SLOWD – SLOshing Wing Dynamics

Project Overview

Airbus (UK)

The first child of the Airbus/Ariane Sloshing Symposium
(SLOWD prototype test)

Acceleration Measurement at tip

Figure 3: Prototype Test Results
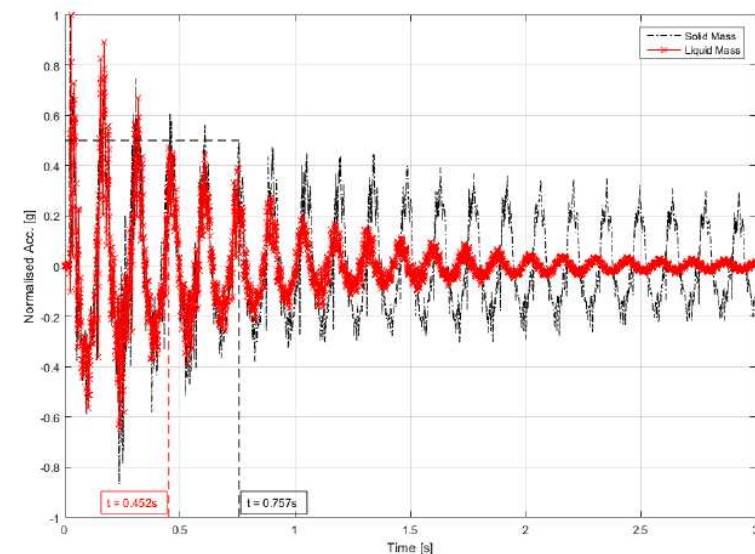
Aim of the project is to better understand the effect of fuel sloshing on the dynamics of a wing-like structure, and benefit existing and future wing designs.
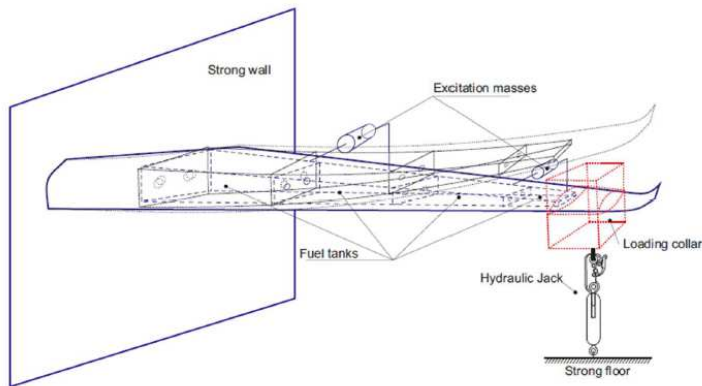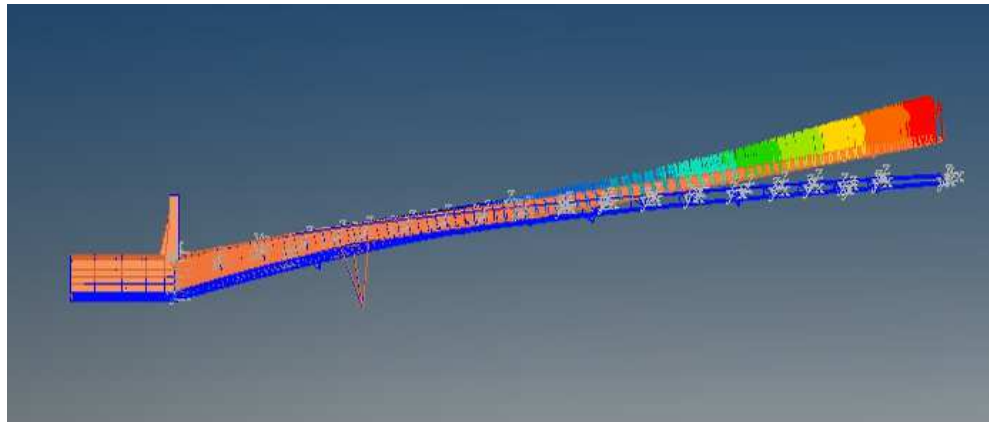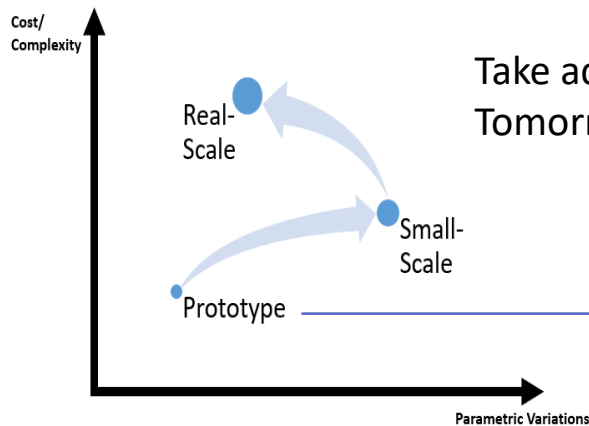
Figure 4: SLOWD Test Concept

