Professsor ION STROESCU's activities and achievements at the Polytechnic School and the University of Bucharest

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The authors of this exposure are graduates of the Faculty of Aircraft, the Aviation Department, respectively, within the Polytechnic Institute of Bucharest, now The "Politehnica" University of Bucharest. During the studies I learned very little about Professor Ion Stroescu. V.N. Constantinescu, professor in ordinary of the Aerodynamics course, after Academician Elie Carafoli's retirement, told us that when designing the Polizu wind tunnel, discussions of following kind took place: Prof. Ion Stroescu, the wind tunnel's designer, proposed a specific curvature of the walls. Acad. Carafoli interfered: "What? Just like that, without calculation? I will calculate the optimum shape myself". After several days, during which he performed the calculations, Academician Carafoli gave the answer: "It remains as it was designed". The story shows the great intuition of the drawing and physical education teacher Ion Stroescu in the field of experimental aerodynamics. Our exposure is based on Viorel Vioreanu's work issued in 1978. We also considered the speeches of academicians Victor Valcovici, Elie Carafoli and Mitu Dumitrescu in a Festive meeting to celebrate 50 years of activity in the field of aviation and experimental aerodynamics and Prof. Ion Stroescu's 70 years of life, an event organized by the Romanian Academy and the Institute of Applied Mechanics "Traian Vuia" on January 31, 1959, and also other works. In 1929, Ion Stroescu became assistant and close collaborator of Professor Elie Carafoli, at the Department of Aeronautics and Aerodynamics of the Polytechnic School. In the Yearbook of the "Royal Polytechnic School Carol II" of Bucharest, published in the academic year 1934-1935, on page 45, chapter "Personnel of the educational laboratories" we can find the following:

"12. Laboratory of Aerodynamics:

- Head of laboratory: Professor PhD.Eng. Elie Carafoli;

- Secondary Teacher assigned to this laboratory: Ion Stroescu", and other three more employees: laboratory assistant, mechanic, and modeler.

Ion Stroescu's activity, together with the two great teachers, Elie Carafoli, at the Polytechnic School and Victor Valcovici, at the University of Bucharest is closely related to the study, design and construction of wind tunnels. Prof. Ion Stroescu built the first wind tunnel in Romania in 1927, at the high school in Ramnicu Sarat. The project was done in 1926, but a wind tunnel project was submitted by Ion Stroescu to the Ministry of War, in 1915. The wind tunnel in 1927, although having a short life, was mentioned in the publications of the time. "Der Flugtechnic" of 11 May 1928 wrote "Professor Stroescu is a true pioneer in the field of Aeronautics. He built in Ramnicu Sarat the first aerodynamic wind tunnel in Romania, of Eiffel type, equipped with a balance of Stroescu type". Ion Stroescu's wind tunnel, equipped with a Ford automobile engine of 12 CP, to which a plane propeller was adapted to make a speed of about 31 m/ s, had a cylindrical experimental area with a diameter of 1.50 m (Figure 1).

Figure 1 THE WIND TUNNEL IN RÂMNICU SĂRAT

Unfortunately, less than a month since the wind tunnel was built, taking advantage of a short departure of Professor Ion Stroescu in Bucharest, it was destroyed, with the help of a school general inspector, who requested the evacuation "of Stroescu's barrel" from the sports room in which it was set up. The inspector made a report and the Ministry of Education ordered telegraphically the immediate evacuation of the "barrel". The first wind tunnel built in Romania was destroyed with axes and thrown into snow in November 1927 despite having been designed so as to be easily disassembled and moved to either to the Polytechnic School of Timisoara, where the rector was Prof. Victor Valcovici, or to the "Aviation school" located on the Cotroceni airfield. In 1930, Professor Elie Carafoli, together with Professor Ion Stroescu built a second aerodynamic wind tunnel in Romania (Figure 2).

