptions of the Norwegian aerospace engineer, the shape of future 21st-century flying vehicles.

Moreover, there are opinions that the aerospace flight crew construction industry is to be revolutionized by the theory formulated by Myrabo engineer. This, assisted by Russian physicist Yuri Raizer, has developed the hypothesis of the so-called "aerospace piscine". In principle, the concept aims to use a new form of energy manifestation that would come from processing and be controlling the environment that outlines the very lenticular aerospace vehicle in flight. In this context, the "aerospace peak" would be triggered by the launch of a microwave beam or laser beam, capable of causing an intense and continuous ionization phenomenon of the environment. This process causes the release of a large amount of energy which, in order not to be explosive and thus destructive even to the radiation emitter, will be transmitted in the form of successive deflagration waves, similar to successive pulses of energy, the result of which will be a paraboloidal shock wave.

This "energetic paraboloid" will surround the airplane as a protective cover (without touching and thus transmitting its very high temperature), which will ultimately lead to substantial reduction of aerodynamic braking forces with the unwanted thermodynamic consequences of these.

Certainly, a scientist of Coanda's scientist could not fail to recognize the exceptional improvements made to the modern performance aircraft capable of evolving into the stratosphere at speeds corresponding to Mach-3, but he believed that this process was achieved with immense intellectual efforts and expensive energy.

With the exception of the English supersonic aircraft Harrier, capable of evolving and fixed, in addition to vertical take-off and landing, aviation could not solve the "fixed point" problem, which Coanda resolved by creating the lenticular aerodynamics.

Moreover, since 1932, Coanda was concerned with the lenticular aerodins: two patents obtained in France and one, in 1936, in Romania. This latest patent, entitled "Improvements to Propellers", also includes the drawing of a lenticular aerodrome in the shape and design of those years. At that time Coanda formulated the principle of his lenticular aerodynamics: "... thus a static pressure gradient can be achieved in around a symmetrical body so that the sum of the pressures taken with their marks lead to a result at least equal to the body weight and oriented so as to sustain it ... we sought to obtain and maintain the atmospheric pressure.

Continuing my attempts, I came to achieve very good results because it was relatively easy to get pressure differences that could reach up to 9000 [kg/m2] or even more on some small surfaces, were obtained using working fluid pressure upstream of the 1.5 [atm (2.5att)] slot. "As for the slot, it had openings ranging from one-third to half-centimeters. Undoubtedly, the experience had to be prepared so that in no way the environment would take the place of the void, which in these

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conditions was obtained in a proportion of about 90%. The continuity of the slot, having the circular or oval shape, was absolutely necessary to eliminate the "marginal losses". I remember that under such conditions the air was relaxed from the atmospheric pressure to the value of a significant depression, reaching a speed of up to 530 m/s, which caused temperatures to rise even in the order of 100 degrees Celsius, accompanied by the occurrence of some waves of shock. "

These lines written by Coanda were a blueprint of how the idea of lenticular aerodins, their operating principle, aerial vehicles capable of maintaining themselves in the air without moving components in the environment in which they were to move. On this occasion, the scientist emphasized the main issues that had to be solved for the new lenticular aerodromes to become truly autonomous and unimportant means of flight: to ensure stability in any flight maneuver and to maintain atmospheric pressure on the fly "flying saucer".

The scientist stated that during experiments conducted with small-scale aerodrome models he found and applied satisfactory solutions to these problems. The practice has also found other difficulties, including fluid supply to the required slots and here the difficulties have become almost without number.

Before mentioning some of the results obtained even with aerodrome models in the years 1932-1936, Coanda confessed that solving the practical problems posed by the slit feed "... waited for three decades until the emergence of TURBOMECA compressors and Pescara free piston engines, in order to get close to the solution with minimum moving parts and no noise ... ".

Since Coanda made experiments on models, he was able to argue for the behavior of fluid jets (air) that were heavily absorbed in the depression area, thus achieving local displacement velocities of the supersonic fluid (Mach ranging from 1.2 to 1.3), obviously at virtually zero altitude and even some relatively low shock waves, which were accompanied by an increase of up to 100 [°C] of the temperature of the mobile fluid.

Thus, a new type of discoidal aircraft was designed, hence the relatively improper name of "flying saucer" taken from fantastic literature.

This was a flying structure like a disk, bulging in the region of the symmetry center, which could be maintained at a fixed point or could evolve at high speed in any direction.

Because the HARRIER supersonic jet, with a highly vectorized traction, fulfilled some of these desiderata, it must be stressed that in addition to Harrier, the lenticular aerodynes have the possibility to change the direction they wish to evolve during the flight in the sense of that these changes of direction are made suddenly and directly (without turns)!

The problems of stability, orientation and guidance of these lenticular aerodrains have been concerned with Coanda for over 3 decades; some of his ideas were concretized by the French patent no. 1156516, published May 19, 1958, which referred to a disk-shaped aerodrome capable of maintaining or evolving in a "fixed point" altitude and having a high degree of autostability.

