

An Retrospective of Civil Transport Aircraft Research within GARTEUR

50th anniversary of the GARTEUR, Oct. 2023, 5-6
Pozzuoli, Naples, Italy

Ph. Beaumier, Aeronautics Director, ONERA

Overview

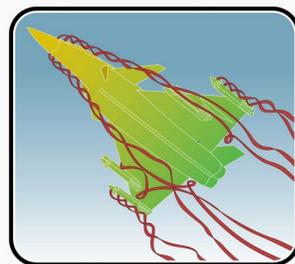
- Introduction
- Highlights through the decades
- Impact & lessons learnt
- Recommendations



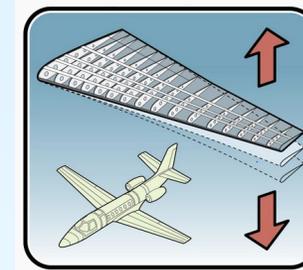
<https://garteur.org/>

Introduction

- This presentation:
 - Is a look back to the last decades, highlighting what seemed to be the most important achievements, from ONERA perspective (does not pretend to be exhaustive)
 - Relies on many documents (GARTEUR reports, conference papers...) produced by a huge number of scientists: thanks!
 - Shares similar content as the ICAS2022 excellent presentations done by the GoRs, but with a different perspective
- Focus on Civil Transport Aircraft, thus 3 GoRs:



Aerodynamics



Structures and
Material



Flight Mechanics, Systems
and Integration



Outline

80's

90's

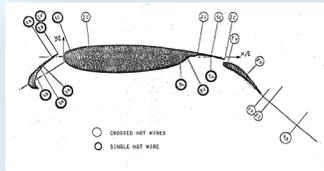
00's

10's

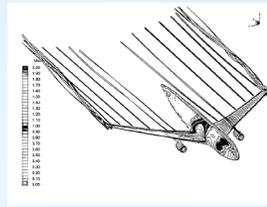
20's

AERODYNAMICS

High Lift, 2D



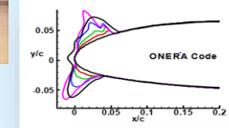
Transonic, 3D



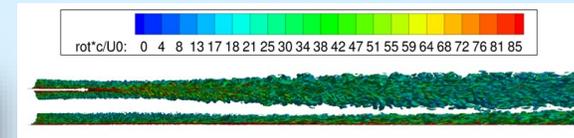
High Lift, 3D



Ice accretion



Flight domain limits
High g loads, Turbulence

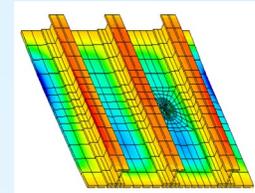
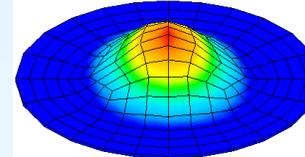
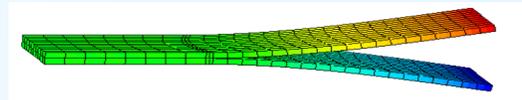
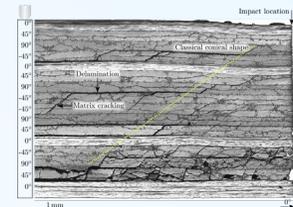


Very flexible aircraft



STRUCTURES & MATERIALS

Composites damage characterization under impact
From materials to complex structures

