GARTEUR

GROUP FOR AERONAUTICAL RESEARCH AND TECHNOLOGY IN EUROPE

FRANCE GERMANY ITALY THE NETHERLANDS SPAIN SWEDEN UNITED KINGDOM

GARTEUR LONG TERM R&T COLLABORATION IN EUROPE

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OUTLINE

- GARTEUR HISTORY & BACKGROUND
- GARTEUR MISSION and PRINCIPLES
- GARTEUR ORGANISATION
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  - FLIGHT MECHANICS, SYSTEMS AND INTEGRATION (FM)
  - HELICOPTERS (HC)
  - STRUCTURES AND MATERIALS (SM)
- CONCLUSIONS

GARTEUR HISTORY:

- Airbus established in 1970 after launching A 300
- GARTEUR established in 1973 by France, Germany and the UK
- In subsequent years joined by the Netherlands, Sweden, Spain and Italy

GARTEUR BACKGROUND

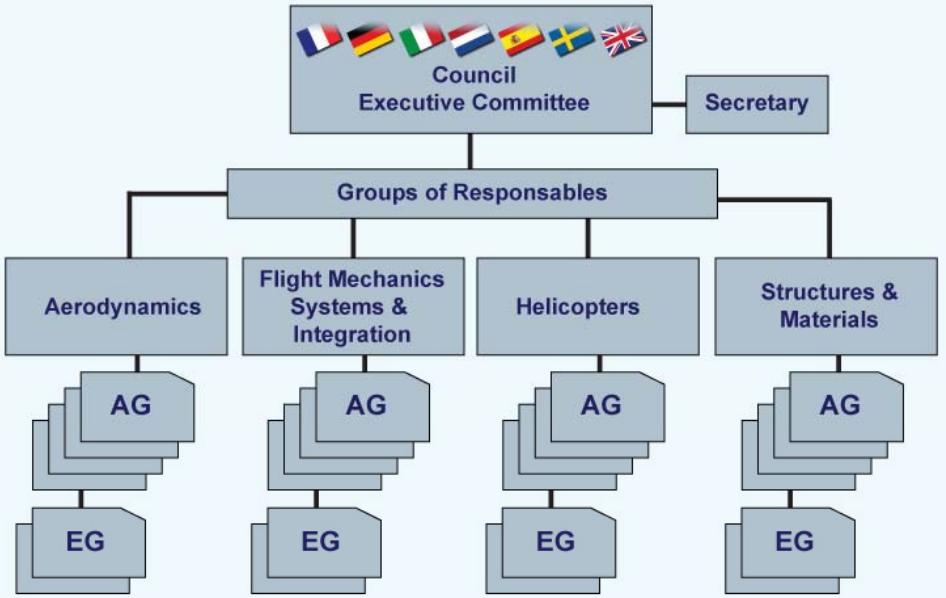
FM(AG15) EADS uses X-31 PIO database

- MoU between France, Germany, Italy, the Netherlands, Spain, Sweden and United Kingdom
- Participants*:* Research Establishments, Industries, Universities
- Identification of innovative R&T, and develop areas for industrial applications at TRL 2-5
- GARTEUR's performance and efficiency is improved continuously through:
  - Close relations with industry
  - Involvement of universities
  - Dual-use technologies

GARTEUR MISSION and PRINCIPLES

- Based on government-to-government agreement (MoU) between European nations with major research and test capabilities in aeronautics
- GARTEUR focus is on long term R&T to assure sustained competitiveness of European aerospace industries
- A unique forum of aeronautical experts from Academia, Research Establishments and Industry.
- The only framework in Europe for both civil and military aeronautics R&T
- Interaction with EU, EREA, ASD, EDA, Air-TN, NATO-RTO

