Aerospace Europe Conference 2023
Joint 10th EUCASS – 9th CEAS Conference

Abstract #XXX *(to be filled by the organizers)*
Preferred Topics: TESTING / PROPHY / CFDMPS
Corresponding author: Martos, Joao
e-mail of corresponding author: joao.martos@tii.ae
Type: Oral
Status of corresponding author: Regular

Title

High speed flight experimental test capability development in the UAE

Authors

Joao Felipe de Araujo MARTOS [1], Alessandro Marini[2], Henrique Gustavo Argentieri [3]*

** Corresponding author*
[1] Propulsion and Space Research Center, Technology Innovation Institute, PO Box 9639 Abu Dhabi, United Arab Emirates, joao.martos@tii.ae
[2] Propulsion and Space Research Center, Technology Innovation Institute, PO Box 9639 Abu Dhabi, United Arab Emirates, alessandro.marini@tii.ae
[3] Propulsion and Space Research Center, Technology Innovation Institute, PO Box 9639 Abu Dhabi, United Arab Emirates, henrique.argentieri@tii.ae

Abstract

High speed transportation has always been desired by our society to reduce transport time and increase the world integration, unfortunately since the retirement of Concorde aircraft we don't have any civilian aircraft capable of it. Supersonic transport for passenger and cargo with great reduction of flight duration represents a major commercial appealing and holds an empty niche in this market since that. In order to develop economic and physically viable aircrafts its necessary to understand the unique features of compressible flow highlighting it as field of great interest nowadays. There are several research topics to be investigate in order to develop commercially viable supersonic/hypersonic aircraft and some of them are: The reduction of the sonic boom that could increase the supersonic flight routes; The waverider technology to improve the aerodynamics efficiency; Propulsion systems such as ramjet, scramjet, air turbo rockets to provide the necessary thrust with viable fuel consumption; development of subsystem for combined cycles propulsion systems; and also material and GNC system capable of operating in such harsh environment. As can be seen still necessary plenty of technology development in this field and unfortunately it is impossible to test everything in a single ground test facility, so it is necessary develop multiple test facilities dedicated to specific topic. In this context, experimental facilities capable to provide the desired conditions of high- speed flows in a controlled environment are necessary for testing and verification necessary along several project stages. There are several types of testing facilities capable of generating supersonic flow, among these the Ludwieg tube has become the chosen one from several institutions around the world due to its many versatile characteristics for aerodynamics analysis. For the propulsion system development, it is required a dedicated test facility capable of reproduce the combustion inlet enthalpy for longer periods of time than the one achieved in the Ludwieg tube, so we propose the project of a combustor level test facility capable of testing the required high enthalpy. In the Middle East there is lack of these type facilities, so we propose to the preliminary design based on theoretical and CFD simulation of a Ludwieg tube and a combustor level test facility suitable for R&D. Creating this capability in the region and thus boosting the national technology and scientific research on this field is our main goal. It is hoped that at the end of this work the complete preliminary design of a Ludwieg tube and a combustor test facility tube can be used to initiate the detailed project of this facilities for deployment in the near future of such facilities.

References

[1] Pope, A., and Goin, K. L., High-Speed Wind Tunnel Testing, John Wiley & Sons, Inc., New York, 1965, pp. 1–65.
[2] Hoffman, E., Combs, C.S.: Design Considerations and Analysis of the UTSA Hypersonic Ludwieg Tube Facility. AIAA Region IV Student Conference (2019).
[3] Kimmel, R.L., Borg, M., Jewell, J.S., Lam, K.Y., Bowersox, R., Srinivasan, R., Fuchs, S., Mooney, T.: AFRL Ludwieg Tube Initial Performance. 55 th AIAA Aerospace Sciences Meeting.