

The GARTEUR Group of Responsables in Aerodynamics (GoR AD)
An Overview of Activities and Success Stories

M. Tormalm (FOI), J. Kok (NLR), J.-L. Hantrais-Gervois (ONERA), G. Mingione (CIRA), E. Andrés Pérez (INTA), K. Richter (DLR), L. Ruiz-Calavera (AIRBUS), G. Fonvielle (MBDA), P. Eliasson (SAAB), D. Sanders (CRANFIELD), M. Mallet (DASSAULT), R. Gemma (LEONARDO)



What is GARTEUR: Story and Mission

- The Group for Aeronautical Research and Technology in EURope (GARTEUR) is an organization for **research collaboration in Europe in the field of aeronautics**
- Formed in 1973 by France, Germany and the United Kingdom
- The Netherlands joined 1977, Sweden 1991, Spain 1996 and Italy 2000
- Partners from non-member countries can participate
- Collaborative research to promote European aeronautics industry
- Research in defence, dual use or civil.

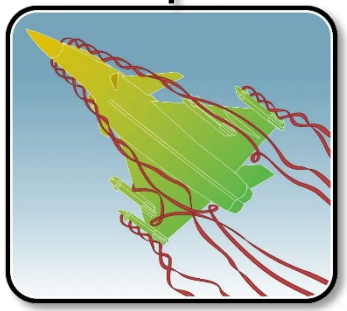
ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