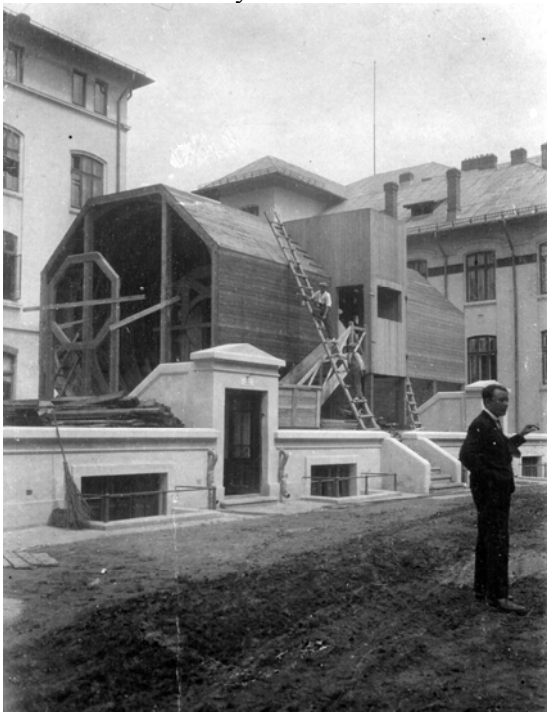

Figure 2 THE WIND TUNNEL WITHIN THE POLITECHNICAL SCHOOL

Today the tunnel belongs to the Faculty of Aerospace Engineering, within the "POLITEHNICA" University of Bucharest. The wind tunnel built in 1930 utilized for the first time in the world, the turbulent boundary layer suction device and the aerodynamic blow-out tangential to the diffuser, based on patents 11.169/1925and 13.677/1925, obtained by Prof. Ion Stroescu. The patents were entitled "Airfoil, with gas jet tangential to the leading edge and underside surface of wing" and "Airplane wing device with compressor for increasing sustentation using Stroescu-Lafay method of fluid jets tangent to underside surface of wing". The aerodynamic balance used in the wind tunnel built in 1930, inspired by that of the laboratory in Gottingen was called Stroescu balance. The above mentioned wind tunnel was the first in the world where the suppression of vibration and the smooth flowing of fluid were ensured by applying suction and blowing -out in the boundary layer.

The data sheet of testing results obtained in the wind tunnel, prepared by Professor Ion Stroescu, together with Professor Elie Carafoli and eng. Nicolae Tipei, was assessed in 1936 by Professor Ludwig Prandtl, director of laboratory of Göttingen as "the most methodical and complete record of aerodynamic experiences".

In 1937 Professor Ion Stroescu is transferred, despite the opposition of Professor Elie Carafoli, to the aerodynamics laboratory of the Department of Mechanical Engineering within the University of Bucharest. The transfer was made by the disposal of King Carol II of Romania, at the request of Professor Victor Valcovici. During 1937-1946, Prof. Ion Stroescu worked as lecturer, then as head of the Laboratory of Applied Mechanics within the Faculty of Sciences of the University of Bucharest.

In 1938 Ion Stroescu designed a wind tunnel having the diameter of 7 m, provided with testing and measuring equipment, but unfortunately that wind tunnel was not built. Here's what Academician Victor Valcovici said, on the occasion of Professor Ion Stroescu's anniversary of 1959:

"Starting from this new model of wind tunnel Stroescu aims to improve the efficiency by suppressing the guide blades. By suppressing the blades Stroescu achieved a substantial energy savings and an enormous simplification of handling. But that revolutionary idea needed to be experimentally proved. The opportunity occurred when, in 1925, the scientific research institute director at that time, (Professor Victor Valcovici) intending to establish a department of aerodynamics, hired Professor Stroescu in order to complete his idea of blades suppressing. Along with building the necessary buildings at Tigăneşti Ion Stroescu undertook experimental studies on a model tested in the Mechanics laboratory of the Faculty of Sciences in Bucharest and after a thorough study of the wing tunnel profile, obtained surprisingly good results, namely:

1. *Suppression of detachment point at current return.*
2. *Complete removal of the turbulent material from the boundary layer.*
3. *Increase of the wind tunnel efficiency by about 40% as compared to the best existing wind tunnels".*

These great results were communicated to the Academy of Aerodynamic Research in Berlin, where they raised very laudatory comments from specialized teachers, such as Prandtl, Betz and others, and also to the International Congress of Applied Mechanics, held in Paris in 1946, where Professor Edmond Brown asked permission to use our wind tunnel project for the needs of Sorbonne laboratories. In 1943 Professor Ion Stroescu accompanied Professor Valcovici on a journey to study the experimental facilities of the laboratory in Gottingen. Prof. Ion Stroescu makes improvements to the wind tunnel built by Professor Ludwig Prandtl and received congratulations from him and from Professor Paul Metras in Paris. In 1946, at the Fourth International Congress of Applied Mechanics, Prof. Ion Stroescu, in collaboration with Professor Victor Valcovici gave at the Sorbonne an original lecture on "A new type of aerodynamic wind tunnel", a description of the wind tunnel of

closed circuit from the University of Bucharest, to which guide blades suppression was applied along with the adjustment of some special curvatures, calculated by Professor Victor Valcovici and modified after experimental verifications by Ion Stroescu.

With the approval of the Romanian government Ion Stroescu stayed in France for 14 months to design and build a wind tunnel for the study of the ice accretion, which was achieved after many intellectual and material efforts in Paris, after a Romanian design project. Ion Stroescu had several offers to work abroad, but returned to Romania in early 1948 and focused on the study and use of wind energy.

