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ONERA
THE FRENCH AEROSPACE LAB

PROPOSITION DE STAGE EN COURS D'ETUDES

Référence : **DAAA-2025-18**
(à rappeler dans toute correspondance)

Lieu : Meudon

Département/Dir./Serv. : DAAA / (AMES+ MASH)

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Responsable(s) du stage : V. Brion/ C. Leclercq

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DESCRIPTION DU STAGE

Thématique(s) : Aérodynamique

Type de stage : ☐ Fin d'études bac+5 ☒ Master 2 ☐ Bac+2 à bac+4 ☐ Autres

Intitulé : Experimental flow control over an open cavity at supersonic speed

Sujet :

The flow over an open cavity is prone to an aero-acoustic feedback loop [1] leading to self-sustained pressure oscillations of large amplitudes. This phenomenon leads to structural fatigue and aero-optic distortion in the compressible case. Aerospace applications range from landing gear and telescope bays to weapon bays (see Figure 1), where flow oscillations may impede safe munition delivery. In this context, active flow control over supersonic and hypersonic cavity flows is identified as a key technology for the development of future military aircraft

In this internship, the goal is to carry out an experimental characterization of the dynamics of an open cavity in a new wind tunnel experiment for a Mach 1.5 flow, and then to test different control strategies. The focus will be on describing the physics of the flow oscillations in this context of a high-speed flow, using various measurement techniques including high speed Schlieren imaging, high frequency pressure measurement and pressure sensitive paint. Control strategies can be based on different principles, depending on whether they target a modification of the mean flow or modify the turbulence equilibrium by forcing the flow at high frequencies.

A synthesis on the efficiency and applicability of the control will be drawn, in the end, based on the experimental results.

The intern candidate must be strongly motivated by experimental work, data post-processing and analysis, as well as keen on compressible aerodynamics.

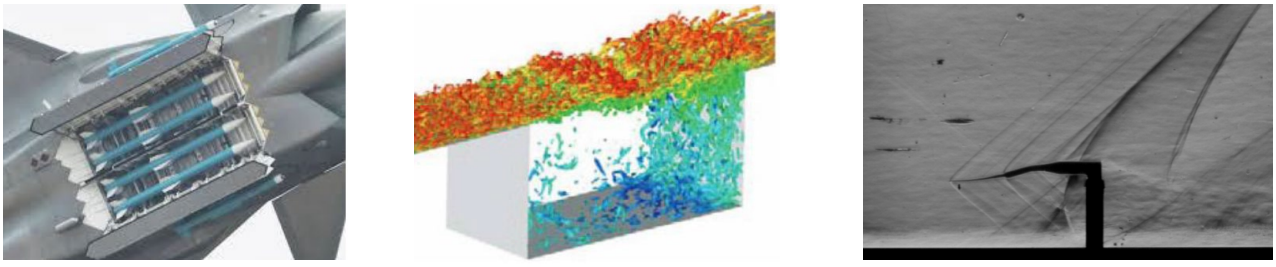

Fig. 1 – (left) Weapon bay of a supersonic fighter as an example of cavity. (middle) Numerical simulation of a cavity and (right) view of the probing of the experimental supersonic Mach 1.5 nozzle in ONERA Meudon wind tunnel.

[1] Cattafesta III, L. N., Song, Q., Williams, D. R., Rowley, C. W., & Alvi, F. S. (2008). Active control of flow-induced cavity oscillations. Progress in Aerospace Sciences, 44(7-8), 479-502.

Est-il possible d'envisager un travail en binôme ? **Non**

Méthodes à mettre en œuvre :

☐ Recherche théorique	☐ Travail de synthèse
☐ Recherche appliquée	☐ Travail de documentation
☒ Recherche expérimentale	☒ Participation à une réalisation

Possibilité de prolongation en thèse : **Non**

Durée du stage : Minimum : 5 mois Maximum : 6 mois

Période souhaitée : mars-août

PROFIL DU STAGIAIRE

Connaissances et niveau requis :	Ecoles ou établissements souhaités :
Fluid dynamics, data analysis, experiments	Engineering school, Master, University