

# Airbus Guidance and Control Selected 2005 Papers

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**AIRBU**

# Airbus Guidance and control – 2005 selected papers

- ✓ Papers on
  - ✓ System
  - ✓ Control laws
  - ✓ Flight mechanics
  
- ✓ Title of the paper is on top, reference at the bottom of the page

# Airbus Guidance and control – A380 update

**FIRST FLIGHT**

**April, 27**

**AUTO LAND**

**June, 1**

**EHA LAND**

**August, 27**



# A380 Flight controls overview

- ✓ Aircraft configuration and control surfaces
  - ✓ Actuator technology
  - ✓ Power sources for Flight Controls
  - ✓ Flight Control Architecture and Computers
  - ✓ Back-up controls
  - ✓ Flight Control Laws
- 
- A black and white photograph of an Airbus A380 aircraft in flight, viewed from a low angle, flying over a body of water with white-capped waves. The aircraft is the central focus, with its four engines and high-wing configuration clearly visible.

Reference: by Xavier LE TRON, Royal Aeronautical Society “A380 Avionics/System Conference”, in London, October 2005.

# A process toward total dependability: Airbus Fly-by-Wire paradigm

- ✓ Airbus FBW safety and availability principles
- ✓ Emphasis on their evolution and on future challenges
- ✓ Physical faults
- ✓ Design and manufacturing errors
- ✓ Particular risks
- ✓ Human factor

Reference: by Pascal TRAVERSE, Isabelle LACAZE and Jean SOUYRIS, 5<sup>th</sup> European Dependable Computing Conference (EDCC-5), in Budapest, April, 2005; and Ankara Aerospace Conference, August 2005.

# NON LINEAR ROBUST AUTOLAND

- ✓ 'Robust-Multi-Inversion' technique for feedback linearization
- ✓ Application to inner and outer loop
- ✓ Simulation results

Reference: by Fabien LAVERGNE, Fabrice VILLAUME, Matthieu JEANNEAU, Sophie TARBOURIECH, Germain GARCIA, AIAA Guidance Navigation and Guidance conference, in San Francisco, August 2005.

# AWIATOR'S DESIGN OF MULTI-OBJECTIVES CONTROL LAWS

✓ Considers various criteria in the design

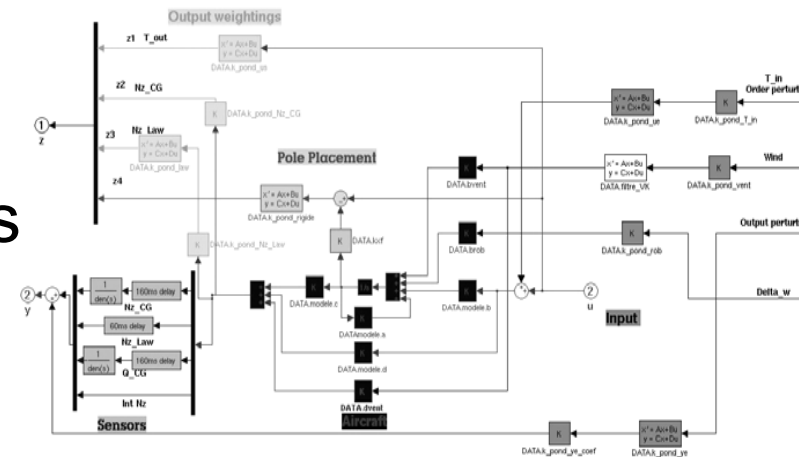
✓ Handling Qualities

✓ Stability margins

✓ Robustness to mass-cases

✓ Loads

✓ Comfort ...



✓ Benefits

✓ In the design process: less iterations with loads

✓ In the performances: conservatism is reduced

Reference: by Matthieu Jeanneau, Jérôme Lamolie, Guilhem Puyou, Nicky Aversa. 16th IFAC World Congress. Prague, July 2005. Awarded an Honourable Mention as one of the 5 finalists for the Young Author Prize.

# FEASIBILITY OF H INFINITY DESIGN SPECIFICATIONS: AN INTERPOLATION METHOD

- ✓ Design of a controller compliant to specifications – free order
- ✓ Nevanlinna Pick interpolation method to compute lower & upper bounds of  $J^*$
- ✓ Application to multiobjective control of flexible aircraft

Reference: by Gilles Ferreres, Guilhem Puyou. In Proceedings of the American Control Conference, Portland 2005 and International Journal of Control, Vol 78, N° 12, pp.927-936, August 2005.

# HANDLING QUALITIES OF THE BAGDAD EVENT

- ✓ Flight mechanics of an aircraft
- ✓ Underline capacity of a crew to land an aircraft without flight controls available, using engine only controls
- ✓ Underline the part of luck and the feat of the crew
- ✓ Demonstrate the difficulty of doing such a flight



Reference: by Benoit LEMAIGNAN, AIAA Atmospheric Flight conference, in San Francisco, August 2005.

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