In his "History of classical applied mathematics in Romania. Mechanics and Astronomy" (printed by Academy Publishing House, 1971) in which, Ion Stroescu is cited in seven rows on page 200, exposing the activity of Academician Mitu (Dumitru) T. Dumitrescu, the author George St. Andone, mentioned: "Other activities (of Academician Mitu Dumitrescu): In collaboration with Elie Carafoli and Ion Stroescu studies have been made to achieve a prototype of wind engine".

In 1949 a wind tunnel was built at the "Institute of Applied Mechanics Traian Vuia" of the Romanian Academy in Bucharest, thanks to Professor Elie Carafoli, the director of the institute and to his collaborator, Professor Ion Stroescu (Figure 3).

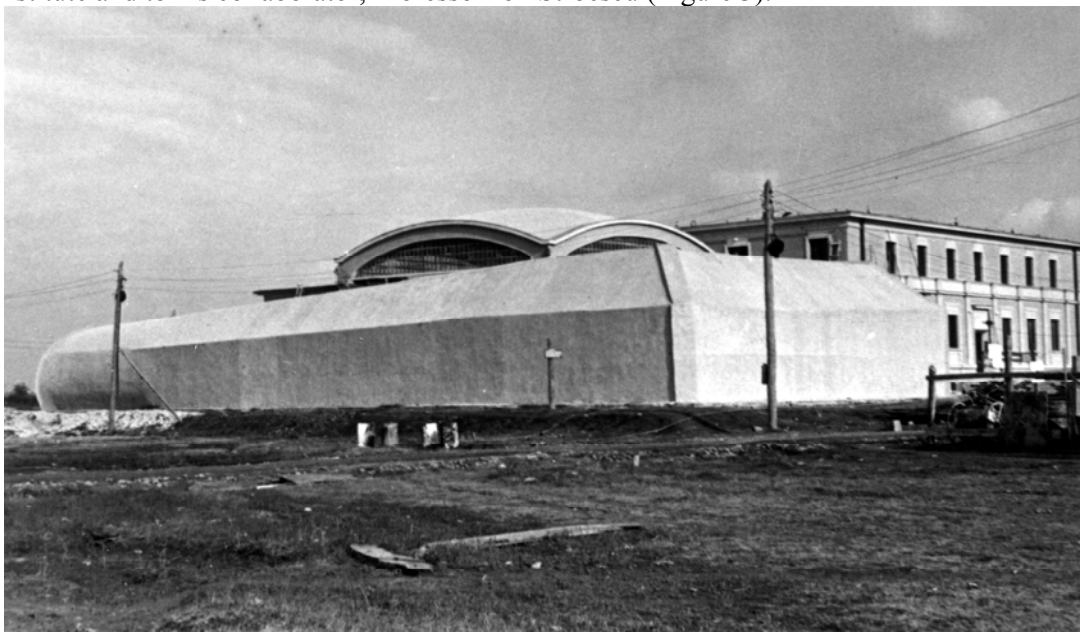

Figure 3 THE WIND TUNNEL WITHIN THE INSTITUTE OF APPLIED MECHANICS

Ion Stroescu worked for "Traian Vuia Institute" until 1961.

Annexes 1-7 present several pages of his "Laboratoire du Travaux aerodynamique" (Annex 1), with pictures of the wind tunnel located in Polizu Street- outside and inside (Annexes 2 and 3), and also the aerodynamic balance scheme (Appendix 4), calibration curves of the micro-manometer (Appendix 5) and (polar) lift curves and drag compared with results from other five laboratories, for the same profile (Annexes 6 and 7).

Annex 1

PROF. ING. DR. ELIE CARAFOLI

TRAVAUX DU LABORATOIRE AÉRODYNAMIQUE

VOLUME I.

AVEC UNE PRÉFACE DE MR.
N. VASILESCO-KARPEN
RECTEUR DE L'ÉCOLE POLYTECHNIQUE

MONITORUL OFICIAL ŞI IMPRIMERIILE STATULUI
IMPRIMERIA NAŢIONALĂ, BUCUREŞTI, 1938

Annex 2

La forme extérieure du tunnel (fig. 1, 2, et planches III, IV) est prismatique, de section octogonale, ayant 6,5 m. de hauteur maxima et

