

HEAT TRANSFER IN ENGINES

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Contents

The following are the four parts of this chapter

1. Fundamentals of the heat transfer theory
2. Thermal protection of power plants
3. Heat exchange apparatus
4. Heat transfer enhancement

Summary

The science of heat transfer has its origin several centuries ago. But it was well developed in the 1920s only and applied to numerous technical tasks. The problem of heat exchange influence calculation is important during construction and designing of aviation and space engines. Topicality of this problem engineering solutions is explained by high thermal intensity of modern engines, by usage of such cryogenic fuel components in liquid phase as hydrogen, oxygen and methane and also by considerable nonstationarity of hydraulic gas dynamics processes in engines systems. Development of thermal regimes calculation methods for aircrafts, air conditioning systems, electronic equipment and dimensions decrease of aircrafts thermally intensive systems are very relevant. The main bases of heat exchange theory and it applications in jet engines are considered in present chapter. It consists of four parts. Heat exchange theory is briefly described in first part. The second part is dedicated to thermal protection methods in jet engine elements Parts 3 presents important aspects of heat exchange units and intensification of heat transfer and lastly Part 4 discusses heat transfer enhancement.

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Biographical Sketches

B.M. Galitseyskiy: Professor of the Department of Aviation-Space Thermal Techniques of Moscow Aviation Institute – MAI. 4. Volokolamskoe shosse, Moscow 125993, Russia. Date of birth – 13.07.1936 Engineer (Moscow Aviation Institute) – 1958. Doctor of Philosophy (Moscow Aviation Institute) - 1965. Doctor of Technical Sciences (Moscow Aviation Institute) - 1976. Titled Professor (Moscow Aviation Institute) - 1980, Russian Federation State Prize Laureate –1990, MAI Prize Laureate – 1989, 2000,

Honored Scientist of Russian Federation – 1998. He is a well-known specialist in the heat-mass transfer and space thermo techniques. He conducted the investigations of heat transfer in oscillating flows, porous systems, jet systems, cooling systems of power plant. He is specialized in effective methods of the heat transfer intensification and highly productive methods of systems cooling calculation. He is author of more than 250 published works, including the monographs: *Heat Transfer in the Power Installations of Spacecrafts* (1975), *Heat and Hydrodynamic Processes in Oscillating Flows* (1977). *Heat transfer in aviation engines* (1985). *Fundamentals of Heat Transfer in Aviation and Rocket-space Technics* (1992, in cooperation with other authors). *Thermal protection of turbine blade* (1996).

Genrikh A. Dreitser. Moscow Aviation Institute – MAI. 4, Volokolamskoe shosse, Moscow, 125993, Russia. Date of birth- 14.06.1934. Engineer (Moscow Power Engineering Institute) - 1958. Doctor of Philosophy (Moscow Aviation Institute)- 1964. Doctor of Technical Sciences (Moscow Aviation Institute) - 1978. Titled Professor (Moscow Aviation Institute) - 1981. USSR State Prize Laureate -1985. Russian Federation State Prize Laureate - 1990. Honored Scientist of Russian Federation - 1996. Two Gold Medals of USSR State Industrial Exhibition-1983, 1985. Three Silver MAI Prize Laureate - 1996, 2000. He is a well known specialist on heat and mass transfer and aerospace thermal techniques. He executed fundamental researches on unsteady heat transfer hydrodynamics in single-phase and two-phase cryogenic fluids in channels and tanks with reference to aerospace engines and power installations. His work has led to the development new engineering methods of calculation unsteady and emergency regimes in engines and power installations, methods of calculation of turbulent two phase flows. He developed and investigated an effective method of heat transfer enhancement in tubular heat exchangers. He for the first time found out the law of remarkable increase of heat transfer in channels with discrete turbulizers in comparison with similar smooth channels concerning increase of hydraulic resistance. This law was registered by USSR State Committee Inventions and Discoveries in 1981 as scientific discovery. Professor G.A. Dreitser – author more than 450 published works, including 24 monographs (Books), among which 6 were translated in the USA.