Wing of Tomorrow Sloshing Test
Attachment's and Load Introductions
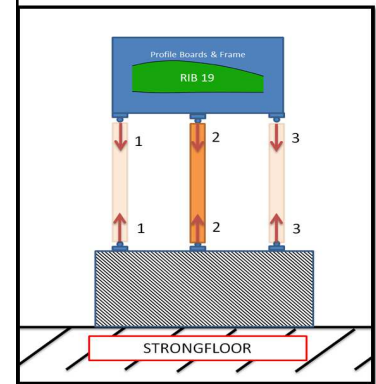
Take advantage of the opportunity to use the "Wing of Tomorrow" full-scale to understand the biases at small scale

We also introduced a 1dof test, to further reduce the complexity of the prototype test
https://www.youtube.com/channel/UC858I6aNUeXKi4QLscu87KQ

Physical System
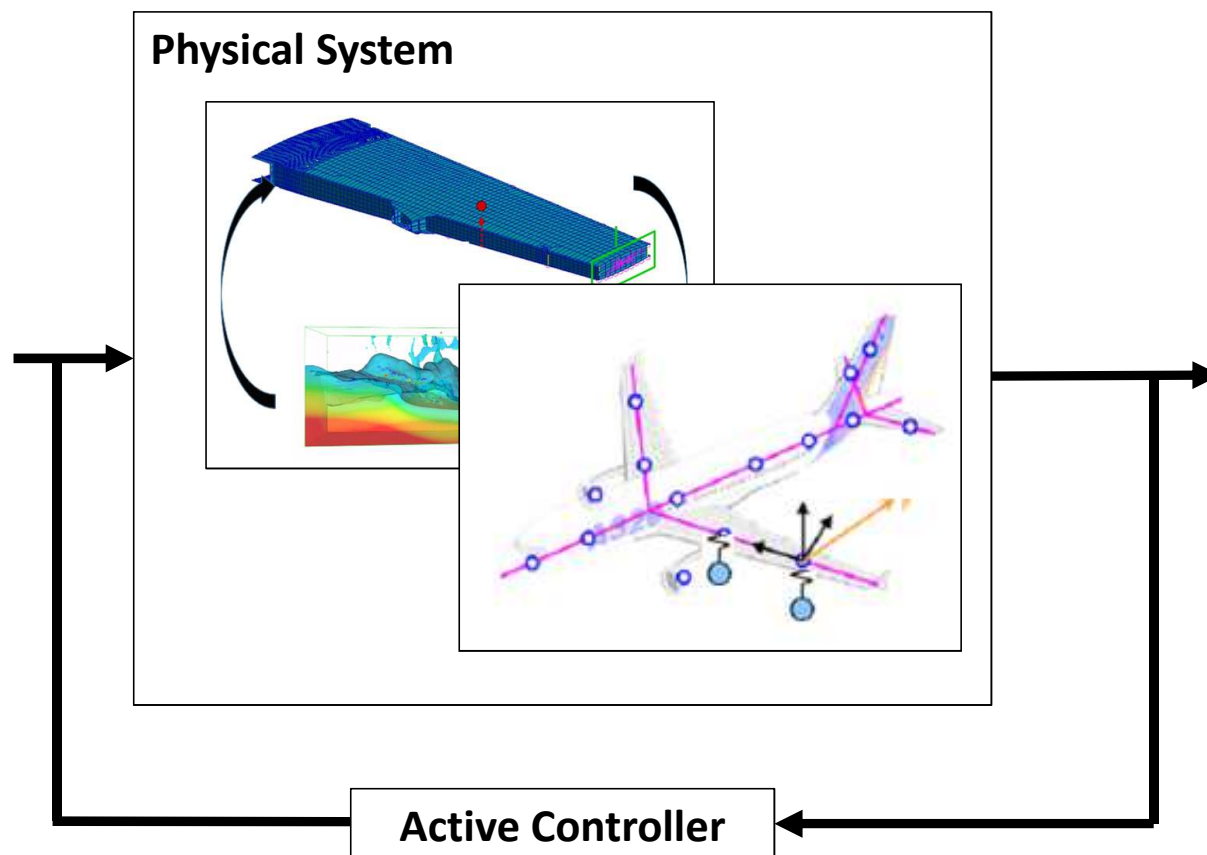
7.1 **Description of Proof of Concept**
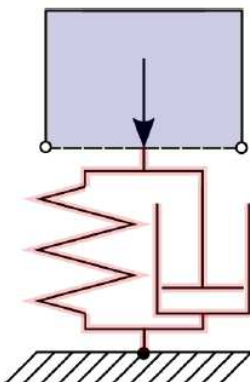
Figure 2: Simple Schematic of 1DOF Spring and Damper System

Developed Proof of concept software solution for FSI problem in Nastran for generic coupling with CFD/Simulink

Active Controller

- Airbus (Coordinator) - UK
- Airbus Defense&Space – Germany
- ArianeGroup – Germany
- UKRI – Science and Technology Facilities Council – UK
- University of Bristol – UK
- Polytechnic University of Madrid (UPM) – Spain
- University of Rome – Italy
- National Research Council (CNR) – Italy
- EASN-TIS - Belgium

Sloshing Induced Damping in Vertically Vibrating Systems *Joe de Courcy, Lucian Constantin, Brano Titurus, Tom Rendall, Jonathan Cooper*	1dof experiment, assessment of experimental and numerical work
Experimental study of the damping effects on a SDOF sloshing tank *Jon Martínez Carrascal, Leo Miguel González Gutiérrez*	
Advances in Reduced Order Modelling for Linear and Nonlinear Sloshing *Marco Pizzoli, Francesco Saltari, Franco Mastroddi*	Reduce order models for vertical sloshing
Proper Orthogonal Decomposition and Wavelet Analysis of Sloshing Flows *Tiziano Pagliaroli, Francesco Gambioli, Francesco Saltari, Jonathan Cooper*	Analysis of prototype test with advanced imaging techniques and signal processing
Investigating the Impact of Non-Dimensional Fluid Properties on Violent Sloshing by means of High Fidelity Volume of Fluid Simulations *M. Wright, A.G. Malan, F. Gambioli*	Detailed CFD analysis (VoF) of 1dof system, looking at the influence of various dimensionless numbers
Prediction of energy dissipation in violent sloshing flows by Smoothed Particle Hydrodynamics *Salvatore Marrone, Javier Calderon, Jon Martinez, Matteo Antuono, Andrea Colagrossi*	CFD analysis (SPH) of 1dof system, with focus on the energy dissipation effects

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Consiglio Nazionale delle Ricerche

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