

# ELTESTSYS

## ELECTRICAL TEST BENCH DRIVE SYSTEMS: MECHANICAL INTERFACES



### State of the art – Background

During Clean Sky programme, a modular test rig dedicated to validate the integration of electrical systems and equipment, the quality of the energy produced, and the stability of the network, as well as demonstrating the maturity of technologies and systems for “more electric” aircraft was developed. In this context, ELTESTSYS project goal was to design, manufacture and commission a test bench, composed of four complete and identical driving systems, intended to be used for aircraft starters/generators testing in conjunction with the modular test rig above mentioned.

Compared to the state of the art starter/generator test benches, the ELTESTSYS Test Bench had to be integrated with all ancillaries and control systems available at the place of use and to cover specific requirements: full control over an imposed speed/torque profile, specific control algorithm, position synchronization between two drives, functioning in both sense of rotation, as driving or breaking system.

To cover these requirements innovative solutions were implemented: use of recess gear system (for the bidirectional and birotational speed multiplier); use of non-contact torque and speed transducer; use of speed/position synchronization function between any two driving systems, use of specialized software for complete system configuration and management. Regenerative converters were used in order to obtain an environmental friendly test bench.

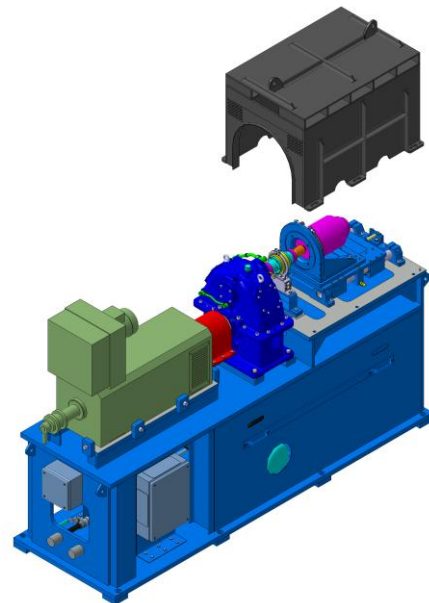
### Objectives

The project objective was to realize four “Generator and starter/generator drives” which will be used in a test lab environment to provide mechanical driving (or breaking) power at a given controlled speed (or torque) to a set of tested aircraft electrical equipment under test. These equipments under test are whether aircraft generators and (Reversible) Electrical Machines performing both starter and generator functions. Up to the total four of these equipments under test might be tested at the same time, independently or interdependently, continuously and in conditions similar to their use on aircraft. At

the end of the project, the ELTESTSYS Test Bench had to be installed at Copper Bird®, Hispano Suiza, Paris in order to enable the test of new aircraft starter/generators, in the frame of CleanSky programme.

### Description of work

The work on this project took 28 months and was structured in three main engineering areas: mechanical, electrical and control & data acquisition. The technical work was divided in 5 work packages: WP1 System Definition, WP2 Preliminary Design Phase, WP3 Detailed Design Phase, WP4 Manufacturing/Assembly and WP5 Commissioning. The results of the design activities (WP 1-3) were detailed engineering documents (analyses, descriptions, diagrams, drawings) needed to support tooling, manufacturing, assembly and testing activities.



ELTESTSYS Drive 3D model

In WP4 Manufacturing/Assembly, the ELTESTSYS test bench was developed and tested as specified in design documentation. After passing all factory tests, the commissioning phase (WP5) has been started. The test bench was installed and integrated at Copper Bird®, Hispano-Suiza, Paris, France where it will be used for aircraft starters/generators testing in conjunction with a modular test rig dedicated to demonstrate the maturity of technologies and systems for “more electric” aircraft.

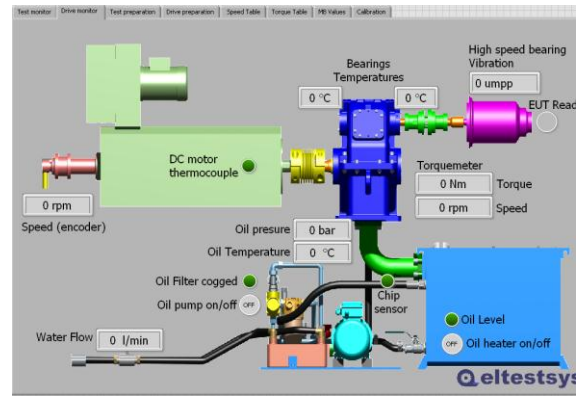
## Results

The result of the project is the complete ELTESTSYS Test Bench: hardware, wearing parts and specific tools, software and documentation.

As hardware, the test bench is composed of four identical Driving Systems and one Control and Storage Computer. Each Driving System consists in one Control Cabinet incorporating an industrial Panel PC with a high-speed data acquisition board, one Power Electronics Cabinet and the Drive. The Drive incorporates, on a welded Supporting Frame, the electric motor, the speed multiplier and its lubrication and cooling group, the mounting interfaces for the equipment under test and a bursting shield. The mechanical connection between the Drive and the equipment under test make use of two hydraulic couplings and a non-contact torque meter able to work up to 24000 RPM.

Up to the total four of these Driving Systems can work at the same time, independently or interdependently, locally or remote controlled, providing mechanical driving (or breaking) power at a given controlled speed (or torque) to a set of aircraft generators and/or starter/generators. Any two of the four drives can be synchronised in speed and position.

The test bench control software is a custom application usable in local mode (at the Control Cabinet touch screen) or in remote mode (through Ethernet). It controls, monitors and logs the entire test sequence as well as the test bench health parameters.



**ELTESTSYS Control Software**

The ELTESTSYS Test Bench was installed and integrated at Copper Bird®, Hispano-Suiza, Paris, France where it is used for aircraft starters/generators testing in order to demonstrate the maturity of technologies and systems for “more electric” aircraft.

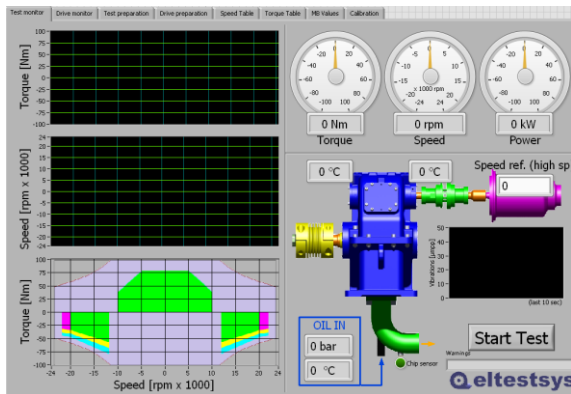


**Power Electronics Cabinets**



**Drives and Control Cabinets**

**ELTESTSYS at place of use (Copper Bird®)**



## Project Summary

Acronym: ELTESTSYS

Name of proposal: ELECTRICAL TEST BENCH DRIVE SYSTEMS: MECHANICAL INTERFACES

Technical domain: Electrical Test Bench Systems

Involved ITD: Eco design

Grant Agreement: 270584

Instrument: Clean Sky

Total Cost: 646 000€

Clean Sky contribution: 440 675€

Call: JTI-CS-2010-1

Starting date: 01/08/2011

Ending date: 30/10/2013

Duration: 28 months

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