What is GARTEUR: Organization

GARTEUR Council Executive Committee

Secretary

Groups of Responsables



Aerodynamics



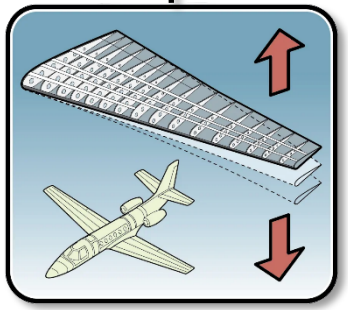
Aviation Security



Flight Mechanics, Systems and Integration



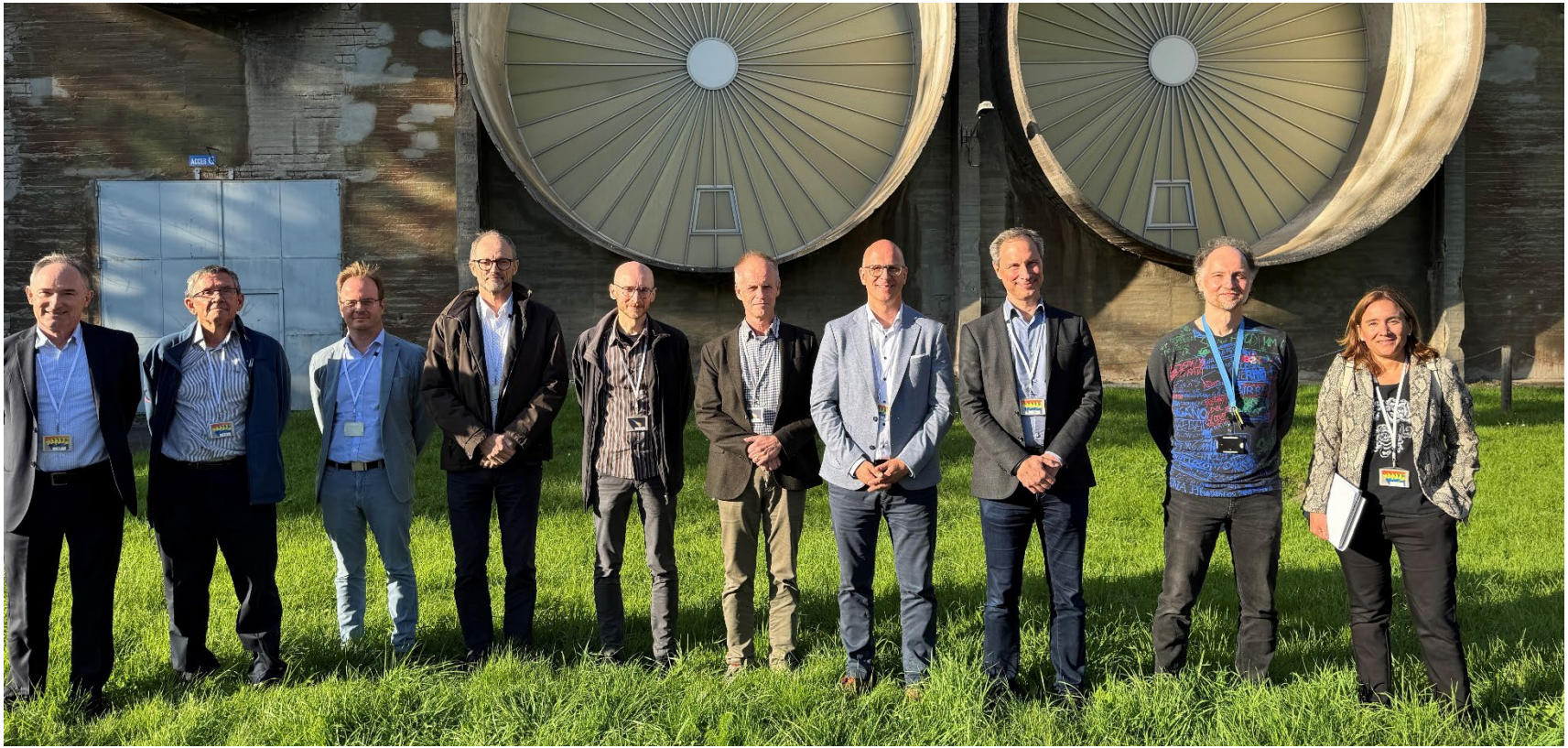
Rotorcraft



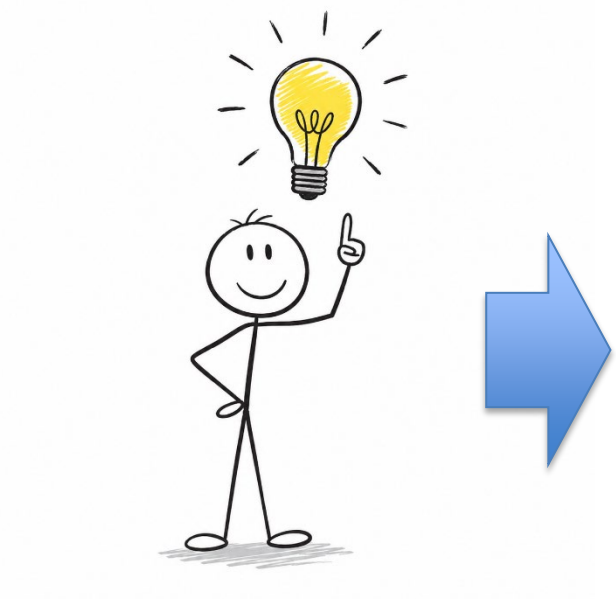
Structures and Materials

ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

The Aerodynamics Group of Responsables



GoR Aerodynamics: Establishment of Action Groups



"identify topics of mutual interest"

Exploratory Group (EG)

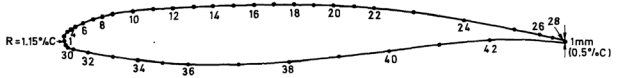
- ✓ Minimum of three member countries
- ✓ Appoint Chair
- ✓ Write proposal
- ✓ Sign Letters of Acceptance and Adherence
- ✓ One year

Action Group (AG)

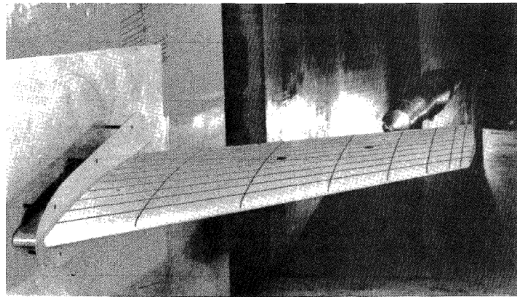
- ✓ Annual meetings /online
- ✓ Monitoring responsable
- ✓ In kind budget
- ✓ Three years
- ✓ Final Report

GoR Aerodynamics: The initial years

- AD/AG-01 “Wing body aerodynamics at transonic speeds”, 1975-1985
- Experimental data for code development
- Small perturbation or full potential flow
- CDC Cyber 170-750 (1.6 Mflops)