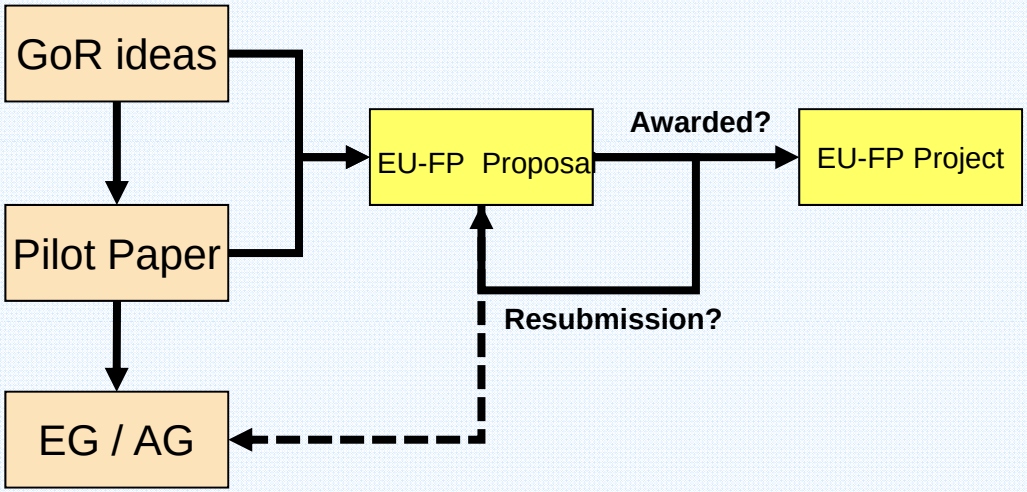
GARTEUR ORGANISATION: Three Levels



- **GARTEUR Council:**
  - Composed of representatives of member countries
  - Assisted by an Council Executive Committee
- **GARTEUR Groups of Responsables:**
  - Scientific management bodies and think-tanks
  - Representatives from RE, industry and academia
  - Four fields of activities AD, FM, HC, SM
- **GARTEUR Action Groups:**
  - Technical expert bodies
  - Formulate research programme and execute the research work
  - Collaboration feasibility of potential research subject investigated by an Exploratory Group (EG) to establish an agreed proposal
  - Participation from at least three GARTEUR countries

Ideas:

GARTEUR activity or European Project?



GARTEUR ORGANISATION: Interaction with AirTN

Upon request from ACARE, GARTEUR Council decided to propose an ERA-Net for aeronautics, using GARTEUR experience and competence. This was successful and resulted in AirTN, comprising 18 countries.

Participation of organizations from all AirTN nations in GARTEUR Action Groups is already possible within current mechanism.

GARTEUR nations and

- Austria
- Belgium
- Czech Republic
- Greece
- Hungary
- Ireland
- Poland
- Portugal
- Romania
- Slovakia
- Switzerland

FIELDS OF ACTIVITIES:
Aerodynamics (AD)

GoR AD is active in experimental, theoretical, analytical and numerical fields of aerodynamics to encourage the developments and applications of methods, tools and procedures for both civil and defense applications. GoR AD focuses on:

- *Applied and Fundamental Aerodynamics*
- *Aerothermodynamics*
- *Aeroacoustics*
- *Aeroelasticity*
- *Propulsion / Systems Aerodynamics Integration*
- *Transition and Turbulence Modelling*

FIELDS OF ACTIVITIES:
Aerodynamics (AD)
Action Groups

o Highly Integrated Subsonic Intakes	AD/AG-46
o Coupling of CFD with Flight Mechanics Modeling	AD/AG-47
o Lateral Jet Interactions at Supersonic Speeds	AD/AG-48
o Scrutinizing Hybrid RANS-LES for Aero Application	AD/AG-49
o Effect of WT Shear Layers on Aero-Acoustics	AD/AG-50
o Transition and Turbulence in Hypersonic Flows	AD/EG-65

FIELDS OF ACTIVITIES:
Flight mechanics, Systems and Integration (FM)

GoR FM is active in flight testing technologies and flight simulations, investigates air traffic control, sensor technology and systems and human factors. GoR FM focuses on:

- Air vehicle systems technology, incl. safety
- Avionics
- Certification
- Performance
- Stability & control

FIELDS OF ACTIVITIES:
Flight mechanics, Systems and Integration (FM)
Action Groups

- Towards Greater Autonomy in Multiple UAVs — FM/AG-18
- Flexible Aircraft Modeling Methodologies — FM/AG-19
- Machine Based Reasoning for Multiple UAVs — FM/EG-26

