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Chapter 10

SOME IMPORTANT ASPECTS ON THE THREE CENTURIES OLD HISTORY OF ROMANIAN AEROSPACE TECHNIQUES*

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Romania has a long tradition in the design and construction of aircraft and aircraft engines. These contributions have helped the development of aviation; however, its interest in jet engineering—rockets—has a history that dates to the Middle Ages.

Romania's traditions place it among those nations which have made a decisive contribution in the conquering of air and space. Thus, the creative genius of the Romanian people was asserted by first-rank pioneers, not only in aviation but rocket engineering and modern astronautics. Today, the Romanian aerospace industry benefits from these traditions and the advantages provided by our socialist society. It is a duty of honor to remind one, even if only briefly, of these achievements. Henri Coandă, the world famous scientist and pioneer of flight observed,‡ ". . . few nations in the world can be proud of having contributed to the progress of aviation to such a degree as the Romanians have in the latest decades!"

A number of prolific successors to the achievements of Henri Coandă and Traian Vuia have followed, such as the constructive genius of the engineers Aurel Vlaicu and George (Gogu) Constantinescu; by the pioneering achievements of the inventors Henri August, Gheorghe Ferechide, George Varlam Ghiţescu, Ion Paulat, Partenie Crişan, Filip Mihail, George Fernic, Grigore Brişcu, Ion Romanescu, Ion Stroiescu, Gheorghe Bothezatu, C. N. Gheorghiu, Nicolae Ionescu-Saru; also by the highly valuable research of the scientists Hermann Oberth, G. Constantinescu, Elie Carafoli, Victor Vîlcovici, Caius Iacob, Nicolae N. Patraulea, Dumitru Dumitrescu, N. Stratilescu, Stefan Gheorghiţă, N. Vasilescu-Karpen etc. The Romanian aircraft industry lives at its most prolific period in history.

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† University Professor, Scientific Secretary, Commission on Astronautics of the Academy of the Socialist Republic of Romania.

‡ In his report at the symposium, "Special Applications of the Coanda Effect in Aero-Hydrodynamics," held in 1967 at the Romanian Academy, Bucharest.

It is important to remind one that the aerospace industry could not be where it is today without the assistance of the Romanian people. A great debt is owed to those engineers, designers, workers, technical experts and the test pilots of those early prototype aircraft and engines. Indeed, the Romanian School of Aviation in the last decade of progress draws from a rich tradition that began over three centuries ago.

Jet engineering can trace its origins to the studies and experiments in the city of Sibiu, by Conrad Haas (1529-1569). Haas, an artillery guard and Chief of the Arsenal of Sibiu, made the earliest studies of military rockets in *Pars Archivi Civitas Cibinensis* or *The Colligatus of Sibiu*. In the third part of this work, Haas was the first to describe the application of military rockets; triangular rudder stabilizers; as well as increasing a payload by the use of a multi-stage arrangement.

In the military arsenal at Alba-Iulia, John the Romanian (Johann der Walache) tested different rocket powder. Conrad Haas mentions der Walache's work in the *Colligatus of Sibiu*.

Alexandru Churcu (1854-1922) first suggested equipping an aircraft with a jet in 1886. With the Frenchman Just Buisson, Churcu proposed that aerostat, built by Gaston Tissandier and exhibited at the Paris Exhibition of Electricity, be equipped with a "jet cylinder." This jet cylinder received French patent No. 179001 in 1886. Churcu foresaw the future of jet propulsion. He conceived equipping ships with jet engines; the jet whaler was tested on the Seine on August 13, 1886. Similarly, Churcu's idea of the "jet rail car," was tested in 1888, observed by Emile Sarrau and Paul Vielle. Churcu believed that all of his ideas and inventions should be used in peaceful applications.

In 1899, Gheorghe Varlam Ghiţescu (1858-1936) designed the first dirigible to carry a crew. This original design was for agro-forest service. Ghiţescu's designs were theoretically superior to similar craft of the period.

