

REMEMBERING PROFESSOR ELIE CARAFOLI

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What can be added to commemorate Professor Elie Carafoli, after the excellent presentations of Acad. Prof. Radu Voinea, (also, my Professor in Basic Mechanics), of Dr. Eng. Dan Pantazopol and of Prof. Dr. Eng. Corneliu Berbente?

This is why I choose to simply present some of my memories about Elie Carafoli, my Professor not only in Aerodynamics, but also in many other respects. I am aware that by doing this I take the risk of speaking too much about me, but, definitely, this is not my intention.

I first met Elie Carafoli not in person, but as the author name on the cover of “Aerodinamica Vitezelor Mari” (High Speed Aerodynamics), a book that I received as award, in 1961, when I graduated the high school, at the “Tudor Vladimirescu” College, in Tg. Jiu.

Two years later, I was among the students that, whenever the occasion, crowded on a corridor of the building “I” of “Politehnica” Institute in Bucharest, where the Aviation Department was located, curious to see an impeccably dressed man in his sixties, cutting his way through the crowd and very politely saluting all people with a large smile on his face while taking his hat out of his bald head. We, the students, were all in admiration for this man that so naturally was demonstrating how nice is, after all, to be elegant and polite, just as is taught in school but far from our usual behavior.

By that time he, Elie Carafoli, was the Head of the Chair of Aviation at the faculty of Mechanics and professor in ordinary of the Aerodynamics course. Also, as we learned later, he was the General Director of the Institute of Fluid Mechanics “Traian Vuia” of the Romanian Academy.

In 1964, I became his student in Aerodynamics, and I was supposed to have a “forth degree encounter” with him in June 1965, at the examination planned for the end of this one year course. But this didn’t happen, because I was not admitted at the examination, by the administration of the faculty, due to the fact that I neglected to motivate the absences I made during a one week stay in the hospital for students following a minor surgery operation. It was not a problem to solve the situation, but the examination was rescheduled for the autumn session and this became my only exam that I had to sustain in September. However, in September 1965, Elie Carafoli was in USA, invited by one of the Universities there, and I sustained this exam with Corneliu Berbente, who was, by that time, Assistant Professor of Elie Carafoli. So, my “fourth degree encounter” with Elie Carafoli was postponed again, until July 1966, when I successfully sustained my Engineer Diploma with a Project in Aerodynamics.

I suppose it was this project, full of mathematics engineering that made Professor Carafoli to invite me to enroll, the earliest opportunity, for a doctoral stage in the field of Aerodynamics.

This opportunity arose in March 1967, after my six month- post graduation military stage as RT (“reduced term”) at the Aviation School for military technical staff in Medias and after becoming employed as an engineer at IRMA, the Company for Aeronautical Material (Equipment) Repairs in Bucharest. I sustained an entrance examination, this time with Elie Carafoli (as head of the entrance commission). A few month later, I became a “doctorand” (PhD student) of the Romanian Academy, for a 3 years stage (up to 1st of May 1970), at the Institute of Fluid Mechanics.

On this occasion, Elie Carafoli also established the title of my doctoral thesis: “Theory of jets and applications”. It was a very general one, as the Professor explained to me, because when you begin a research work “maybe you know where you start but you never know where you’ll arrive”. Indeed! After a while he told me that it would be interesting to study a little bit the hyper-sustentation with lateral jets, a research that, by that time, was already in the attention of several other colleagues. This is way, at the beginning; I didn’t pay to much attention to this problem. But two years later, in 1969, he made me clearly understand that this was my real doctoral destination. Until then, I took all my exams and doctoral reports as established in my “individual doctoral plan” and I invested a lot of time in studying mathematics and fluid mechanics, including viscous and turbulent flows and *jets*, anything, but not connected with *lateral jets*.

To be sure that, this time, I will take my “destination” seriously the Professor gave me a bunch of papers synthesizing his own calculations, asking me to have a discussion about the mater “the next day at noon”.

Since than “the next day at noon” became our permanent meeting time...

Meanwhile, in our country the situation in the field of aviation started to change. This is something I consider important to tell about, in order to understand Elie Carafoli and his complex presence within the Romanian Aeronautical development.