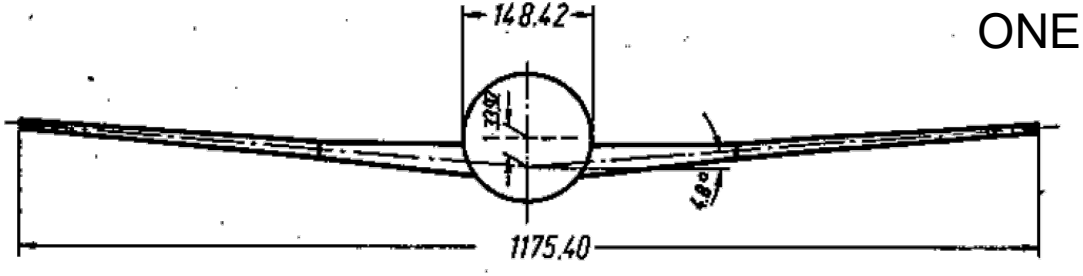


Dornier CAST 7



ONERA M6

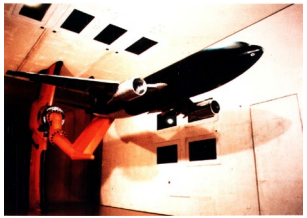
DFVLR-F4
Body-Wing



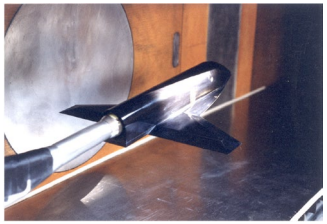
ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

GoR Aerodynamics: Wind tunnel testing development

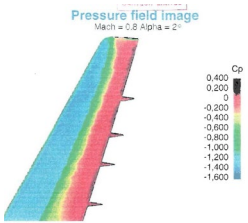
- AD/AG-02: 2D Transonic Testing Methods, wall interference, 1980
- AD/AG-06: Model support interference in large low-speed wind tunnels, 1985
- AD/AG-18: Adaptive wall wind tunnels, wall corrections, 1993
- AD/AG-19: Applicability of PIV to large scale wind tunnels, 1994
- AD/AG-21: Pressure sensitive paint, 1995
- AD/AG-22: Practical Application of LDV, 1995
- AD/AG-28, Transonic Wing/Body Code Validation Experiment, 1997
- AD/AG-37: Pressure sensitive paint (Phase II), 2000
- AD/AG-50: Effect of wind tunnel shear layers on aeroacoustic measurements, 2009



AD/AG-06, A310



AD/AG-18, TWIG



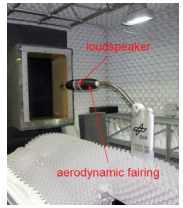
AD/AG-21, PSP



AD/AG-22, LDV



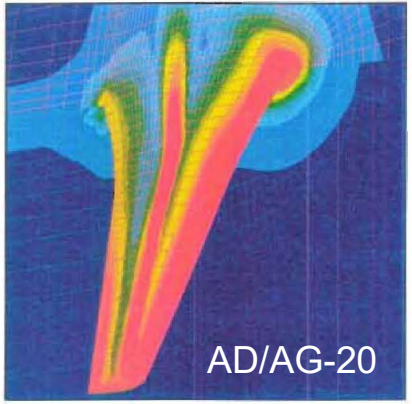
AD/AG-28

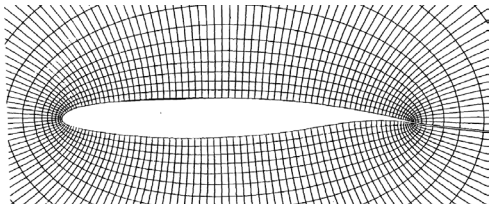


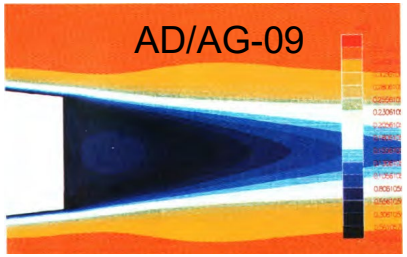
AD/AG-50

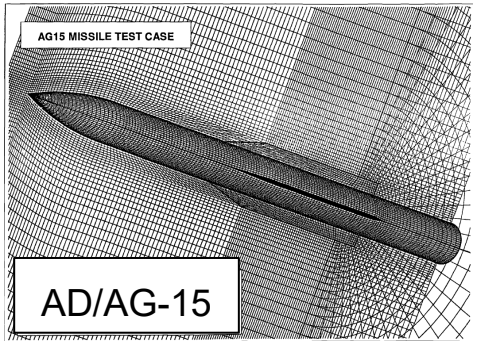
GoR Aerodynamics: CFD code validation and development

