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Abstract

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Title

ACTiVE – Experimental investigation of the pressure distribution of linear aerospike nozzles with aerodynamic thrust vectoring

Authors

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Abstract

Within the ACTiVE-project, numerical and experimental investigations were conducted at Technische Universität Dresden concerning aerospike nozzles with thrust vector control through secondary fluid injection. One part of this project is a cold-gas experiment campaign to measure the surface pressure of linear aerospike nozzles utilizing thrust vector control through secondary injection in cooperation with the Institute of Space Propulsion of the German Aerospace Center (DLR) in Lampoldshausen.

This paper covers the methodology for the surface measurement tests as well as the results from the test campaign conducted in 2019. This campaign is a continuation of the pre-test campaign, which was presented at EUCASS in 2019 [1]. Following the argumentation for the investigated nozzle and thrust vector control method, a detailed presentation of the experimental set-up is given. The set-up covers the used test bench P6.2 at Lampoldshausen, the additional measurement equipment, consisting of a Schlieren motion picture (cf. Fig. 1) and a background oriented Schlieren (BOS) system. Subsequently, the test specimen (cf. Fig. 2) is described with respect to the nozzle and secondary injection design. The specimen itself is constructed modularly, allowing a fast replacement of the central spike with two truncation lengths and two injection positions for the secondary gas injection. This section will be completed with the specification of the pressure measurement locations. Subsequently, a presentation of the measurement results w.r.t. the nozzle surface and base pressure is given for the different nozzles at different nozzle pressure rates (NPRs) and injection pressures. In conclusion, these results are discussed and brought into context with literature.

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Fig. 1 Schlieren picture of a nearly adapted flow at NPR=45

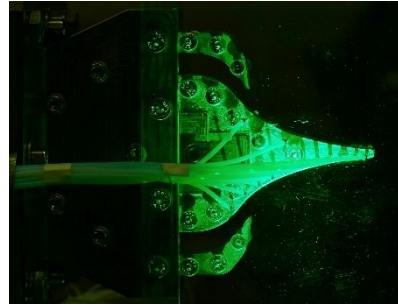


Fig. 2 Photograph of test specimen

References

- [1] Sieder-Katzmann, J.; Propst, M.; Stark, R.; Scheider, D.; General, Stephan; Tajmar, M. and Bach, C.: ACTiVE – Experimental set up and first results of cold gas measurements for linear aerospike nozzles with secondary fluid injection for thrust vectoring, 8th European Conference for Aeronautics and Aerospace Sciences (EUCASS), Madrid, July 2019 - <https://doi.org/10.13009/EUCASS2019-465>