After what had happened in August 1968 in Czechoslovakia, the government decided to re-start the aeronautical activities in our country. The first move (26 October 1968) was to create two new units: GAB (Group for Aviation Bucharest) as a new department in the Ministry for Mechanical Industry, and ICPAS, the Institute for Aerospace Design and Construction. Both units were assigned with the construction of a military jet aircraft, in 3-4 years.

Elie Carafoli was requested to take responsibilities in the program, by changing the academic profile of the Institute of Fluid Mechanics (IMF) into one directly connected with aircraft design. More than this IMF was planned to become part of the new ICPAS. Everything was done in a strictly secret manner that induced a reaction of suspicion and prudence to a lot of people that where not accustomed with this kind of “atmosphere”.

At the beginning, maybe also taking into account his age of 68, Elie Carafoli did not accept such a risky charge as building a military aircraft in 3-4 years and, at the same time changing the statute and letting IMF become part of ICPAS. He suspected that this request was kind of a provocation and there will be consequences in case of refusal.

This was indeed exactly what followed in 1969. First, ICPAS started to recruit specialists from different institutes and enterprises. However, IMF and the Institute for Solid Mechanics (also from the Romanian Academy) only “lost” 4-5 people each, which was far from being sufficiently. This process was accompanied by negotiations under a lot of pressure put on the Directors of these Institutes that poisoned the relationship between the institutions and the people involved. Elie Carafoli, as Member of the Romanian Academy, was in the middle of this “battle”.

Something put an end to this situation. In 1969 the governments of Romania and Yugoslavia were negotiating their cooperation in the field of aeronautics and in January 1970, the two countries signed a cooperation treaty, starting at 1 February 1970, to build YUROM, a twin jet ground attack aircraft able to fly with a Mach number of 0.9. This aircraft was planned to fly in 1974!

As a consequence, the government decided to make use of its authority and ordered the merger, at 1 February 1970, of IMF and ICPAS in one Institute: IMFCA (Institute for *Fluid Mechanics* and Aerospace Construction). Based on the principle “if it is an order, then my pleasure” and making use of his prestige, Elie Carafoli succeeded to have an important contribution regarding the manner in which this merger was put into practice. He obtained a statute of equality between IMF and ICPAS, which also became evident in the name of the new Institute: *IMFCA*. In the same time, IMF preserved its basic internal organization (structure) up to the last employee. Also, Elie Carafoli obtained that IMF keep its tradition of academic research (including, evidently, the corresponding financing!), which, in time, lead to a new tradition, of combining the academic and applied research. In addition, as a guarantee of this arrangement, the scientific director of IMF, Dr. Eng. Dan Pantazopol, kept his position and Elie Carafoli became Honor Director of IMFCA.

This arrangement proved to be benefic in the evolution of the new Institute. IMF brought in its Library and its expertise, represented by the skill and scientific reports/papers/books of its specialists in Fluid Mechanics, Aerodynamics, Dynamics of Flight, etc. Also, IMF brought many laboratories (wind tunnels, shock tubes, etc.) and manufacture shops with highly trained workers and technicians. The fact that all these existed was something that we can call the “Carafoli “effect”!

In the next years, everybody at IMFCA was tightly involved in the development of YUROM and a cooperation atmosphere took the place of confrontation between people. This proved to be profitable for the aircraft development rhythm.

It is important to notice that, despite the complicated personal situation of the years 1968, 1969 and 1970, Elie Carafoli continued his scientific activity, working closely

with his collaborators (researchers and PhD students, as myself) from IMF and from the Aviation department of the “Politehnica” University. His international prestige was continuously increasing, as he was twice elected as president of IAF (International Astronautics Federation) and received the Gauss Medal for Scientific activity.

Three month after the establishment of IMFCA, at 1 May 1970, I finished my doctoral stage at the Romanian Academy and I joined IMFCA, the Aerodynamics department, where the only subject was YUROM. Everybody worked, so to speak, “with the sword of Damocles over the head”: Financially speaking, the cooperation with Yugoslavia was based on a simple, but very efficient, principle: they give us two cats of 50000 dollars and we give them, in exchange, one dog of 100000. The only problem was what would happen when one of the parts was not able to deliver the product, at the requested quality! However, nobody was curious to find out the answer of this problem, so this situation never occurred...As a consequence, both the Romanian and Yugoslavian YUROMs had their first flight on the 26th of October 1974, the Romanian flight was two hours before the Yugoslavian one! After all, on the 26th of October is celebrated the Romanian Army Day ...