FIELDS OF ACTIVITIES:
Helicopters (HC)

GoR HC is active to facilitate the advancement of civil and military rotorcraft technology, seeks to extend the flight envelope and performance, to increase safety and survivability and to increase public acceptance. Technical disciplines include, but are not limited to:

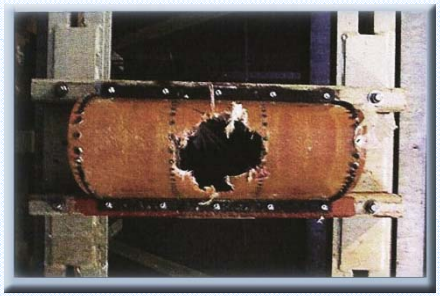
- Aerodynamics
- Aeroelastics including stability, structural dynamics and vibration
- Flight mechanics & control and handling qualities
- Vehicle design synthesis and optimization
- Human factors
- Internal and external acoustics and environmental impact
- Simulation techniques and facilities for ground-based testing

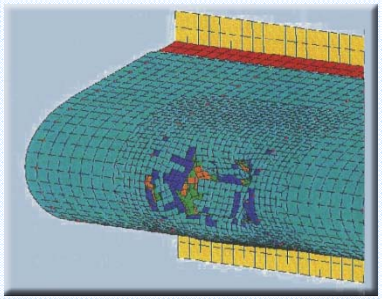
FIELDS OF ACTIVITIES:
Helicopters (HC)
Action Groups

Rotor test rig and experimental rotor in QinetiQ 5 metre wind tunnel

- Wake Modeling in Presence of Ground Obstacles — HC/AG17
- Error Localization and Model Refinement for Structural Dynamics FEM Models — HC/AG18
- Methods for Improvement of Structural Dynamics FEM Model using In-Flight Test Data — HC/AG19

FIELDS OF ACTIVITIES:
Structures & Materials (SM)





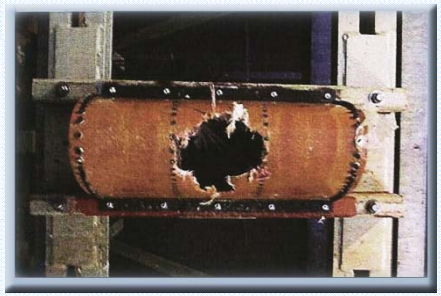
GoR SM is active in initiating and organizing aeronautics-oriented research on:

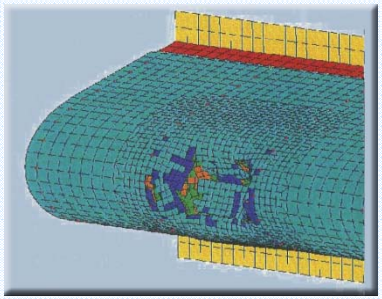
- Structures
- structural dynamic
- materials

Structures research is devoted to computational mechanics, loads & design methodology.

Structural dynamics research involves vibrations, responses to shock and transient loads, aero-elasticity and acoustic response

Materials research is related to materials systems including aspects of polymers, metals and composite systems





FIELDS OF ACTIVITIES:
Structures & Materials (SM)
Action Groups

o High Velocity Impact	SM/AG-30
o Damage Management in Composites	SM/AG-31
o Damage Growth in Composites	SM/AG-32
o RTM Materials Properties During Curing	SM/AG-33

Conclusions

- GARTEUR activities > 670 man-years between 1989 and 2010
- More than 120 collaboration projects (Action Groups)
- More than 170 Technical Reports
- GARTEUR Open Technical Reports will be made available on the website

www.garteur.org

Conclusions

- GARTEUR is a unique forum of aeronautical experts from Industry, Research Establishments and Academia
- GARTEUR is the only framework in Europe for both civil and military Research & Technology for Aeronautics.
- A main GARTEUR asset is its unique mechanism for cooperation which provides a straightforward way to increase collaboration on dual use projects
- GARTEUR takes a flexible and open approach towards participation of non-GARTEUR nations and organisations in research projects

"The future only comes through working together"