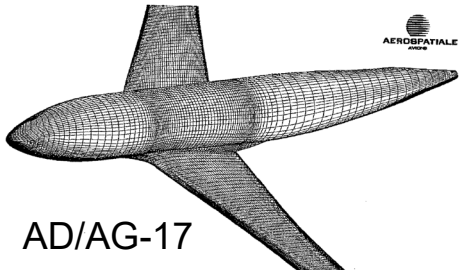
- AD/AG-04: Slender-body aerodynamics at high angles of incidence in low speed flow, 1981
- AD/AG-05: Convergence Study of Transonic Flow Computations for 3D Wings, 1984
- AD/AG-09: Flow Past Missile Afterbodies, 1986
- AD/AG-11: Comparison of Navier-Stokes equation,1991
- AD/AG-15, Validation of Euler Codes for Supersonic Flow, 1993
- AD/AG-17: The Verification of 3D Transonic Euler Methods, 1993
- AD/AG-20: Mesh Adaptation, 1994




AD/AG-05



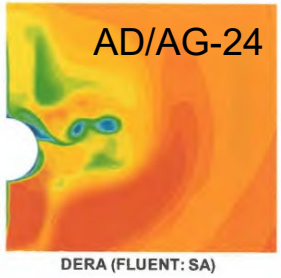


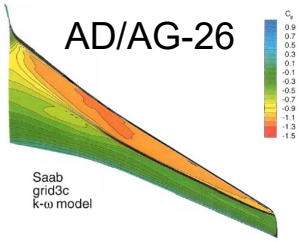


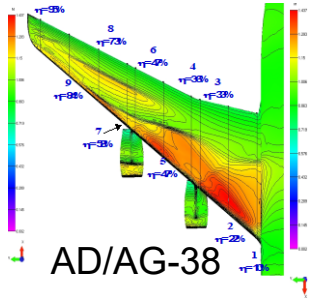
ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

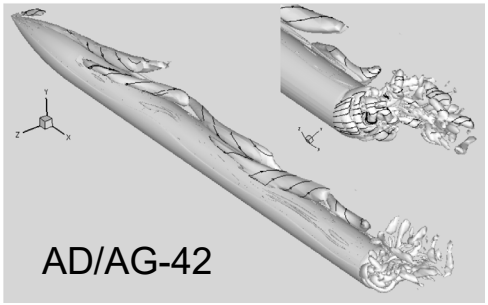
GoR Aerodynamics: CFD code validation and development

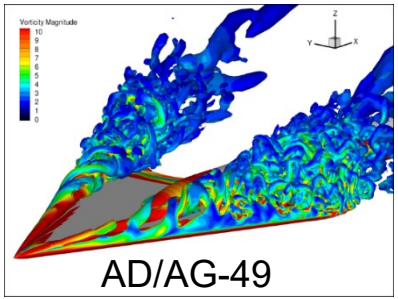
- AD/AG-24: Navier-Stokes calculations of the supersonic flow about slender configurations, 1995
- AD/AG-26: Transonic wing-body Navier-Stokes computations, 1996
- AD/AG-38: Time accurate methods, 2001
- AD/AG-39: RANS validation for transonic wing-body (phase II), 2004
- AD/AG-42: Missile Aerodynamics, 2004
- AD/AG-49, Scrutinizing Hybrid RANS-LES Methods for Aerodynamic Applications, 2009





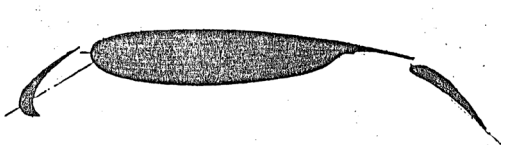




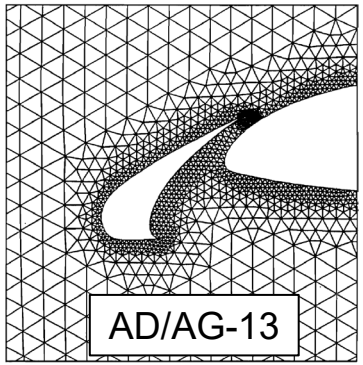


GoR Aerodynamics: High Lift development

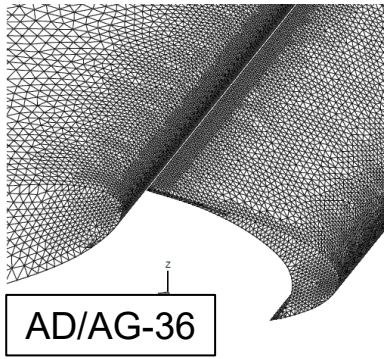
- AD/AG-03: Theory/Experiment comparison for high lift airfoil, 1981
- AD/AG-08: High-Lift, Phase II, 1985
- AD/AG-13: High-Lift, Phase III, 1991
- AD/AG-25: 2D maximum lift prediction, High Lift Aerodynamics, phase IV, 1996
- AD/AG-36: 3D High Lift Computations, 2000