For about 7-8 month after I started working at IMFCA, I kind of interrupted my cooperation with Elie Carafoli, due to the fact that I was assigned, as everybody else, very important and time-consuming tasks related to the aerodynamics of YUROM. Anyway, the principle “the next day at noon” was not working anymore. But one day, Elie Carafoli, called the secretary of our department asking for me. I immediately took the tram (the subway did not exist yet) and in 40 minutes I arrived at his office, which was in the center of Bucharest, about seven km away. The Professor was, I can say, very furious, considering that I neglected my work for the doctoral thesis. Instead of trying to excuse myself, I handled him about 6 pages containing my progresses. He didn’t look at them and concluded that if I don’t start to work, he will put an end to my doctorate. I left in a not so very happy state. Forty minutes later, when I was back at the Institute, the secretary was looking for me with a message from Elie Carafoli saying to go back immediately. After another 40 minutes I arrived at his office and found a different man, who told me: you did a good work, let’s finish it and write down a paper. Today, when I remember this, I ask myself if I ever met another person with such a capacity to choose, despite his anger, the right thing to do in such a situation.

I started working immediately, and after one week I gave the Professor a “paper” of 45 pages long. He took it and told me the magic words “the next day at noon”. The next day, when we met, he told me that he made some unimportant adjustments and, again, to meet him “next day at noon”. When I arrived at home and started to look at my forty five pages paper, I realized that I have to cut about 60 percent of its content. Shortly, one week later, after a few iterations, during which the Professor also added a few pages, the paper was ready, having only about 16 pages at all!

I mention this because it was a real lesson for me of how to write a “crystal clear” paper, mainly by avoiding unnecessary explanations and repetitions, because a scientific

high level paper is addressed to highly educated and trained specialists. Only essential issues and demonstrations are important! Later, as I will show below, I had the occasion to see how valuable this lesson was.

Elie Carafoli, retired from the Politehnica University in 1971, exactly when the Aviation section of the Faculty of Mechanics became the Faculty of Aerospace Engineering. He was 70, but, as a Life Member, he still remained active at the Romanian Academy, keeping its position as Head of Technical Section. He also remained Honor Director at IMFCA. In the same time he continued to be the supervisor for about ten PhD students from Romanian Academy (including me) and from the “Politehnica” Institute.

In 1974-1976 the Romanian Academy had cooperation programs in the field of culture and science with France and USA. Elie Carafoli, as Head of Technical Section, obtained that both the Aerospace Engineering Faculty and IMFCA be involved in two scientific research contracts, one with ONERA, France, and the other with VPI&SU (Virginia Tech-Virginia Polytechnic Institute and State University), from Blacksburg, Virginia. I was involved both in the research contract with ONERA (where Elie Carafoli and I delivered a scientific research about Hyper sustentation using Lateral Jets) and in the scientific “exchange project” with VPI&SU, where, in 1976, I had a stage of 6 month in Blacksburg, as a visiting researcher at the Aerospace and Ocean Engineering Department.

There, (along with two other Romanian colleagues, Prof. Corneliu Berbente and Dr. Eng. Florin Munteanu) I was celebrating America’s bicentennial by working very seriously to build their capitalism, while, “in exchange”, 4 Americans were trying hard in Bucharest to build our Romanian socialism...

From our part, we, the Romanians, spent a lot of time at the Virginia Tech Library and it was with this occasion when I discovered that the shelves contained nearly complete series of Romanian Academy Institutes publications (journals), both in Romanian and English (or French) and many scientific books of Romanian authors. Among them I found a lot of copies of Elie Carafoli’s “High Speed Aerodynamics”, both on the current shelves, for normal use, and on the basement shelves, prepared to be sent for rehabilitation, because of their over used state. I was impressed and proud and I understood once more the value of the lessons learned from Elie Carafoli.