On February 16, 1903, Traian Vuia's (1872-1950) work, "Projet d'aeroplan automobile," was published in the *Comptes rendus ed l'Academie des sciences*. This aircraft design, which Vuia latter built, was patented No. 332106 on August 13, 1903 by the Office national de la porpriété industrielle de la République Francaise. The Vuia No. 1 was equipped with an engine that Vuia also designed and built. The Vuia No. 1 first flew on March 18, 1906, and was the first "heavier-than-air" aircraft which took off under the power of its own engine.

Henri Coandă (1886-1972), the world famous inventor and pioneer of jet engines, made great contributions to space engineering. He equipped an airplane with a rocket engine in 1905; built and flew the world's first jet engine plane, the Coandă-1910. The Coandă-1910 was exhibited at the Second Show of Aeronautics and Automobiles in Paris in 1910. Coandă built the first twin-engine airplane in 1911. This plane was equipped with two Gnôme rotary engines.

In 1911, Ion Paulat (1873-1954) built the world's first amphibian hull aircraft. The plane was to be equipped with two engines in the original design but was equipped with only one because of lack of financial resources.

In 1910, Grigore Briscu published a study that described his experiments concerning the use of the cumulative rotor for propulsion and support.

At the International Flying Contest in Aspern, Austria in 1912, Aurel Vlaicu (1882-1913) won several prizes flying his original A. Vlaicu No. II aircraft. He excelled over noted personalities such as Roland Garros.

Between 1918 and 1922, Traian Vuia built and flight-tested two helicopters. His second design had a mechanical drive from the engine to the lifting rotor. This practically proved the "the rotating wing can ensure both support and propulsion. In 1919, Vuia published in Paris, *Etude experimentale sur les plans inclinés en rotation*, (An Experimental Study on Rotating Incline Planes). In 1920, his helicopter was patented in France and Great Britain, under the title, *Improvements in Propelling Tractive and Supporting Apparatus*.

Between 1921 and 1924, in Dayton, Ohio, Romanian professor of mathematics, Gheorghe Bothezatu built and tested two helicopters. Bothezatu, the first person in the world to obtain a doctorate in the aeronautic subject, *The Study of Aircraft Stability at the Sorbonne*, on January 19, 1923 flew his second design to an altitude of 1.22 meters with two persons on board. Bothezatu's interest in aviation went far beyond helicopters through making a number of calculations on possible Earth to Moon trajectories.

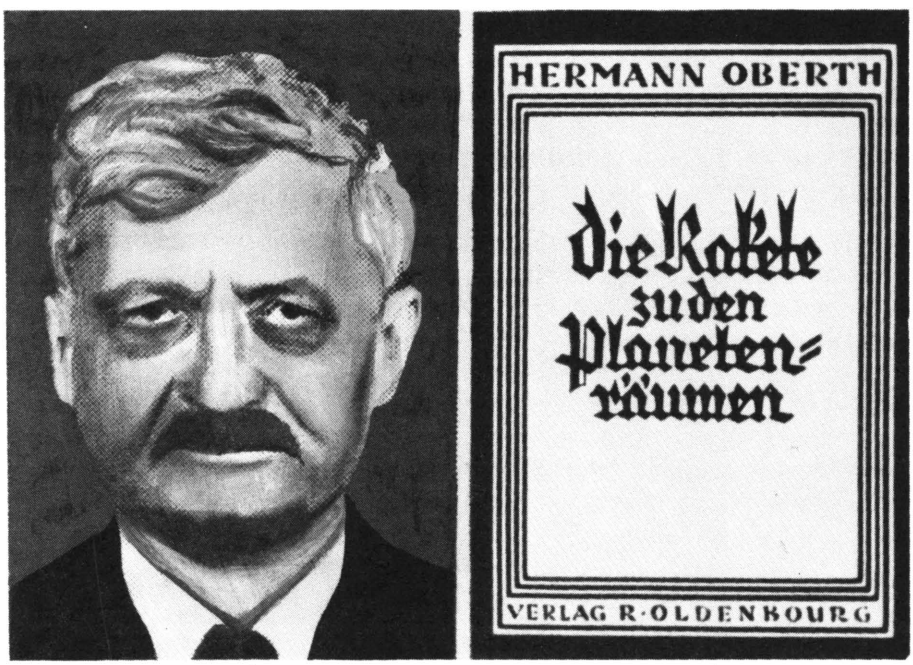

Figure 1 Hermann Oberth's book Die Rackete zu den Planetenräumen, which was published in 1923.

