Academician Elie Carafoli

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Recently, our institute bearing the name of the Academician Elie Carafoli has been accorded the status of national institute in sign of recognition of its scientific level and capacity of solving theoretical and applicative issues in the framework of its activity program.

The moment chosen for rendering homage to the Academician Elie Carafoli's memory, Professor and world-class scientist is also justified by the pass of 60 years since the foundation under his leadership of the Institute of Applied Mechanics of the Romanian Academy (period which represents the tradition of our existing institute at present).

Calling to mind of the Academician Elie Carafoli also represents a real act of culture, since mentioning one such involved in the evolution of an entire scientific and technical branch – namely aeronautics – equals discussing, ipso facto, the history of this discipline.

The beginning of Elie Carafoli's activity can be placed during the years 1925-1928 when, as a stipendiary student in Paris, he got his diploma in mathematics and physics and also his PhD degree with the doctoral dissertation <*Contribution à la théorie de la sustentation en aérodynamique*>.

At that time, many of the fundamental phenomena of this science were not yet elucidated, both the theory and the experimental methods being under-developped. While working for the Aero technical Institute of Saint-Cyr belonging to Sorbonne, under the guidance of Professor Albert Toussaint, Elie Carafoli came to front due his ingenuity and gradually made a name for himself in the science of aeronautics. He has managed to become famous among scientists worldwide especially through his books: <*Théorie et tracée des profiles aérodynamiques*>, <*Influence des ailerons sur les caractéristiques des surfaces sustentarices*> ,<*Recherches expérimentales sur les ailes monoplanes*>.

It is significant the way in which the world of science in France valued Carafoli`s contribution to the development of aeronautics; apart from the Louis Breguet prize(1928), the silver Honorific Medal of The Society for Progress Supporting he was exceptionally awarded the scholarship named after the legendary flight hero Guynemer, scholarship usually intended to French people only.

Within the Polytechnic School in Bucharest where he opens the first course of aerodynamics in the country, Elie Carafoli imagines and originizes a laboratory intended to aerodynamics studies, which was provided in 1930 with a continuously operating wind-tunnel, created in collaboration with another passionate aeronautics researcher, Ion Stroescu. The results were remarkable for that time; using that wind-tunnel Elie Carafoli

carried on his researches on the aircraft wings. His theoretical and experimental studies on aerodynamic profiles led to many developments and contributed to finalize the general method of tracing and design of profiles. An important generalization is represented by the round profiles known in the specialty literature as "*Carafoli profiles"*. Having convenient aerodynamic and structural features these profiles could be precisely calculated by applying his theory along with the profiles theory. Elie Carafoli developed arduous theoretical and experimental researches on finite wing span, finalizing an analytical calculation method, easy to apply, efficient and general. It is the period when he approaches the theory of ailerons thus offering the mathematical means for the calculus of aerodynamical control–surface forces and moments. Also, he develops the theory of profiles and wings in rotational or rotational-forward motion applicable as well to the oscillatory motion of the aircraft.

These works elaborated at the highest scientific standards were published later on, in 1952, under the title of *"Aerodynamics",* which received the National Prize and was translated afterwards in German and Russian. One can consider that due to his works, the aviation engineers benefited since those years from a high scientific preparation in aerodynamics, flight mechanics as well as one of the most correct calculation methods, fully satisfying for the aeronautic industry needs.

As a consequence, some of the Romanian airplanes - IAR-CV-11, IAR-13, IAR-14, IAR-15 - brought new, constructive information on the international stage, among which the low wing formula was a remarkable success. Endowed with original aerodynamic profiles generated by Professor Carafoli's tracing method, they have frequently brought a well-deserved success to Romanian aircraft manufacturers. Thus, at the aviation competition held in Bucharest in 1931, IAR-13 Aircraft beat some of the best airplanes of the time, making, for example, maximum speeds 10% higher and time of climb to 5000 meters 15% smaller than the second ranked, FZL-11 aircraft.

Elected in 1948 member in ordinary of the Academy, Professor Elie Carafoli becomes director of The Applied Mechanics Institute of Bucharest. In the field of aerodynamic research, Professor Carafoli brought remarkable contributions to the development of the conical motions theory applied to polyhedral profile wings in supersonic regime, creating and coordinating a strong research team. At the same time, under his leadership, within the Institute who had previously been transformed into the Institute of Fluid Mechanics, research teams are created in several fields as for instance Aerodynamics of lifting bodies and surfaces at subsonic and supersonic speeds, Theory of permeable surfaces and bodies, Mechanics of viscous fluids and boundary layer theory, Shock tubes, Combustion, etc thus forming the nucleus of the Romanian school of Aerodynamics.

