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Ihr Schreiben

Unser Zeichen

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## License Agreement

for the CFD Test Case

### HF-6: LOX/H<sub>2</sub>-Combustion LOX/H<sub>2</sub>-Combustion under forced acoustic excitation

The test data of this test case was generated by Dr.-Ing. Samuel Webster during his doctorate project (2010 – 2016) under the scientific supervision of Univ.-Prof. Dr. rer.nat. M. Oschwald in the Combustion Dynamics Group of Dr. Justin Hardi at the DLR Institute of Space Propulsion in Lampoldshausen, Germany.

The test case was first published at the 3rd Modeling Workshop of the French/German Rocket Engine Stability Initiative (REST) in 2014.

The test case "HF-6" is open to everyone, who wants to use the data base for CFD validation. The provision of this test case is intended to be a contribution to the field of research on thermo-acoustic instabilities, especially to high frequency combustion instabilities in rocket engines in order to advance progress in these fields. The provider of the test case highly appreciates to share results, experience and other useful information among the group of users and encourages all users to participate in that sense. Joint publications are welcome.

The test case consists of two documents:

- (1) the Test Case Description
- (2) the Test Case Data Set.

By signing this license agreement the user accepts:

- to not give access to anybody else to the contents of the test case description and test case data set
- to not distribute the contents of the test case and test case data set to third parties
- that he does not gain any rights on the obtained data or any other information on the test case.

- to cite in every publication (or in any other form of communication) the source and origin of his information, i.e. naming the authors and the institute. If the test case is used in any form of publication, the relevant publications below must be cited. Furthermore, the origin of the data base must be mentioned as follows: "The measurements on the test case "HF-6" were carried out at the Institute of Space Propulsion at the German Aerospace Center in Lampoldshausen, Germany."
- to give feedback to the Institute of Space Propulsion at the German Aerospace Center in Lampoldshausen about what he did with the provided information. Participation in the potential workshops and inclusion of these results in the data base are solicited and welcome.

After the signed License Agreement has been received by the contact at DLR listed below the detailed Test Case Description and the Test Case Data Set will be made available to the licensee.

#### Relevant publications of the test case:

- [1] *J. Hardi, M. Oswald, B. Dally: "Flame response to acoustic excitation in a rectangular rocket combustor with LOX/LH2 propellants", CEAS Space Journal, 2, 2011, pp. 41–49*
- [2] *J. Hardi, M. Oswald, B. Dally : «Acoustic characterisation of a rectangular rocket combustor with liquid oxygen and hydrogen propellants», Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering, Volume 227, Issue 3, March 2013, Pages 436-446*
- [3] *J. Hardi, S. Beinke, M. Oswald, B. Dally, Coupling of LOX/H2 Flames to Longitudinal and Transverse Acoustic Instabilities, Journal of Propulsion and Power, Vol. 30, No.4, 2014*
- [4] *J. Hardi, H.C. Gomez Martinez, M. Oswald, LOX Jet Atomization under Transverse Acoustic Oscillation, Journal of Propulsion and Power, Vol. 30, No. 2, pp. 337-349, 2014*
- [5] *S. Webster, J. Hardi, M. Oswald, Characterization of Acoustic Energy Content in an Experimental Combustion Chamber with and without External Forcing, CEAS Space Journal, Vol. 7, pp. 37-51, 2015*
- [6] *J. Hardi, M. Oswald, Cryogenic Oxygen Jet Response to Transverse Acoustic Excitation With the First Transverse and the the First Combined Longitudinal – Transverse Modes, Progress in Propulsion Physics, Vol. 8, pp. 75-94, 2016*
- [7] *S. Webster, J. Hardi, M. Oswald: Measurement of Acoustic Dissipation in an Experimental Combustor Under Representative Conditions, Journal of Sound and Vibration, Vol. 390, pp. 39-54, 2017*
- [8] *S. Webster, Analysis of Pressure Dynamics, Forced Excitation and Damping in a High Pressure LOX/H<sub>2</sub> Combustor, Dissertation, RWTH Aachen University, Germany, 2016*

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CFD Test Case

**HF-6: LOX/H2-Combustion LOX/H2-Combustion under  
forced acoustic excitation**

**License Agreement**

**User Details:**

Name:

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With my signature I fully accept the license agreement on the CFD test case HF-6 of DLR  
Institute of Space Propulsion :

Licensee Signature

Date

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