Paper ID: 48619
oral

IAF SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic Air-breathing and Combined Cycle Propulsion (9)

Author: Prof.Dr. Klaus Hannemann
DLR, German Aerospace Center, Germany, Klaus.Hannemann@dlr.de

KEYNOTE: ADVANCE OF SCRAMJET OPERATING MODE COMPREHENSION BASED ON SHOCK TUNNEL EXPERIMENTS AND NUMERICAL MODELLING

Abstract

At DLR, hydrogen fueled integrated scramjet configurations were in the focus of combined experimental and numerical research activities. The ground based testing was conducted in the High Enthalpy Shock Tunnel Göttingen. Among the considered configurations is the Australian HyShot II flight test vehicle. It was considered to be well suited for basic combustor investigations and numerical tool validation purposes. Benchmark data was compiled related to combustor flows. The latter focused on the response of the HyShot II combustor to equivalence ratios close to the critical value at which the onset of thermal choking occurs. The detailed analysis of the developing shock train and its unexpected behaviour revealed new insight in the combustor flow generated by localized thermal choking. A small scale flight experiment was designed in the framework of the LAPCAT II project. The complete scramjet flow path was subsequently tested and the numerically predicted positive aero-propulsive balance could be demonstrated by utilizing the free flight force measurement technique based on optical tracking.