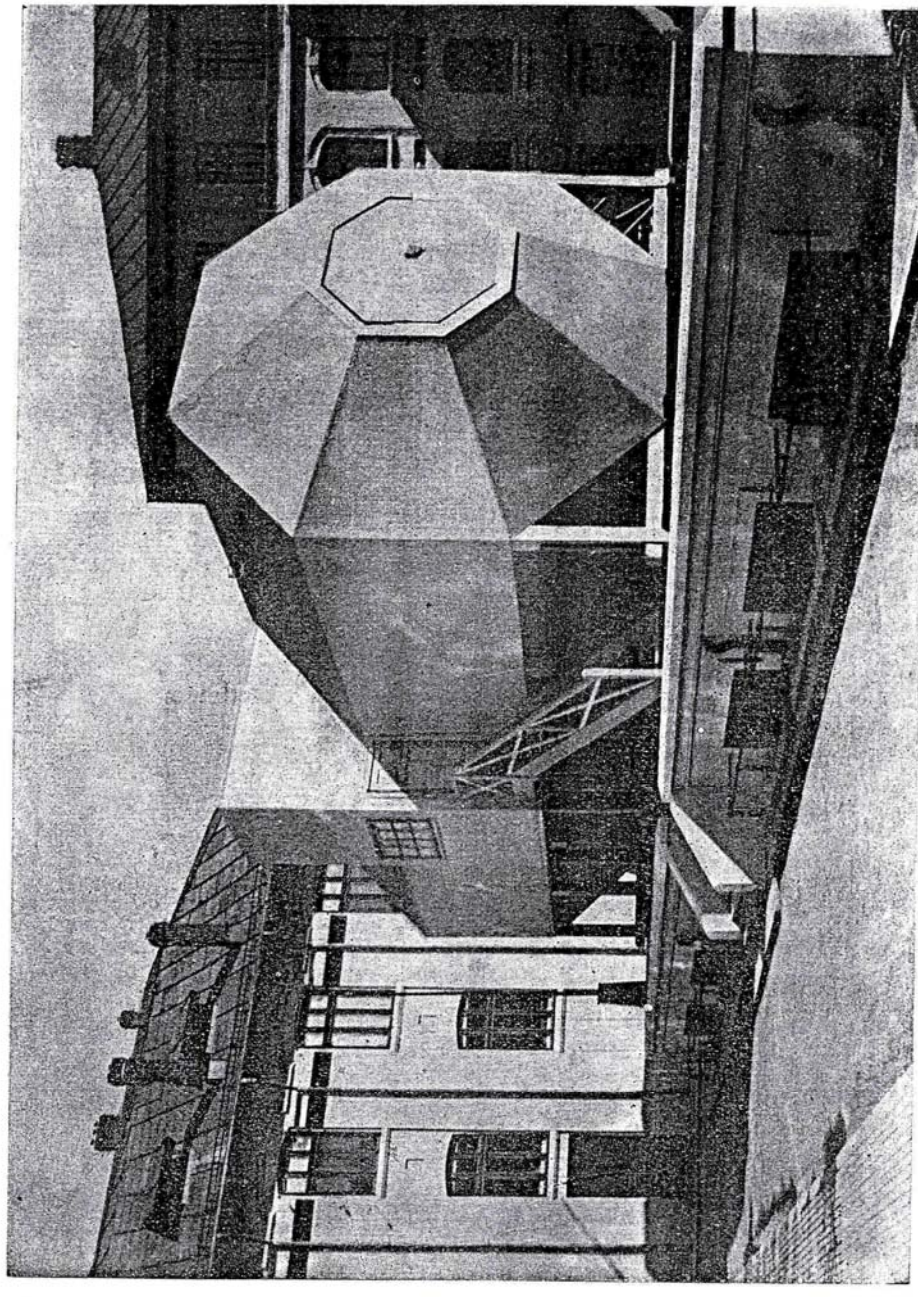

Fig. 1. — Soufflerie de l'École Polytechnique de Bucarest.

15,235 m. de longueur totale. Dans les flancs de cette construction prismatique, à l'extérieur, il y a deux petites cabines d'entrée avec des

Annex 3

portes étanches et accessibles par les escaliers latéraux. Ces cabines communiquent avec la chambre d'expérience dont la partie extérieure, de

