
CLEANSKY
GREEN REGIONAL AIRCRAFT (GRA) ITD
All Electric Aircraft (AEA) DOMAIN
Design and development of an FCS Electro-mechanical actuator
Call for proposal description
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Test Bench and general EMA/ECU concept design

- The CFP herewith summarized includes the requirements for design, development and testing of an Electromechanical FCS actuator (EMA) and its relevant Electronic Control Unit (ECU) for future Regional Aircraft Primary Flight Control surface application, and its associated test bench design / development requirements.

- The class of actuator in term of load/power has been focused on a Rudder surface application, being one of the most loaded actuators.

Test Bench and general EMA/ECU concept design

- The test bench will be equipped with a passive load device for performance tests in loaded conditions. The inertial loads will be simulated by means of a dedicated mass-balance system.

- The test bench will we installed on an ATR A/C for Energy management demonstration during experimental flight(s)

- During the experimental flight(s) the EMA will not be connected to any A/C flight control surface.

Test Bench and general EMA/ECU philolosophy

- The test bench will be also installed on a test rig (named Copper Bird Rig at Hispano-Suiza premises, Paris area)
- The Test bench will be power supplied at 230 Vac on the Rig and at 115 Vac (variable frequency) on the A/C.
- The maximum test bench power (EMA excluded) shall be around 1 kW
- The EMA will be power supplied at 270 HVdc
- The ECU will be supplied at 28 Vdc, provided by the test bench

EMA main features

- The required EMA main features are:
  - Linear type
  - Simplex motor
  - 30 kN maximum operative load and 45 kN stall load
  - 2.1 kW mechanical continuous power
  - Max 2.8 kW electrical power
  - Bandwidth > 5 Hz
  - Static stiffness > 60 kN/mm
  - Low backdrive force (breakout load < 1 kN) and damping in fail-safe condition

EMA main features

- EMA required main features (continued):
  - Anti-jamming device
  - Dual redundant position sensor
  - ECU power consumption around 100 W
  - Mass (including ECU) 15 kg max

ECU main features

- The ECU required main features are:
  - Digital position control
  - Dual digital communication link for command (either test bench generated or external source)
  - 28 Vdc power supply

Qualification

- A limited set of tests will be performed on EMA/ECU for the in-flight energy management test purpose and in order to demonstrate a reasonable capability to operate in a real operative environment:
  - Limited Endurance and Fatigue Tests
  - Vibration Tests
  - Temperature Tests
  - EMI/EMC limited tests (emissions)

Design and development schedule

The development is scheduled by the following main events

- PDR at T0+4 Months
- CDR at T0+8 Months
- EMA/ECU test bench qualification and delivery: T0+16 Months
- End of activities: december 2015