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SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic and Combined Cycle Propulsion (9)

Author: Dr. Wenhui Ling
Science and Technology on Scramjet Laboratory, Beijing Power Machinery Research Institute, China, 59460924@qq.com

Dr. Baoxi Wei
Science and Technology on Scramjet Laboratory, Beijing Power Machinery Research Institute, China, weibaohuasky@163.com
Mr. Chunqin Luo
Science and Technology on Scramjet Laboratory, Beijing Power Machinery Research Institute, China, luozhyi@sina.com
Dr. Tinghe Li
China, weibaohuasky@163.com
Mr. Qiang Gang
China, weibaohuasky@163.com

A NOVEL TURBO-AIDED ROCKET-AUGMENTED RAMJET COMBINED CYCLE ENGINE CONCEPT

Abstract

Abstract: A novel multi-mode propulsion system is proposed for potential application to hypersonic planes. It is a Turbo-aided Rocket-augmented Ramjet Combined Cycle Engine Concept. A unique feature of this concept is the use of turbine engine combined with rocket-augmented Ramjet engine. It is an over-under configuration composed of low-speed turbine engine tunnel, high-speed rocket-augmented Ramjet engine tunnel and geometry variable common inlet and exhaust system. Turbine engine act as the primary thruster for Mach numbers in the range of about 0-2, and rocket-augmented Ramjet engine for Mach numbers of 2-6+. The obvious advantage is the high specific impulse performance and high thrust-to-weight performance. But not like TBCC, it eliminates the need of advanced turbine which can work at Mach namber of 0-4. It uses rocket-augmented Ramjet engine to resolve the relay problem from Turbine mode to Ramjet mode. And with a suitable use of air augmented rocket, this new combined engine can provide high thrust-to-weight performance and extremely raise the stable combustion ability of Ramjet mode at low pressure condition. This allows the hypersonic plane to obtain the economic subsonic and hypersonic long-range cruise ability, the high maneuvering ability at hypersonic flight condition and high ceiling altitude hypersonic cruise ability. Preliminary performance estimates suggust that thrust and specific impulse are comparable or superior to existing TBCC designs.