In 1923, *Die Rackete zu den Planetenräumen* (The Rocket into Interplanetary Space), was published in Munich (Figure 1). This book soon became a classic on rocket engineering. Hermann Oberth theorized on the possibility of a liquid fueled

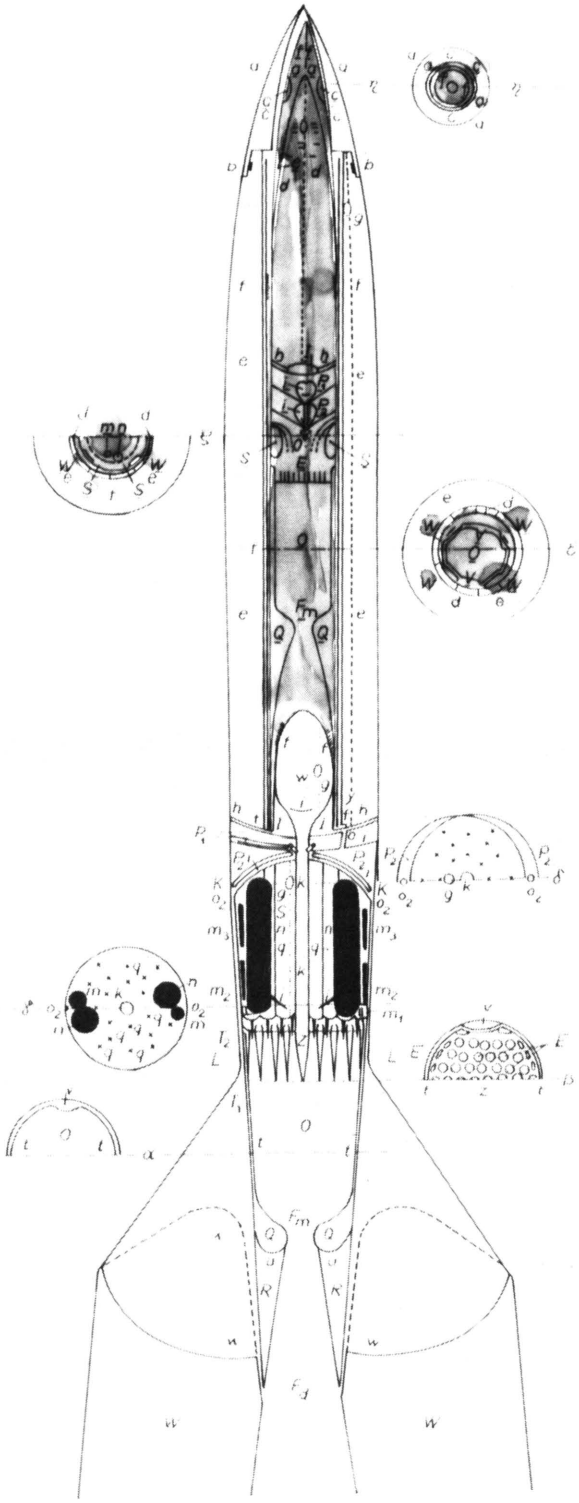

Figure 2a Schematic diagram showing technical details of Oberth's rocket design.

