Combustion Instability

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ABOUT THE BOOK

Combustion instability has long been recognized as one of the most important but difficult problems in the development of propulsion systems. Both the U.S. and the former Soviet Union were working during the Cold War to solve the instability problem at the same time. However, the scientific basis and engineering approach employed by the Soviets remained largely unknown to the Western world.

This book—much of it formerly classified material—is a clear exposition of much of the theoretical work on combustion instabilities performed in support of the Soviet liquid rocket program during its most vigorous period. While there are similarities between Western and Eastern work, there are many distinct differences. The author was one of the small group of Soviet theorists actively engaged in all of the Soviet liquid rocket programs. His development of the field is firmly grounded in fundamental ideas, and progresses toward applications. One chapter is new since the original Russian edition, covering both theory and experiment for bifurcations of dynamical behavior in liquid rocket chambers.

The book was written by Professor M. S. Natanzon in Russia and edited by Professor Fred E. C. Culick of Caltech, two internationally renowned experts in the field.

ABOUT THE AUTHOR

Miron Semyonovich Natanzon was born in 1926 in the city of Karkov, Ukraine. He began his aviation career during WWII at the age of 16 when he entered the Voronej Aviation Institute in Uzbekistan. After the war, he entered and graduated from the Moscow Aviation Institute where he specialized in aeroengine design and construction. He then worked at NII (now known as the Keldysh Research Center) where he made his initial contribution to the field of unsteady combustion. In 1949, he proposed a model to explain loss of stability in liquid rocket engines. The fundamental formulation of that model is still used. Later that same year, he was forced to leave the organization after his father’s arrest by the KGB. For eight years, he continued working at home on problems of theoretical physics and publishing articles on his research. He later returned to NII, making significant contributions to the development of liquid rocket engines. The government subsequently awarded him the title “Honored Scientist and Technician of Russia.”

ABOUT THE EDITOR

Fred E. C. Culick is Richard L. and Dorothy M. Hayman Professor of Mechanical Engineering (Retired) at the California Institute of Technology.