LEV GERASIMOVICH LOITSYANSKII (ON HIS 75TH BIRTHDAY)

Lev Gerasimovich Loitsyanskii was born in St. Petersburg on December 26, 1900, into the family of a printer. In 1917, after graduating from the gymnasium, he entered the physics and mathematical department of St. Petersburg University, and he continued his education in Crimea University in Simferopol. After his graduation in 1921, he taught analytic geometry and mathematical analysis in the mathematics department of Crimea University.

In 1922, after his return to Petrograd, Doctor Loitsyanskii was appointed Assistant Chairman in the department of theoretical mechanics in the Petrograd Polytechnic Institute. From 1924 on he worked in the same department as an assistant professor, and after 1929 as a substitute professor of the department of mechanics in the Gertsen Leningrad Pedagogical Institute. In 1930 he was appointed to a professorship in the department of theoretical mechanics of the Leningrad Polytechnic Institute (L. P. I.).

While he worked in the L. P. I., Doctor Loitsyanskii organized an aerometric laboratory (1929) which he directed until 1931 at the Chief Bureau of Weights and Measures. In 1934 he organized and became the director of the department of hydrodynamics in the L. P. I. In 1935, Doctor Loitsyanskii was given the title of Doctor of Physics and Mathematical Sciences (without dissertation defense). From 1935 to 1941 he acted as a resident scientific consultant at the Zhukovskii Central Aerohydrodynamics Institute, and from 1938 to 1940 as a senior scientific colleague of the Institute of Mechanics of the Academy of Sciences of the USSR. During these years he was a scientific director and consultant in the Polzunov Central Turbine Institute, the Vedeneev All-Union Scientific-Research Institute of Hydrotechnology, and the Krylov Central Scientific-Research Institute. From 1938 to 1941, Doctor Loitsyanskii taught a course in theoretical mechanics in the Budennyi Military Electrotechnological Academy.

At the beginning of World War II, L. G. Loitsyanskii was a director of one of the scientific departments of the Zhukovskii Institute. In 1945 he returned to the Leningrad Polytechnic Institute in the department of hydroaerodynamics.

For his great contribution to aeronautics during World War II, Doctor Loitsyanskii was awarded the Order of the Red Banner of Labor and the Order of the Red Star. In 1946 he and Academician A. A. Dorodnitsyn were awarded a national prize for their research in jet aerodynamics.

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Doctor Loitsyanskii was also rewarded for his scientific and pedagogical activity by the Order of Lenin, by another Order of the Red Banner of Labor, and by various honorary degrees. In 1968, by order of the Supreme Soviet of the USSR, he was named a distinguished scientist of the USSR. In 1969 he was elected an Associate Member of the International Astronautical Academy, and in 1971 he became a full member. Since 1972 L. G. Loitsyanskii has been a member of the Polish Society of Theoretical and Applied Mechanics.

For many years Doctor Loitsyanskii has done much for science and society. He acts as Vice-Chairman of the National Committee of the USSR in Theoretical and Applied Mechanics, Vice-Chairman of the Scientific Council on Problems of Control Processes, Academy of Sciences of the USSR, Vice-Chairman of the Physics and Mathematical Section of the Editorial Council of the Academy of Sciences of the USSR, and a member of the Presidium of the Scientific and Methodological Council of Mechanics of the USSR. He is also a member of the editorial board of "News of the Academy of Sciences of the USSR," "Fluid and Gas Mechanics," and "Technical Physics," a member of the Scientific Council of the Leningrad Polytechnic Institute and the Ioffe Physics Institute, a member of the Council of the House of Scientists, and a member of the Artistic Council of the Lenfil'm studio.

Doctor Loitsyanskii has published more than 100 original scientific works, a number of monographs, textbooks, surveys, and bibliographies.

Loitsyanksii's scientific work began with his study of problems related to applied mathematics. His research in the theory of plane kinematic mechanisms with two degrees of freedom was extremely original. Taking the Poincaré method as his point of departure, Loitsyanskii developed a theory of mechanisms that realizes conformal mappings, and then he formulated and proved several general theorems for "conformal motion transformators"; afterwards he applied this theorem to his research on some two-dimensional mechanisms. During this time L. G. Loitsyanskii carried out research in the theory of the approximate revolution of integrals by expanding orthogonal functions. The variety of his scientific interest is evident from his study in the oscillations of an aeronautical inclinometer, the oscillations of a solid particle on a screen in the presence of dry friction, and the oscillations subject to a step law of resistance. He also derived an original Euler formula for the finite rotation of a solid.

Doctor Loitsyanskii obtained essential and significant results in theoretical and applied hydroaerodynamics and also in boundary-layer theory, eddy theory in fluids and gases, and lubrication theory. Loitsyanskii played a great role in propagating ideas of boundary-layer theory, especially in the thirties and forties, when these concepts only began to spread and met with mistrust and skepticism from various scientists who did not believe in the future prospects and technological significance of the new branch of hydroaerodynamics – boundary-layer theory.