AD/AG-03 ONERA TC



AD/AG-13



AD/AG-36



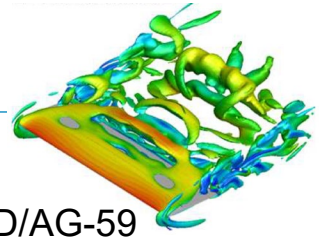
Airbus, Researchers Work To Correlate Airflow Data

© Aviation Week & Space Technology,1988-01-18

AD/AG-08, Flight test

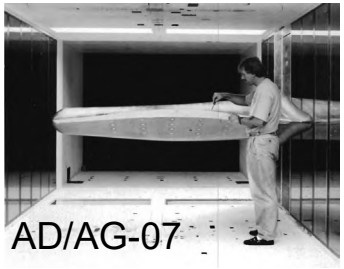
ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

GoR Aerodynamics: Transition Laminar/Turbulent

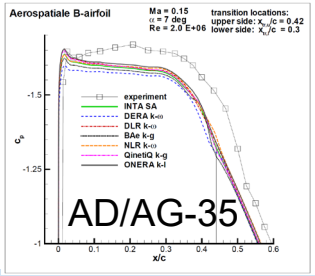


AD/AG-59

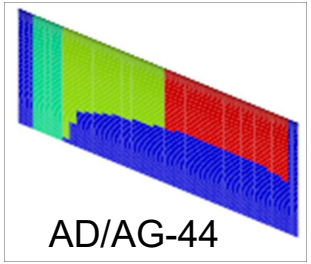
- AD/AG-07, 3D Shear Layer Experiment, GARTEUR wing G7, 1986
- AD/AG-14: Transition for airfoils and wings, 1991
- AD/AG-23: 3D Turbulent Shear Layer Experiment, phase II, 1995
- AD/AG-27: Transition on airfoils and infinite swept wings with regard to nonlocal instability investigation, 1997
- AD/AG-29: 3D Turbulent Shear Layer Experiment, phase III, 1997
- AD/AG-35: Application of transition criteria in Navier Stokes computations, 2000
- AD/AG-44: Application of transition criteria in Navier-Stokes computations Phase II, 2006
- AD/AG-51: Effect of laminar/turbulent transition in hypersonic flows, 2011
- AD/AG-53: Receptivity and Transition Prediction: Effects of surface irregularity and inflow perturbations, 2015
- AD/AG-59: IMOLA: Improving the MOdelling of LAminar separation bubbles, 2020



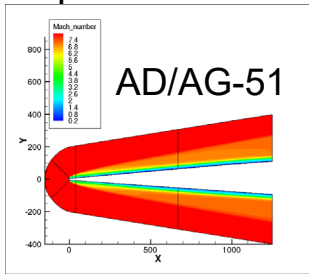
AD/AG-07



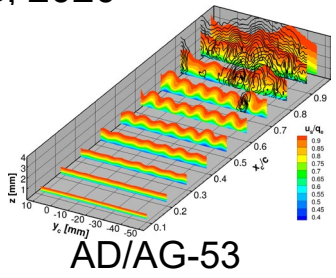
AD/AG-35



AD/AG-44



AD/AG-51

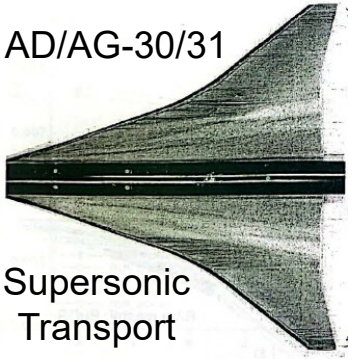


AD/AG-53

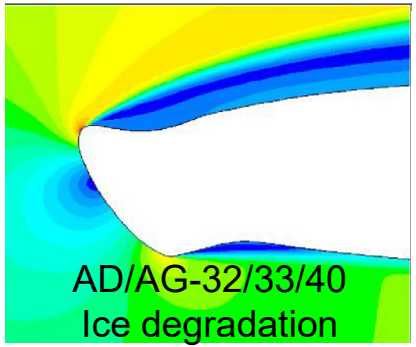
INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES
ICAS2026
SYDNEY | AUSTRALIA
13-17 SEPT 2026
icas2026.com