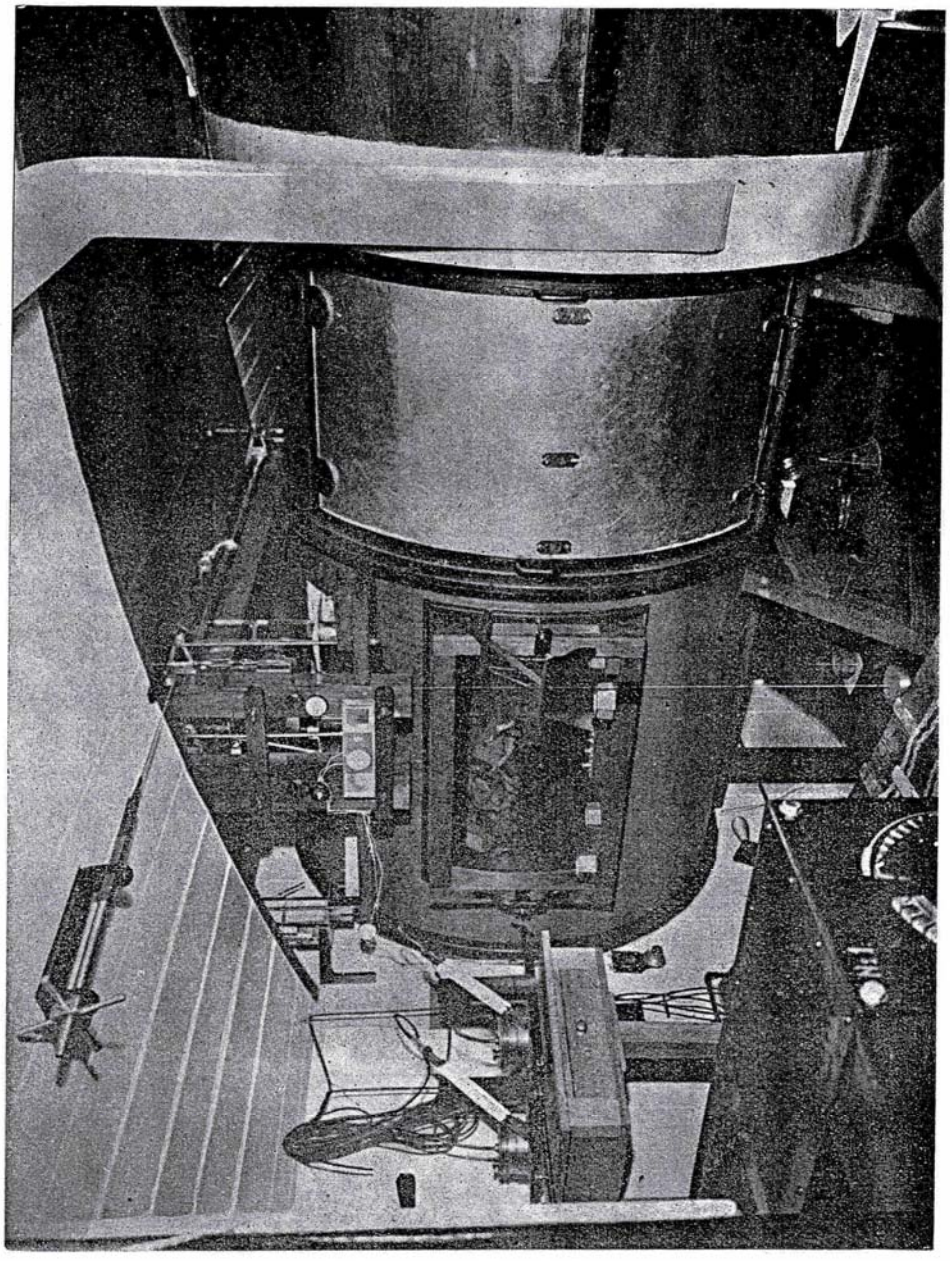

Fig. 2. — Vue intérieure de la soufflerie.

forme cylindrique, a une section en profil biconvexe symétrique (19 et 20, planche II).

Annex 4

BALANCES AÉRODYNAMIQUES.

Les balances (fig. 8—9) ont été établies en vue de la mesure des forces dans le plan vertical, ainsi que du moment correspondant.