Back in Romania, I hardly remembered what I was doing before Blacksburg. My doctoral thesis, which received, in 1973, the green light from Elie Carafoli after minor corrections, was ready and 90% tapped in five exemplars (on the best quality paper and using an IBM tapping machine), when a new law, imposed a row spacing of 1.5 (instead of 2) and the use of both sides of the paper (instead of one) in order to reduce the paper consumption.

I waited for a while, hoping that “any wonder last only three days”, as usually, but when a doctoral thesis that was already submitted to the Ministry of Education was rejected for not conforming to the law, I understood that I have to restart the tapping from the beginning. But this was not all: another law, that imposed the condition to be a

Communist party member for obtaining the PhD degree, was a hard blow to me (however, the fact of not being a party member helped me, after all, to obtain the visa for USA...).

Elie Carafoli encouraged me by recalling the children game “don’t get upset, brother”!

Unfortunately, the two laws, despite their declared reasons, proved to be only the beginning of some kind of repression against the Romanian Academy that repeatedly refused to accept some new members with high political position and corresponding “scientific” level. First the Academy lost its Institutes, then its cars (this time for reduction of fuel consumption “reasons”), then suffered a drastic reduction of funds accompanied by a decline of its Journals.

However, as the Academy garage lost most of its cars, Elie Carafoli “received” an old Russian car Volga and an old driver, that every body use to call “Nea Cristea”. Whenever needed, Elie Carafoli came with nea’ Cristea at the Institute, about 7-8 km from his home, to discuss with his collaborators. I remember that, leaving at the end of the working program, he always took as many people as possible in his Volga, with nea Cristea.

In 1980 I succeed to sustain my doctoral thesis. Meanwhile, I was directly involved with the building of the Trisonic Wind Tunnel, along with three other PhD candidate fellows, which all seem to wait for me to break the ice by first sustaining my doctoral thesis. By then I was the head of the Trisonic Wind Tunnel and two years older then the next of them.

Soon after this, the Volga was recycled, and nea Cristea retired, but I took his place and whenever needed I was the driver of Elie Carafoli, using my own Dacia. He continued to be present at the Institute, helping his PhD students and continuing to work.

In September 1981, Elie Carafoli celebrated his 80th anniversary and he used his right as former president of IAF to bring with him as much as five people to participate at the IAF Congress in Rome (apart from Elie Carafoli, who’s expenses were covered by the Academy, was Dr. Eng. Constantin Teodorescu, the General Director of the Institute, which, in turn, covered the expenses for the rest of the team, Dr.Eng. Dan Pantazopol, the scientific Director, Mat. Mihai Popescu, who proved to be the only that submitted a contribution, and, finally, myself). There, Professor Santini, who was by that time the President of IAF, and a good friend of Elie Carafoli, announced that he succeeded to obtain that all participants at the IAF Congress (International Astronautics Federation) be accepted in a private Audience at Castel Gandolfo, the main residence outside Rome of the Holy Pope John Paul II. This was the first Audience after the terrorist attack against John Paul II and he was not completely recovered, but he wanted very much to meet and address a message to the scientists and astronauts that, by their profession, appear to be so close to God.

Indeed, we were received inside the Castel, and Elie Carafoli was as far as 3 meters from Ioan Paul II and so were many of us. Meeting with the Holy Father profoundly impressed him and he said that this was the most important moment of all his life.

Two years later, in September 1983, there was another IAF Congress, this time in Budapest. Elie Carafoli met there Herman Obert, another personality, a German from Romania, considered “the father” of Astronautics (as Tsiolkovski is “the father” of Cosmonautics) due to his book about Space Flight theory. He was also the professor of the famous Von Braun.

Back in Bucharest, Elie Carafoli told to all his collaborators about his discussions in Romanian with Herman Obert and about the fact that he was willing to visit, as soon as possible, Romania, the country where he was born and where he spent a good part of his life.

On the 24th of October 1983, Elie Carafoli passed away while he was writing a report addressed to the Government about his meeting with Herman Obert. His lady secretary found him at his office, his head on the desk.

I wrote this paper based on my own memories, with the hope to bring to the public awareness less known facts, allowing a better understanding of his personality and of his contributions to the development of the aeronautical sciences, both in Romania and worldwide.