The composition of these aerodromes included several Coanda interior nozzles designed to absorb the air from the back of the apparatus and then evacuate it to the ground in order to sustain and perform maneuvers of climbing or lowering the apparatus.

Coanda has obtained the auto-stabilization of the fly sail that he designed with a special nozzle arrangement so that the elongations of their longitudinal axes compete in the pressure center of the apparatus above the center of gravity of the appliance.

As far as aerodyne displacements are concerned, they were obtained by nozzle jets located properly at the periphery of the flying disk. Particular attention has been paid to nozzle ejection coefficients, respectively, to the increase in the ratio of ambient air masses.

Regarding the methodology of controlling the movements of these lenticular aerodrails in the conditions of the vertical evolutions, Coandă emphasized that the main attention should be paid to the realization of an automatic correlation which must be ensured between the intensity and the direction of the jets meant to carry out these maneuvers. In this regard, Coanda has proposed an automatic assembly of simultaneous control of the nozzle end positioning and directional elements located on the periphery of the flying apparatus, having a known discoidal shape.

A certain solution has been included in the French patent no. 1158539, published June 16, 1958. Significantly, according to the calculations made by Coanda itself, the use of two "Tramontane" turbochargers manufactured by the French company TURBOMECA could theoretically reach an ascent speed of up to 2 km/minute, or nearly 33 m/s, which exceeds the performance of the McDonnell Douglas SKYHAWK US Air Force combat aircraft!

In one of the conversations by the former journalist and writer V. Firoiu, Henri Coanda referred directly to the lenticular aerodynes and to the first aircraft that would contain such aerodromes, grouped around a cylindrical fuselage located at the pressure center of the four- suppressive forces appearing on those discs. Coanda then stated: "... I believe that what is right to remember between the features of this new flying machine is that it does not have any mechanical parts in motion, thus being destined for a long life and maintenance of the least expensive. It's a lightweight device that will weigh under a ton, at speeds of up to 800 km/h, with a range of about 5000 km, using propane as fuel ... The privilege of taking off anywhere and landing vertically eliminates the requirement for aerodromes ... including access systems to aerodromes ... Not long after, the first discoid plane will answer many questions about the future of aviation ... "

In order to understand this, it is necessary to highlight the organization and operation of the interior nozzles. The air supply of these nozzles is provided by an annular chamber, the feed slot being provided with a "lip", whose patented profile with the Coanda effect ensures the deviation due to the depression region thus created.

The depressions on the "lip" surface mentioned above at the exit of the annular space can reach 0.8 atm.

The consequence of this high depression is highlighted on the one hand by the rapid variation of the velocity of the fluid flowing into the depression zone and on the other by a consistent air suction from the environment which causes the entrainment of a mass of air considerable.

This inductive phenomenon, realizable without the use of mechanical moving parts, is characteristic of Coanda nozzles.

Such a scheme has eliminated any system that could present a threat of aerodynamic instability.

The location of the center of gravity over the weight has led to the conclusion that the depression of such an aeronautical vehicle with a very low center of gravity is not the sole responsibility for solving the functionality of that air vehicle.

The main problem in the vertical evolution of a lenticular aerodrome is that in the situation of its specific shape it is able to maintain its balance under all conditions.

The fact that the organization of the lenticular air vehicle has to ensure a perfectly symmetrical horizontal projection allowed Coanda to choose the circular shape. Such a solution provided the analysis of the revolutionary ellipsoid, with two axes in the same horizontal plane. Still in the French patent no. 1156516/19 May 1958 Coanda stopped on an aerodrome of discoidal form, able to evolve vertically into planes with different tilts and fixed points, which involved almost automatic stability.

The organization of this aerodrome included numerous nozzles, whereby the air from the extrados is sent to the bottom, which ensures the sustainability and the other maneuvers mentioned. The stability of the aerodrome is ensured by the location of the nozzles already mentioned in such a way that their longitudinal axes converge to a point above the center of the aerodrome (Petrescu, 2016).

Air nozzle feeding during flight involves the existence of an energy generator plus a compressor assembly, the aspiration of which is carried out from the dorsal area of the vehicle. In the version proposed by Coanda, the power plant was to include a thermal generator, the hot gas masses entraining air through aspiration and then by ejection from the environment and thus contributing to an optimal operation of the nozzles.

Conclusion

In the last years of life, Coanda has invented a device for improving the operation of internal combustion engines and has dealt with one of the most important problems of interplanetary flight - antigravity.

Henri Coanda returned definitively to the country in 1969 as director of the National Institute of Scientific and Technical Creation (INCREST) and in the following year, 1970, he became a member of the Romanian Academy (Petrescu, 2016).

On November 25, 1972, at the age of 86 in Bucharest, Henri Marie Coanda leaves us, "making his last flight from this world - to a better world!"

The world has taught him to fly; better, faster, lighter, more comfortable, safer and more difficult, more, more ...! Coanda has given us all a new means of transport.

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Author's Contributions

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

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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