Les modèles sont suspendus par l'intermédiaire des fils métalliques

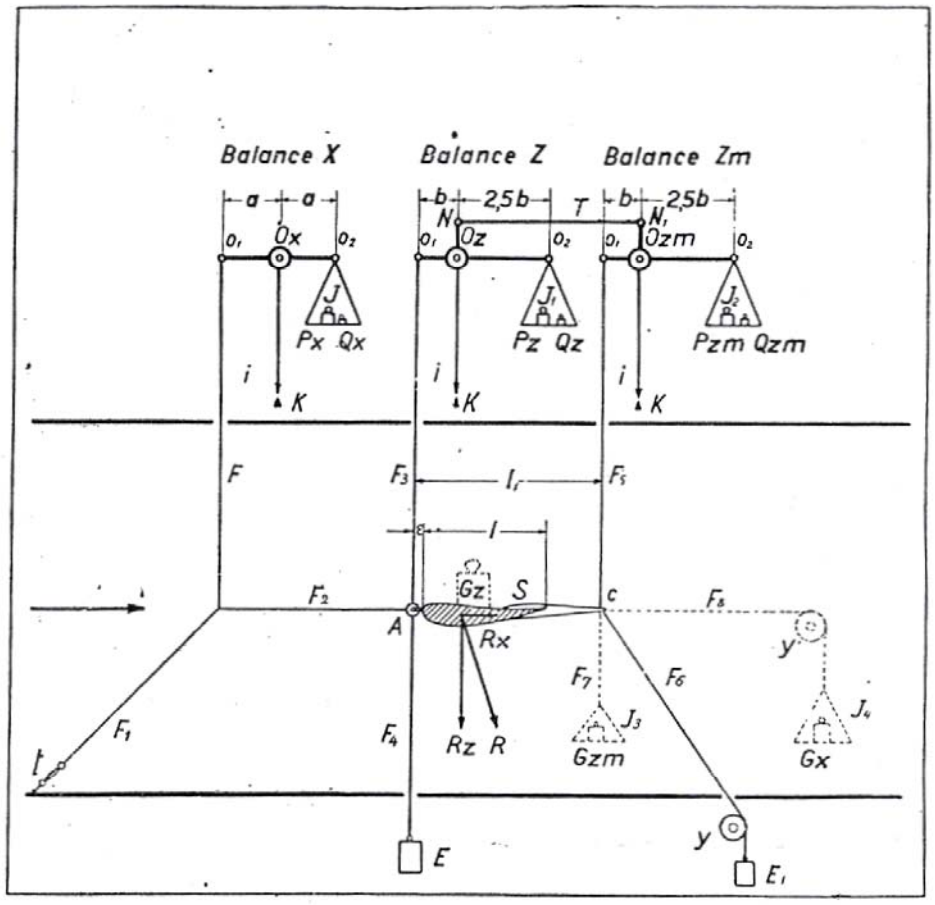

Fig. 8. — Vue d'ensemble des balances pour la mesure des forces.

aux poutres transversales B, reposant, au moyen des couteaux, sur les leviers des balances à plateaux. Les fils ont une tension initiale reglée par les poids E, E_1.

L'effort de traînée est mesuré par la balance X, la portance par les balances Z et Zm, qui sont couplées par une bielle T reposant sur des paliers à billes, (fig. 8). S'il s'agit de déterminer le moment aéro-

Annex5

MESURE DE LA VITESSE DE L'AIR.

On utilise, dans ce but, deux prises de pression statique dans la veine fluide, situées respectivement dans la région de vitesse maxima et en un point du circuit de retour. La différence de pression est indiquée

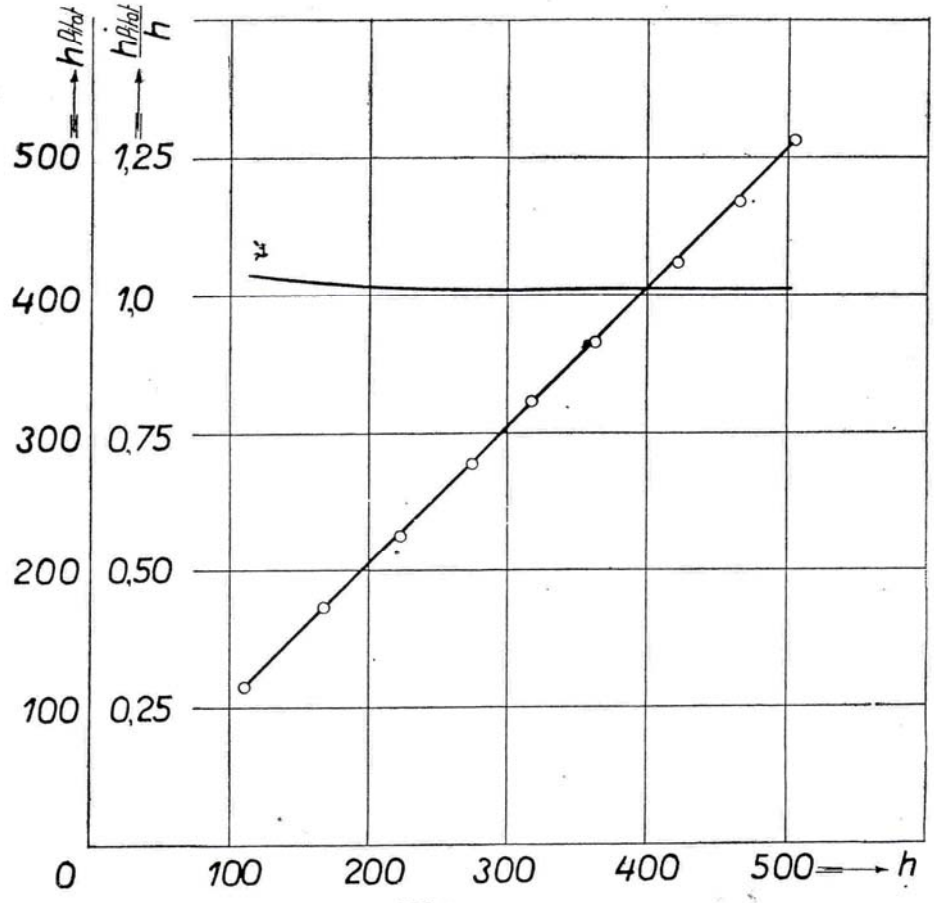

Fig. 11. — Variation du rapport $\frac{hPitot}{h}$. Courbe d'étalonnage du micromanomètre.