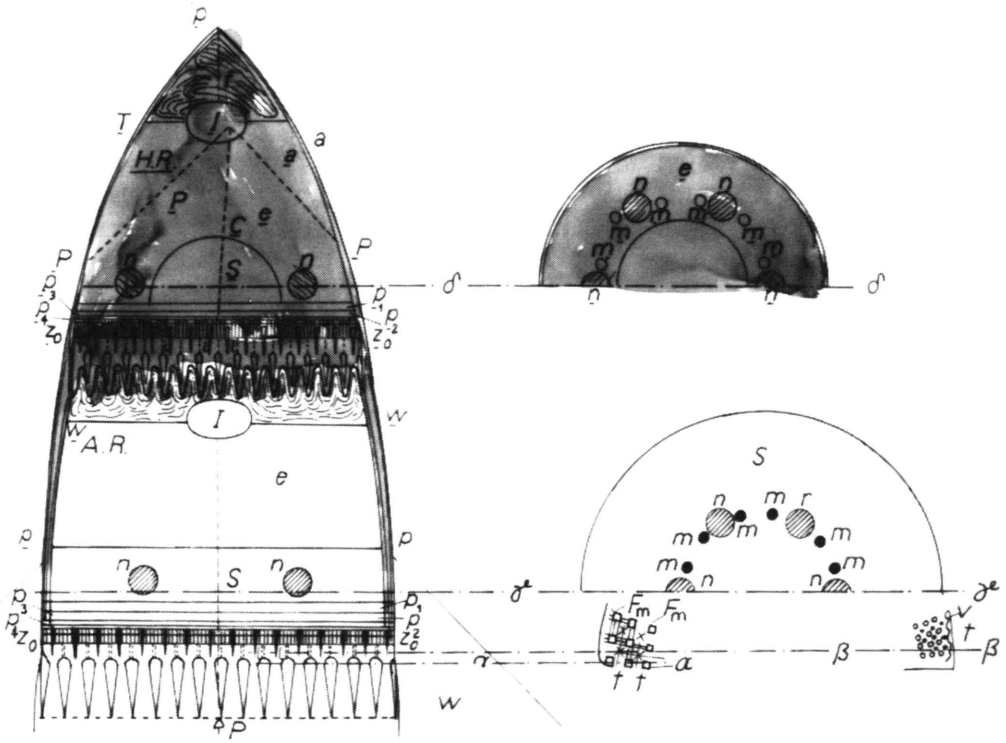

Figure 2b Schematic diagram showing technical details of Oberth's rocket design (Model E).

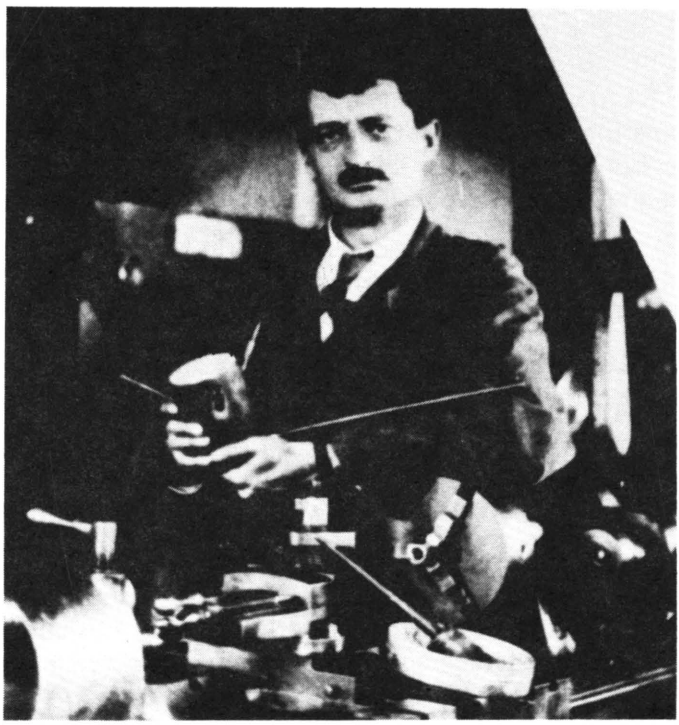

Figure 3 Professor Hermann Oberth working in his laboratory.

rocket (Figures 2a and 2b). Oberth later tested these theories in the laboratory (Figure 3). These theories were critical to early spaceflight and circumterrestrial manned orbits. Oberth at his works at Sighisoara and Medias (1924-1938) invented the "Method and apparatus for a fast combustion." His work was patented No. 19516 on March 6, 1930 in Romania. This patent refined the method of injection of low temperature liquid propellants into a rocket engine. It is to Oberth as well, that the field of astronautics owes many first ideas stated in *Wege zur Raumschiffahrt* (Means for Space Travel): the use of cryogenic liquids (liquefied gases) as rocket engine fuel and engine coolant; the use of soft alloys in the construction of rocket engines; guiding the rocket by means of graphite rudders; electrostatic rocket engine; artificial satellites for astronomy; and the collection of solar energy from satellite power stations.

