PROJECT

ACT-TILT

Active control technologies for tiltrotor

Funding: European (5th RTD Framework Programme)
Duration: Nov 2001 - May 2005
Status: Complete with results

Background & policy context:

As the air passenger traffic continues to grow, by at least 5% per year, airport congestion becomes a mounting problem in Europe. Because of environmental constraints, airport extensions are more and more difficult to achieve and there is an increasing pressure for finding innovative solutions to cope with the air traffic growth expected within the next 20 years.

As already evidenced during the AIRPORT-IV study sponsored mid 90's by DG-VII, one of these innovative solutions could be the use of Rotorcraft for some of the hub-feeder missions which are today achieved with turboprop aircraft.

Indeed, thanks to their inherent Vertical Takeoff and Landing (VTOL) capability, Rotorcraft are able to reach airports without using the main runways which, in that case, could be reserved for large capacity medium/long haul jet airplanes.

Objectives:

The prime objective of the ACT-TILT project was to study some of the critical aspects of the Tilt-Rotor in order to reduce the development risk of a flying demonstrator:

- Flight Mechanics Models Improvements
- Handling Qualities Criteria
- Pre-design of Flight Control System
- Advanced Control Laws
- Power / Thrust Management
- Sidestick and Cockpit Layout

Methodology:

Pilot-in-the-loop simulations have been largely used to validate the different elements developed during this project.

Parent Programmes:
FP5-GROWTH KA4 (AERONAUTICS) - New Perspectives in Aeronautics

Institute type: Public institution
Institute name: European Commission, Directorate-General for Research (DG Research)
Funding type: Public (EU)

Partners:

France:
Eurocopter

Germany:
Eurocopter Deutschland GmbH; Liebherr Aerospace Lindenberg GmbH
Italy:
University degli Studi di Pisa; Teleavio, Consorzio Telecommunicazioni Avionica S.R.L.; Agusta S.P.A.

The Netherlands:
Stichting Nationaal Lucht- en Ruimtevaart Laboratorium

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Key Results:

The ACT-TILT project delivered 10 major results related to Tilt-Rotor flight control system design:

- Level 1 Handling Qualities criteria for a civil tilt-rotor
- Improved flight mechanics models for tilt-rotor, including ERICA configuration specific features (movable tip wing)
- Definition and safety analysis of Flight Control System (FCS) for a civil tilt-rotor, in particular for the ERICA configuration
- Optimised control gearings for the ERICA tilt-rotor configuration, including open loop tiltable outer wing control
- Active (closed loop) control laws providing Level 1 Handling Qualities for civil tilt-rotor, in particular for the ERICA configuration
- Carefree Handling features (Structural Load Alleviation, Envelope protection) compatible with HQ level 1 active control laws
- Power Thrust Management System (PTMS) for civil tilt-rotor, in particular for the ERICA configuration
- Requirements of primary controls (i.e. active side-stick) for use in a tilt-rotor cockpit
- Assessment of aircraft Handling Qualities in piloted simulation with both a conventional inceptor and a side-stick
- Defined applicability of in-flight simulation in support of tilt-rotor demonstrator development

Technical Implications

All these results represent a significant gain in Tilt-Rotor knowledge that could be exploited in further European Tilt-Rotor activities, in particular in NICE-TRIP.

Documents:

ACT-TILT A Major Step towards NICE-TRIP (Project presentation)

STRIA Roadmaps: Vehicle design and manufacturing, Network and traffic management systems

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Geo-spatial type: Infrastructure Node