GoR Aerodynamics: Special topics

AD/AG-30/31

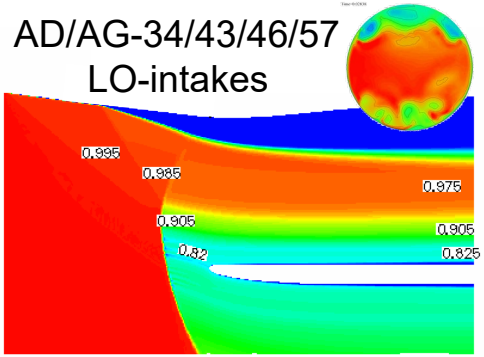


Supersonic Transport

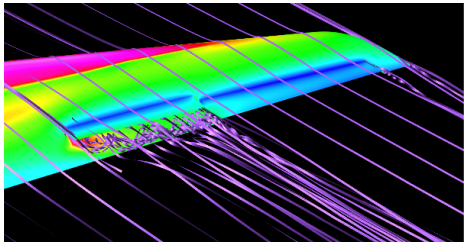


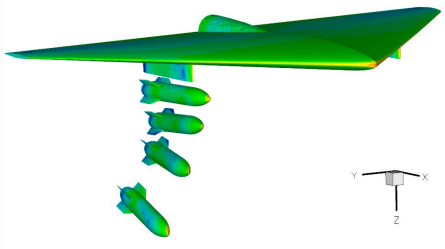
AD/AG-32/33/40
Ice degradation

AD/AG-34/43/46/57
LO-intakes

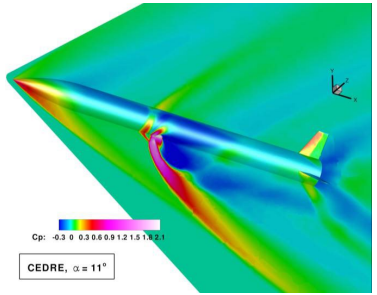


AD/AG-45/56
Aeroelasticity

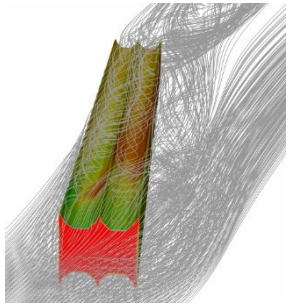




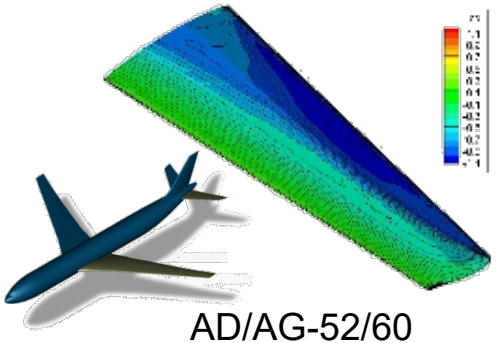
AD/AG-47
Store separation



AD/AG-48
Fluidic control



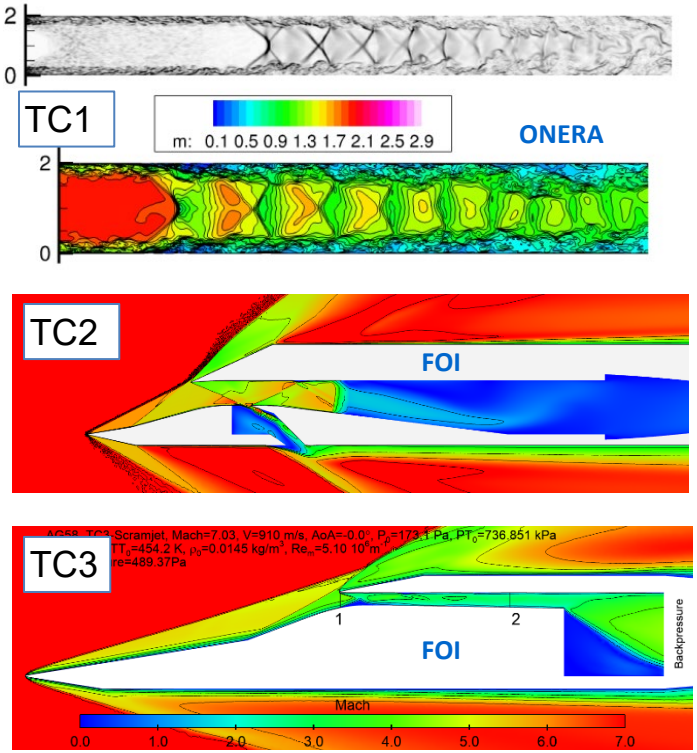
AD/AG-55
Countermeasure



AD/AG-52/60
Optimization/ML

AD/AG-58: Supersonic air intakes

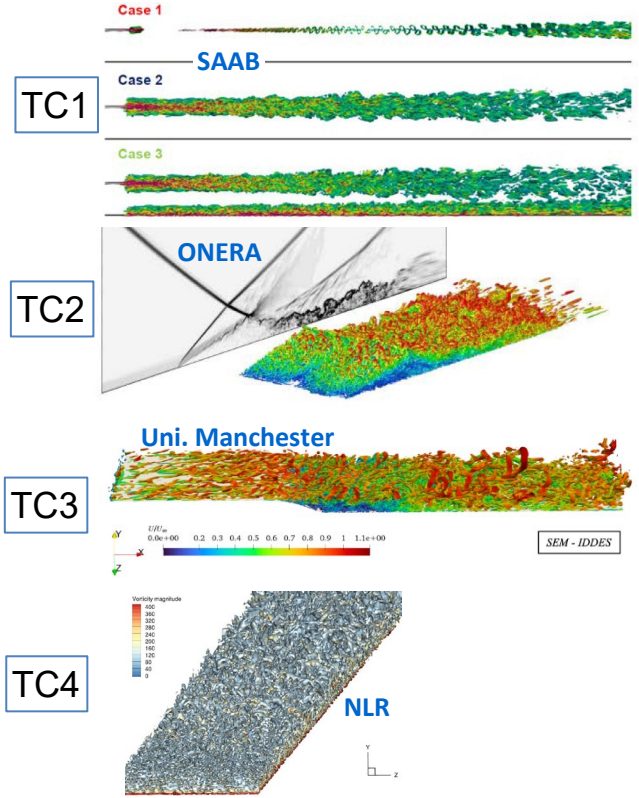
- Group
  - Chair: Christophe Nottin (MBDA-F)
  - Monitoring responsable: Guillaume Fonvielle (MBDA-F)
  - Partners: DLR, FOI, MBDA-F, MBDA-UK, ONERA
  - Started 2019
- Achievements
  - TC1: Shock train in rectangular channel, inlet at Mach=1.96
    - ONERA RANS SA-QCR, ZDES
    - FOI RANS, hybrid RANS-LES
