SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic and Combined Cycle Propulsion (5)

Author: Prof. Piotr Wolanski
Polish Academy of Sciences, Poland, wolanski@itc.pw.edu.pl

Dr. Jan Kindracki
Warsaw University of Technology (WUT), Poland, jkind@itc.pw.edu.pl

APPLICATION OF CONTINUOUS ROTATING DETONATION TO JET PROPULSION

Abstract

Since the late fifties of the last century there have been many ideas of application of detonative combustion to propulsion systems, such as Standing Detonation (wave) Engine, Pulsed Detonation Engine (PDE) and Rotating Detonation Engine(RDE), sometimes called rotating wave detonation engine. During last twenty years intensive research were focused on PDE, but only more recently research on RDE were intensified. In this paper experimental research on rotating detonation carried out at Warsaw University of Technology and Institute of Aviation will be presented. Research are focused on evaluation of the conditions at which rotating detonation is propagating in cylindrical channels for different fuel-air and fuel-oxygen mixtures. Special test stands were build and conditions satisfactory for supporting propagation of the rotating detonation were tested. It was shown that rotating detonation can be initiated in various mixtures, such as acetylene and hydrogen with air, and hydrogen, methane, ethane or propane with oxygen. For that mixtures detonation parameters and detonation wave stability were tested. Also structure of propagating detonation wave was measured using pressure transducers and temperature at the exit of the chamber was measured by means of thermocouple. Possible application of continuously rotating detonation to air-breathing and rocket propulsion will be discussed.