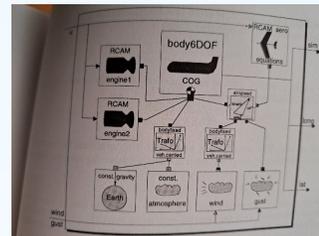


Complex structures
Hybrid, shock absorbers

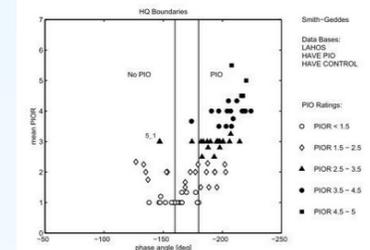


FLIGHT MECHANICS

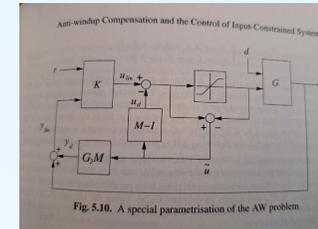
Robust Flight Control



Pilot-Induced Oscillations criteria



Non Linear Flight Control Systems



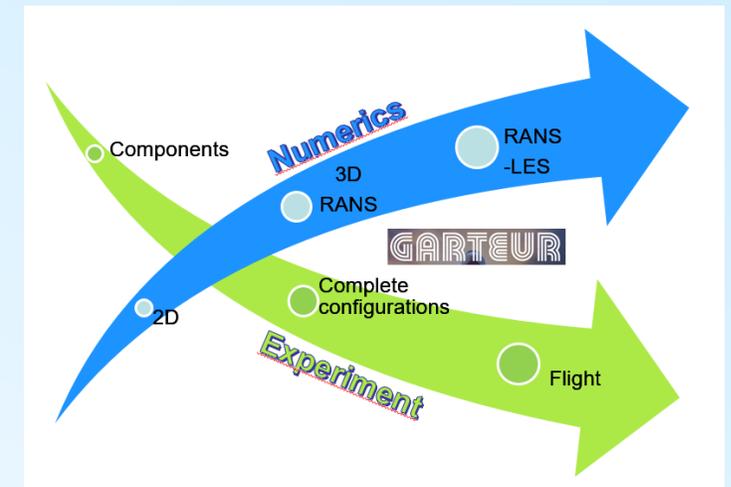
New manufacturing techniques
ALM

GARTEUR

1973 2023

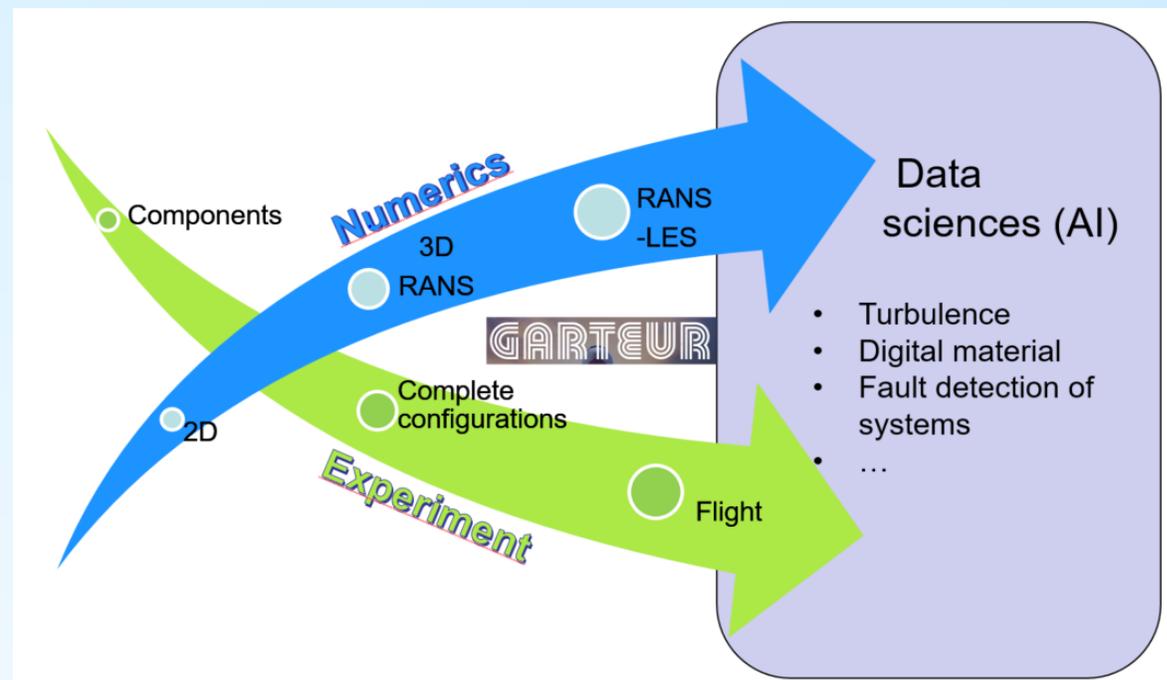
Impact and lessons learnt

- GARTEUR has always boosted **synergies** to build and share ‘academic’ **databases** or experiments to validate models = key of best performing AGs
- A group **dynamics** leading people to know each other and leading to **EU-funded project** (collaborative research, PPPs: CS2, Sesar)
- Recognition of GARTEUR through state-of-the-art **scientific publications**
- Evolution since 40 years:
 - More **experimental** activities in the past, more **numerics** now
 - **Industry** interest has remained: contribution has progressively changed from actor to prescriber/observer



Recommendations

- Maintain the ‘as little administrative work as possible’ spirit
- The ‘no money exchange’ spirit should remain
- **Industry** should continue to be part of the activities and even be reinforced
- AGs should be seen as ‘anticipators’
- Concerning Civil Transport Aircraft:
 - Prepare the **0-emission aircraft** (H2)
 - **Inter-disciplinary** couplings: multi-GoR approach?
 - Prepare **AI** emergence



Acknowledgement

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 - Roger Ohayon, Tasadduq Khan, Louis Anquez
 - Jean-François Magni
 - ...
- ICAS2022 Overview papers' contributors:
 - The Group of Responsables Aerodynamics (GoR AD): Giuseppe Mingione et al.
 - GARTEUR Structures and Materials: Bert Thuis et al
 - The Group of Responsables "Flight Mechanics, Systems & Integration (GoR FM)": Bernd Korn and Martin Hagström