

# EXPLORING NEW TECHNICAL ENVIRONMENT FOR GROUND VIBRATION TEST FOR THE EXTRA PERFORMANCE WING AIRBUS UPNEXT PROJECT

*Nicolas LASTERE \*, Fabien AYME and Guillaume OSMOND (AIRBUS), Nicolas GUERIN, Adrien ARNOULT and Cyrille STEPHAN (ONERA), Julian SINSKE, Keith SOAL, Martin TANG and Carsten THIEM (DLR)*

\* AIRBUS SAS

1 rond-point Maurice Bellonte 31707 Blagnac Cedex  
FRANCE

## ABSTRACT

Performing a Ground Vibration Test (GVT) is a prerequisite prior to First Flight to secure the flight envelope opening. Such an early identification is particularly important for a new aircraft prototype featuring innovative technical solutions for real-time control of dynamic response and loads on the airframe.

The eXtra performance WING Flight Test vehicle is derived from the genuine airframe structure of a Cessna Citation VII with brand new wing components including foldable large wing tips, morphing ailerons and three trailing edge flaps fitted with multi-control tab surfaces. This new wing technology demonstrator is representative of the high aspect ratio wing profile and will support the launch of a next-generation single-aisle aircraft.

Some of the Flight test objectives are aiming to develop new technology bricks for load alleviation or active flutter suppression in order to increase wing aspect ratio while remaining neutral in terms of weight. Detailed identification of the structural dynamic characteristics and refined modelling of the dynamic response of the structure are key enablers to support those new developments.

Full Fly-by-Wire technologies were implemented to support the fast control response of the aircraft to mitigate induced loads on the structure or control its structural dynamic response.

This paper is describing the specificities of this GVT in terms of testing objectives for modal identification of three aircraft configurations: a first configuration with fixed folding wing tip aligned on the outer wing component, a second configuration with folding wing tip coasting angle at 30° and a third configuration with folding wing tip free of rotation.

Specific testing set-up was designed and implemented with the contribution of the three vibration testing teams of Airbus, DLR & ONERA. This paper provides some technical insights into the challenges to identify the dynamic contribution / interaction of the multiple control surfaces implemented on this wing. Given the peculiar design of the eXtra performance WING Flight Test vehicle, the campaign also involved cutting-edge GVT methods to support the identification of nonlinear dynamic characteristics of the aircraft to support future GVT testing solutions.

State-of-the-art instrumentation technique and layout was implemented with a large number of external accelerometers. This was enhanced with the introduction of a specific tool suite allowing the synchronisation and the merge with the aircraft Flight Test Instrumentation sensors (Integrated Electronics Piezo-Electric accelerometers, MicroElectroMechanical System accelerometers or Inertial Measurement Units). Various types of electrodynamic shakers were used according to the specificities of the airframe components or expected amplitudes of the dynamic response.

This Ground Vibration Test was a full-scale demonstration of the technical collaboration, cross-fertilization and interaction of the Airbus, DLR & ONERA vibration teams to prepare the future GVT of Airbus.