

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion System (2) (2)

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KEYNOTE: BORIS NOVOZHILOV: LIFE AND CONTRIBUTION TO THE PHYSICS OF
COMBUSTION**Abstract**

Professor Boris Novozhilov passed away on February 19th, 2017 in Moscow. He is best known for his outstanding fundamental contribution to the theory of solid propellant combustion. The presentation starts with the brief overview of Prof. B. Novozhilov's biography and explains the scientific environment that surrounded him during the formative years of his career in the Soviet Union. The discussion is necessary to appreciate the strong influence of the Soviet school of theoretical physics on Boris' activities, and to understand why he was so successful in developing fundamental theoretical concepts. Technical part of the presentation discusses four major contributions made by Boris Novozhilov to the physics of combustion (although they do not exhaust by any means all his contributions). We start with the discussion of the Zeldovich-Novozhilov (ZN) theory of solid-propellant nonsteady combustion. This is Boris' wide-known contribution for which he was awarded Zeldovich Gold Medal for outstanding contribution to the theory of combustion by The Combustion Institute in 1996. Along with the fundamentals of this theory, its several important applications are discussed: stability of propellant combustion, burning rate oscillations and associated nonlinear effects, transient propellant extinction, and extension of the theory incorporating gas phase inertia. ZN theory was essentially developed by Boris in the 60s, although he has been refining it up to the end of his life. In parallel, and also during later stages of his career he worked on other topics in combustion. One of these was the theory of thermal explosion, the oldest problem in theoretical combustion, still however being developed up to the present day. Boris contributed to solution of several problems in this area, and some of his results will be discussed. During the later stages of his career, in the 90s and 00s, Boris made the other two fascinating discoveries in the combustion theory. The first was the theory of spin combustion, where he proposed an extremely elegant, essentially text book – style theory, pioneering rigorous explanation of this phenomenon. Another was his investigation of chaotic regimes of propellant combustion, where he demonstrated how the famous Feigenbaum period bifurcation scenario appears in distributed combustion systems.