

GUDGET: GUST GENERATORS AND MODEL DESIGN FOR TRANSONIC WIND TUNNEL TESTS

PROJECT OBJECTIVES

The GUDGET project will design, manufacture, calibrate, verify and finally install in the ONERA S3Ch Wind Tunnel (WT) an enhanced gust generator system and an aeroelastic half-model connected to the WT side wall, with the purpose to support ONERA in the execution of a WT test campaign and gather information on the aeroelastic behaviour of the model under high amplitude gust conditions, with the acquisition of a relevant database will allow to assess the numerical capabilities for the prediction of gust loads. At this aim, the consortium GUDGET has, first of all, to perform the design of the experimental setup. This means to design and manufacture the WT model according to technical requirements provided by ONERA. Special care will be dedicated to the dynamic characteristics of the final model, by ensuring that at least the three first normal modes will be in the frequency bandwidth [0-100 Hz], and that a specific interface with the WT will be implemented, with an elastic constraint around the model pitch axis.

In parallel, the consortium GUDGET will perform a preliminary trade-off analysis to find the best configuration of the GG to comply with requirements dictated in the topic, by considering innovative configurations of tilting airfoils moved by mechanical actuators as well as blowing slots fed by fluidic actuators or a combination of both. The objective is to develop 17 PJA that can provide a sonic jet and with a mass flow of 30 g/s for each one. The upstream pressure is 6 bar whereas the downstream pressure is close to 1 bar.

INNOVATION

Previous projects have already studied and designed Active Flow Control (AFC) solutions. We can mention [VIPER](#) which focused on the development of a Pulsed Jet Actuator (PJA), an actuator with non-zero mass net flux, and [ASPIC](#) or [SynJet3C](#), whose target was a Synthetic Jet Actuator (SJA) based on Amplified Piezo Actuators (APA®) of large dimensions.

Mechanism developed on VIPER was only a laboratory prototype to demonstrate the working of a PJA with APA® technology. The additional constraint on GUDGET project is to develop a miniaturized PJA that can be implemented into a wing for allowing high level test with the ONERA wind tunnel. One difficult constraint is to design a high performance PJA with mechanical space limitations.



Fig. 1: Overview of the wing airflow into a wind tunnel

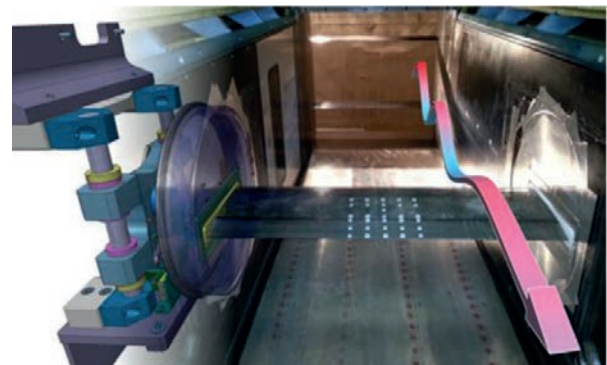


Fig. 2: Overview of the first PJA prototype for GUDGET project

CTEC CONTRIBUTION IN THE PROJECT

In the GUDGET project CTEC oversees:

- Design of a new miniaturized PJA prototype following requirements needed for aircraft wing integration,
- Manufacturing and tests of the prototype to validate the predicted performances,
- Optimize the prototype and produce some eight PJA for integration in the wing model into the wind tunnel,
- Produce the associated drive electronics.

CTEC will use heritage from the former VIPER projects using PJA, also developed for aircraft application. The general principle of such a flow control actuator is to inject a high-speed pulsed air flow on the air foil surface, through slots or holes. The interaction of this secondary flow aims at improving the aerodynamic performance of the aircraft.

PARTNERS

- [ONERA](#) : Topic Manager
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