

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

Author: Dr. Wu Xianyu

College of Aerospace and Materials Engineering, National University of Defense Technology, China,
wxynudt@yahoo.com.cn

Mr. Chen Xuefu

China, ChenXuefu@163.com

Dr. Ding Meng

College of Aerospace and Materials Engineering, National University of Defense Technology, China,
mengding2011@163.com

Prof. Shen Chibing

National University of Defense Technology, China, cbshen@nudt.edu.cn

SYSTEM DESIGN AND ANALYSIS OF HYDROCARBON SCRAMJET WITH REGENERATION
COOLING AND EXPANSION CYCLE

Abstract

A new cycle scheme of scramjet system was brought forward in this paper. For this cycle scheme, the supercritical/cracking hydrocarbon fuel with high pressure and temperature produced after regeneration cooling is used to drive turbo-pump to supply hydrocarbon fuel, and the hot hydrocarbon from the turbo exit is injected to scramjet for organizing combustion. The ethylene assistant subsystem is adopted for scramjet ignition and cold start-up. This scheme will be propitious to high performance combustion, efficiency fuel supply and long-time thermal protection with the advantage of simple configuration, light weight and high efficiency. At the same time, the scramjet system coupling of thermodynamics and dynamics is complex because of the strong coupling of combustion, flow and heat transfer. It is a challenge for scramjet system design, dynamics characteristic analysis and working mode control. The working modes of this scramjet are expatiated, and the system design and analysis of scramjet start-up is performed. This work has a benefit to study the dynamics and thermodynamics coupling problem farther.