The first Soviet monograph by Loitsyanskii on boundary-layer theory, entitled "Aerodynamics of a Boundary Layer" (1940), played an important role in this regard. In this monograph Loitsyanskii summarized all the achievements of Soviet and foreign scientists on boundary-layer theory (including his own) up to World War II, 30 years after the publication of Prandtl's fundamental work.

His monograph became and still remains a reference book for engineers and scientists engaged in aerodyanmic design.

In his early works Loitsyanskii carried out research on the controlling of a boundary layer on poorly flowing bodies in order to decrease their resistance and intensification of heat transfer, and he also indicated methods of boundary-layer turbulence. Loitsyanskii's studies in the theory of the resistance of lattices, which imitate the rotors of a turbodynamo, had great applied value. As a result, he obtained new formulas for the lattice resistance of profiles which were widely applied in the practice of designing rotors.

In the 1930s Doctor Loitsyanskii developed new methods for calculating two-dimensional and three-dimensional axisymmetric boundary layers. In particular, he formulated and solved approximately a problem for calculating a three-dimensional boundary layer close to the line of intersection of two surfaces.

The approximate single-parameter methods developed by L. G. Loitsyanskii from 1941-1945 for calculating laminar and turbulent boundary layers was of great significance, and these methods were widely used in practice.

At the end of the 1940's, Loitsyanskii proposed together with approximate methods a number of exact methods based on the application of the Jourdain variational principle and the general method of moments (Loitsyanskii's "moment equations"). The latter method was widely used in both Soviet and foreign research.

The study of single-parameter methods for laminar boundary-layer theory that was started in the 1940's was completed by Loitsyanskii in the last decade. In his study Loitsyanskii carried out the generalization of the classical similarity method for the case of similarity with innumerable parameters and with a finite and small number of parameters (because of computer limitations). The integrodifferential equation of the "generalized similarity" appeared for the first time in the works of 1964-1966. This equation has a universal form independent of the particular form of the velocity distribution on the external boundary of the boundary layer in the specific problem given. When the numerical integration of this equation is carried out once, it establishes a valid multiparameter family of longitudinal velocity profiles in sections of the boundary layer; the location of the profiles along the sections requires an ordinary differential equation of the first order in specific problems. An approximate integral of this equation can be represented in closed form. The "generalized similarity" method was widely used both in the Soviet Union and abroad and was applied to complex physical problems of boundary-layer theory.

The parameter method was newly developed recently. By doubling the number of independent parameters, we can reduce the integrodifferential universal equation of the old k-parameter method to a differential equation in partial derivatives in the new 2k-parameter method, which allows us to apply it to unsteady problems and more complex problems of boundary-layer theory.

The contribution of Loitsyanskii to the theory of laminar and turbulent jets is also considerable. His work in the theory of twisted, radially slit, and fan jets are original both in the formulation and the solution of problems (only nontwisted jets had been studied up to the publication of these works in 1953). The ideas in these works were extensively developed in both Soviet and foreign research for solving heat problems.

Loitsyanskii's "The Laminary Boundary Layer" (1962) was a significant event in the development of hydroaerodynamics. In this work Loitsyanskii discussed classical boundary-layer theory along with a new stage in this theory that is related to the solution of problems arising for the motion velocities of gas flows. The monograph was translated into German and published in East Germany in 1967.

The work of Doctor Loitsyanskii in semiempirical turbulence theory has had a significant scientific, methodological, and applied value. Loitsyanskii established a general resistance law that is valid in every flow by including a boundary region in which it is impossible to neglect the effect of molecular viscosity on turbulence transfer. These works not only deepened our knowledge of the classical semiempirical theories of Prandtl and Karman, but also created a new theory of turbulent motion that allows us to successfully calculate processes of heat and mass transfer for large values of Prandtl and Schmidt numbers.

Doctor Loitsyanskii's research in statistical theories of turbulence ("the Loitsyanskii invariant") enjoyed great popularity in our country and abroad. This invariant served as one of the points of departure for the study of statistical theories of turbulence.

L. G. Loitsyanskii is one of the pioneers of national research in the theory of the gas lubrication of bearings and suspension devices. The general formulas obtained by Loitsyanskii for the lift and the moment of resistance of a spherical pivot during its random motion with respect to a spherical bearing with compression both taken into account and neglected served as the basis for extensive practical applications.

The role which Loitsyanskii played in teaching hydroaerodynamics is universally acknowledged. His basic work, "Fluid and Gas Mechanics," which went through four printings (1950, 1957, 1970, and 1973), enjoys great popularity among teachers, students, engineers, and scientists. It was published in the People's Republic of China, Czechoslovakia, Hungary, and England.

The world renowned two-volume "Course in Theoretical Mechanics" and also the three-volume "Theoretical Mechanics" of L. G. Loitsyanskii and A. I. Lur'e were reprinted many times since 1934. These works are already classics of Soviet technological literature, and they have been used continuously as textbooks by many generations of Soviet and foreign engineers.

The editorial staff of "Journal of Engineering Physics" warmly congratulates Doctor Loitsyanskii on his 75th birthday and for his 50 years of scientific and pedagogical activity, and it also wishes him good health and future success.