

AN INFLUENCE OF BOOSTERS AND STABILIZERS ON AERODYNAMIC CHARACTERISTICS OF THE ILR-33 AMBER ROCKET

Robert Placek, Paweł Ruchała, Wit Stryczniewicz

Zakład Aerodynamiki, Instytut Lotnictwa

Jan Matyszewski, Dawid Cieśliński, Bartosz Bartkowiak

Zakład Technologii Kosmicznych, Instytut Lotnictwa

The paper presents results of wind tunnel tests of the ILR-33 Amber (“Bursztyn”) sounding rocket, which is developed in Institute of Aviation. The ILR-33 is designed as an easy accessible and affordable platform for microgravity experiments. Proposed design enables to perform experiments in microgravity for almost 150 seconds with apogee of about 100 km. The ILR-33 Amber has slightly more than 4.0 m of length, 0.23 m of diameter and about 175 kg of take-off weight.

The full-scale model of the ILR-33 Amber has been investigated in the T-3 wind tunnel in Institute of Aviation. The tunnel has open test section with the diameter of 5.0 m and the maximum flow speed is 90 m/s. During the investigation, the aerodynamic loads of the rocket has been measured for the angle of attack up to 10° and the different rotation angle around the longitudinal axis (up to 90° , depending on the configuration). Three configurations has been investigated:

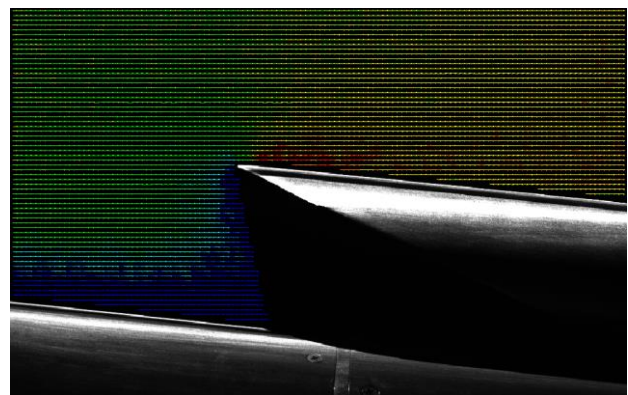
- 1) without stabilizers and boosters
- 2) with stabilizers and without boosters
- 3) with stabilizers and boosters

Additionally, the measurements of velocity field around the rocket using the Particle Image Velocimetry (PIV) has been performed.

Based on the wind tunnel test results, an influence of stabilizers and boosters on aerodynamic characteristics of the rocket has been described. Some conclusions concerning stability and performance of the rocket were drawn as well.



The ILR-33 Amber model in the T-3 wind tunnel



A velocity field around the booster, obtained using PIV