Professor Ioan Stroiescu's (1888-1961) articles published in *Les Ailes* on May 17, 1928 and in *Der Flug* in May 1928, resulted in the study and construction on hypersustentation of the "blow wing." These designs resulted in two Romanian patents No. 11169 and No. 13677.

In 1925, the IAR-Brasov facility became the first factory specifically designed and built for aircraft and aircraft engine production. Since that time the factory has been the nucleus of aeronautical construction in Romania. It was here in 1936, that Elie Carafoli (1901-1983), the founder of the School of Aerodynamics, with L. Virmoux built the low wing monoplane, IAR-CV-11. The IAR-CV-11 set a number of early speed records.

In 1929, in New York, the Romanian inventor and aircraft designer George Fernic (1893-1930) made preparation to inaugurate a new Atlantic air-route from New York to Bucharest.

In 1930, Professors Ion Stroiescu and Elie Carafoli built the largest wind tunnel in South Eastern Europe. It was in this tunnel that a number of Romanian fighter designs such as the IAR-80 were tested.

On May 19, 1932, Smaranda Brăescu set a new world record for a sport parachute decent from the altitude of 6820 meters in Sacramento, California. This broke her own record of 6000 meters, established on October 2, 1931 in Romania.

Between 1933 and 1935, Romanian flyers with stock aircraft made several exceptional flights from Bucharest to Capetown, South Africa. Pilot Alex Papana set a new altitude record of 11,631 meters in a IAR-16.

In 1940, the IAR-Brasov works began manufacturing the IAR-80. The IAR-80 equipped with the 1000 h.p. IAR 1000A engine, was the fourth fastest fighter in its class.

Between 1941-1945, Nicolae Vaideanu (1911-1982) designed and built a liquid fueled rocket, the Udovilul, at the Mechanical Workshop of Petrosani at Orastie. Vaideanu patented the rudder system and the propellant feeding system.

In 1953, in Brasov, a group of engineers, led by Radu Manicatide and Paul Tissandier, designed and built the first Romanian twin engine aircraft, the IAR-814, which set several records in its category.

In 1968, an important development in Romanian aerospace research took place. The Romanian aerospace industry was centralized. This centralization included The Research and Design Institute, INCREST-Bucharest, combining the Romanian Committee for Space Activities. This new bureau, headed today by Dr. C. Teodorescu, was subordinated to the National Council for Science and Technology, which merged with the Astronautical Commission of the Academy (founded in 1961 and affiliated with the I.A.F. that same year). The centralization of space technology in the national economy insures Romanian participation in scientific study of the biosphere, the Earth's crust, outer space processes, and human behavior in space.

In 1967, Romania joined with the other socialist nations in the Soviet Union's call for the peaceful utilization of space. Since the beginning of this cooperative effort, Romanian institutions have played an active role in the Intercosmos program. Several experimental and theoretical works have been produced. A number of highly complex devices operated on a number of Soviet rockets and satellites between 1972 and 1982.

Between May 14 and May 20, 1981, a crew comprised of the Romanian astronaut, Dumitru Dorin Prunariu and the Soviet cosmonaut, Leonid Popov, made a joint space flight on the Soyuz T-4/Salyut 6/Soyuz 40 orbital complex.

In August 1982, the first flight of the Romanian ROMBAC 1-11 jet liner took place. A number of agreements were signed with Moscow in 1983, that established a strong Romanian position for the construction of these aircraft with reactive engines.

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