par un micromanomètre à alcool. A l'aide d'un tube Pitot, étalonné rigoureusement, on détermine le rapport qu'il y a entre la vitesse réelle et les indications du micromanomètre, et c'est avec ce rapport qu'on multiplie ensuite les chiffres obtenus pendant l'expérience. On a obtenu, après une série de recherches rigoureusement contrôlées, le diagramme de la fig. 11 dont la valeur moyenne est

$$h_{Pitot} = 1{,}01\ h$$

h étant la hauteur de l'alcool dans le tube du micromanomètre utilisé.

Annex 6

resultats d'autres différents laboratoires, executés sur une aile de caracteristiques et profils identiques.

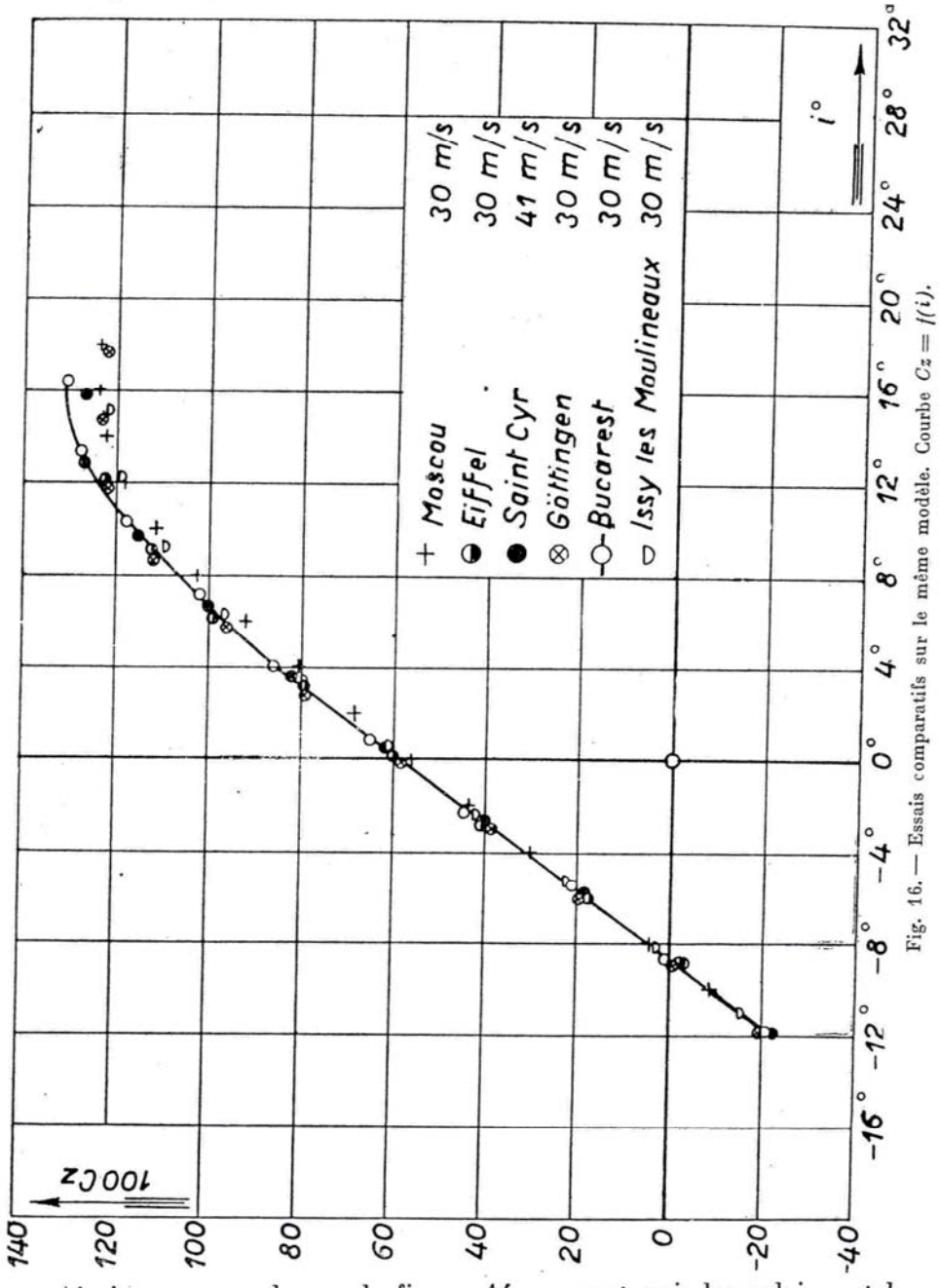

Fig. 16. — Essais comparatifs sur le même modèle. Courbe $C_z = f(i)$.