  - TC2: Ramjet at Mach=3.0
    - Experimental data from DLR
    - RANS-EARSM by FOI
    - RANS-SST/EARSM by ONERA
  - TC3: Scramjet at Mach=7.0
    - RANS-EARSM by FOI
- Status
  - Work done, final report is being prepared



ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

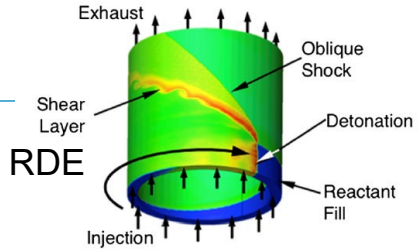
AD/AG-61: Hybrid RANS/LES methods for WMLES and embedded LES

- Group
  - Chair: Nicolas Renard (ONERA)
  - Monitoring responsable: Jean-Luc Hantrais-Gervois (ONERA)
  - Partners: CIRA, DLR, NLR, ONERA, SAAB, Univ. Manchester, Univ. Strasbourg
- Achievements
  - TC1: Mixing co-flow of wake and Boundary Layer
  - TC2: Shock Wave-Boundary Layer Interaction
  - TC3: Shallow flow separation from a smooth surface
  - TC4: Flat-plate boundary layer
- Status
  - Final meeting at SAAB Gothenburg, 21st April, 2026
  - Final report is being prepared, end 2026, Garteur Open after journal papers
  - Next AG is being considered, RANS/LES with AI