The journals *Studies and Research of Applied Mechanics* and <*Revue Roumaine de Mécanique Apliquée*> (RMA) which had been edited since the foundation by Professor Carafoli as well as the international conferences gathering world-wide scientists have largely contributed to the high reputation of the Romanian aerodynamic school.

Apart from the work conducted as the director of the Applied Mechanics Institute, the Academician Elie Carafoli elaborated valuable works with his collaborators.

His book "*The High Speed Aerodynamics*" was translated into Russian, English and German. Another book (published by Pergamon Press), about the theory of polyhedral profile wings in supersonic regime represents a synthesis of an impressive number of articles written by Carafoli and his collaborators and published both in Romania and abroad. At the same time, as the leader of the Aircraft Chair at the Polytechnic Institute of Bucharest and as a Professor in ordinary of the aerodynamics course, Professor Carafoli made arduous efforts to shape up the aircraft engineers to become to whom he has passed the passion for this field, the scientific sense, the technical thinking as well as the sense of Romanian tradition in aerodynamics, self confidence, audacity and enthusiasm for science. As a coordinator of doctoral works, priceless guider and counsellor in matters regarding the orientations and organisation of programs on fundamental and applied research, Professor Carafoli has always been in the front line of Romanian science, contributing with all his enthusiasm and youthful upsurge to the realisation of his life time dream, that of developing national aviation.

The scientific value of Professor's Carafoli work and its international importance have been recognized and honoured by famous institutions from countries having a long tradition in the aviation field. Therefore, the Romanian scientist was elected member of honour of The Royal Aircraft Society in England, member of The International Astronautics Academy and twice elected president of The International Astronautics Federation (1969 and 1970) these are just some of the significant symbols of this wide acknowledgement .We can also mention the Gauss medal awarded by the Scientific Society in Braunschweig (RFG,1979), the diploma and the medal <Tiolkovschi> (URSS, 1981), The Silver Medal (1967) of the Society of Research and Invention Supporting in Paris, the "Paul Tissandier" diploma (1956), conferred by the Aeronautics International Federation.

The opinions of illustrious scientist expressed on various occasions are of significant importance. Thus, referring to the Russian edition of *Aerodynamics* book, the Academician Leonid Sedov writes to Elie Carafoli in 20 May 1957: *"In your book all the results of the basic in aerodynamics are completely and magisterially exposed. We pay homage to your contribution to the development of this field*".

With reference to the same book, another great scientist, Professor Paul Germain, member of the Science Academy in Paris wrote in 15 April 1957: "*Please receive my congratulations. Internationally, few achievements are comparable to yours. You should be proud of having created such an important work."*

We state the opinion of Academician J Kozesnik from the Science Academy in Czechoslovakia (30 April 1957) about the *High Speed Aerodynamics*:

Your work on Fluid mechanics and aerodynamics has made you world-wide famous through their great scientific and practical importance as well as through the finery of your solutions.

At 17 December 1969, Professor H Blenk, the president of the Scientific Society in Braunschweig wrote to Professor Carafoli:

Today I have the great honour and joy to inform you that our society has decided the Carl Friederich Gauss 1970 medal to be awarded to you in recognition of your exceptional pioneer's works in Fluids Physics.

Moreover, it is significant to mention that Elie Carafoli was the 4th representative of the Fluids Physics to be awarded the Gauss medal, before him Theodor von Karman Professor Betz of Gottingen and Professor Goertler of Freiburg receiving this distinction. A few years later, the fifth would be Sir James Lighthill.

In our country, Professor Carafoli was repetitively conferred ranks, medals, awards and distinctions. Thus, he was the prize- winner of The First Class National Prize, decorated with the First Class Working Rank, The First Class Scientific Merit and held the title of *Emeritus Scientist*.

With a list of scientifically valuable and path finding works, which includes over 180 studies among which 12 internationally recognized as field references, Elie Carafoli was one of the most important scientist in aeronautics, acknowledged as such everywhere in the world, to our great honour as a nation.

In 24 October 1983, Academician Elie Carafoli passed away at his study in Constantin Mille Street.

Nowadays, the National Institute of Aerospace Research, continuer of the national aircraft scientific tradition in this filed created and developed by Elie Carafoli bears his name as recognition and homage paid by the generations of engineers and researchers who have studied at his school.