Ainsi, par exemple, sur la figure 14 on peut voir les polaires et les courbes des moments d'une même aile expérimentée trois fois dans

Annex 7

notre tunnel, à de dates différentes. Quoi qu'il s'agisse d'un modèle ayant une flèche très prononcée et par conséquent une forme assez sin-

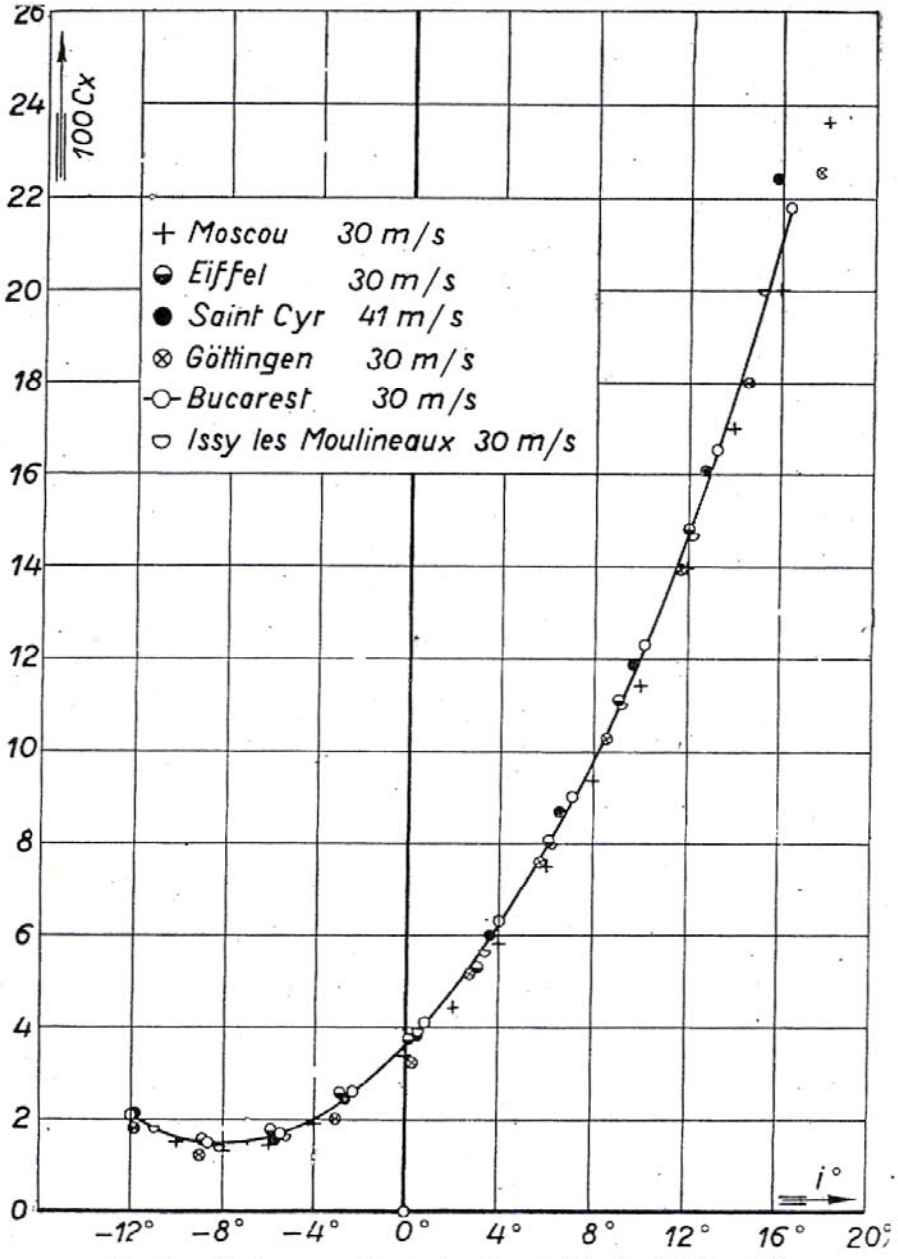

Fig. 17. — Essais comparatifs sur le même modèle. Courbe $Cx = f(i)$.

gulière, les résultats ne diffèrent que par des quantités absolument négligeables.