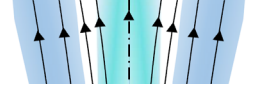


ICAS2026 SYDNEY | AUSTRALIA 13-17 SEPT 2026 icas2026.com

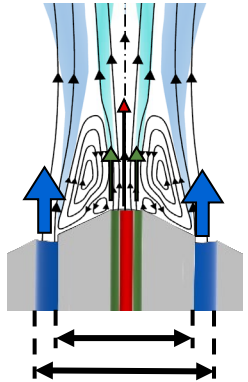
AD/AG-62: Hydrogen Combustion



RDE

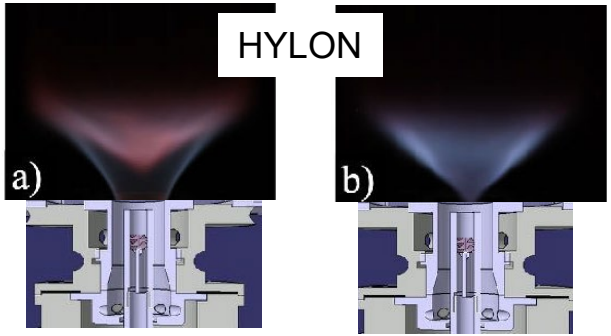


HYDROGEN



- Group
  - Chair: Ainslie French (CIRA)
  - Monitoring responsable: Giuseppe Mingione (CIRA)
  - Partners: CIRA, ENEA, Poli. Di Bari, Cranfield Uni., Cambridge Uni., CERFACS, IMFT, INTA, Piaggio Aerospace, Tech. Uni. Darmstadt, Uni. Beira Interior, Poli Milano
- Objectives
  - Understand the dynamics of hydrogen combustion
  - Develop reliable and validated software design tool
  - Leakage from hydrogen tanks
  - Concept feasibility study of a rotating detonation engine
- Status
  - Duration: July 2025-July 2028
  - HYLON (IMFT) for Combustion Tokyo July 2026
  - Multi-regime Burner (TU-Darmstadt)

HYLON



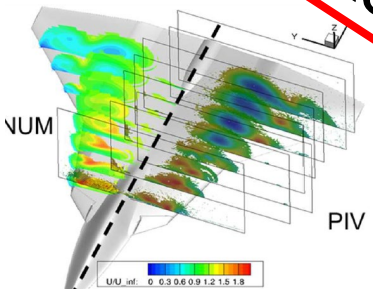
T ~ 600/700^0 C

T ~ 200/300^0 C

GoR Aerodynamics: New Action Groups

New AD/AG

- AD/AG-63: Mesh/Solver Adaptation Strategies for CFD
  - Chair: Stevie Ray Janssen (NLR)
  - Partners: NLR, CIRA, DLR, FOI, ONERA
  - Mesh adaptation sensors: Physics/PDE-Error/Geometric
  - Integrated mesh adaptation strategies for various geometries and flight conditions



TC D: ONERA generic Fighter

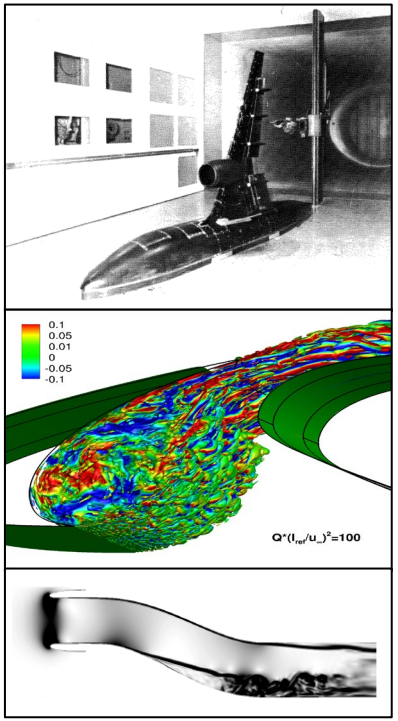
- AD/AG-64: Aligning Research on MDO with Industry Requirements – RENDER
  - Chair: Mohammad Abu-Zurayk (DLR)
  - Partners: DLR, ONERA, CIRA, FOI, Cranfield Uni, BSC, IRT, Airbus, SAAB
  - Advance multidisciplinary design optimization (MDO) by more industry-relevant constraints.
  - Transition from single-disciplinary design optimization (SDO) to MDO.
  - Create an open access data platform



DLR F25

GoR Aerodynamics: Summary

- At present, 64 Action Groups in Aerodynamics
- Development of experimental methods in aerodynamics
- Validation and development of computational aerodynamics
- High-lift improvements
- Laminar/turbulent transition developments
- Many new ideas on the way!



GARTEUR

Please visit garteur.org

