The European Aero-engine Community

Riga, 20 April 2005
EIMG : The European aero-engine community

- Rolls-Royce UK
- Alstom
- Techspace Aero
- Snecma Moteurs
- Turbomeca
- ITP
- Volvo Aero
- Rolls-Royce Deutschland
- PBS
- MTU Aero Engines
- AVIO
Objectives of EIMG

- EIMG was formed in 1990 in response to a request from the European Commission.
- EIMG consists of one representative from each of the major European Aero-engine companies.
- The Purpose of EIMG is:
  - to provide a European Aero-engine view on research and technology programmes
  - to maximise leverage of technology acquisition between partners in pre-competitive areas
  - to support the European Commission in developing future framework programmes

The EIMG companies undertake joint actions such as co-ordinated preparation and submission of project proposals to be carried out under European Commission contracts within the Research Framework Programmes.
Structure of EIMG

**EIMG**
Engine Industry Management Group for R&T
(Lead: MTU Aero Engines)

**Technical Areas**

- Low Emission Combustion (RR Germany)
- Turbomachinery (MTU)
- Mechatronics (MTU)
- Advanced Materials (ITP)
- Manufacture & Overhaul (Volvo)
- Whole Engine (RR UK)
- Mechanical Systems (Turbomeca)
- Noise (Snecma)
ACARE 2020 Environmental Goals: The Engine Contribution

ACARE 2020 OBJECTIVES (reference: 2000 aircraft)
- Reduce perceived noise by half (10dB)
- Reduce CO2 by 50%
- Reduce NOx by 80%
- Acceptable cost

ACARE 2020 OBJECTIVES
Engine Contribution
- Reduce noise by 6db at each certification point
- Reduce CO2 by 20%
- Reduce NOx by 80%
- Acceptable cost
Background for Noise

Trends in Aircraft Noise Reduction

- High bypass-ratio (BPR) turbofan engines represented a technology breakthrough allowing a 20 dB noise decrease in 40 years.
- To reach the 2020 targets: need for new breakthrough technologies
Introduction of high bypass-ratio turbofan engines in the 1970's and then increasing cycle pressure ratio and BPR have reduced fuel consumption.

But increasing cycle pressure ratio increases NOx emissions.

To reach the 2020 targets: need for breakthrough technologies.
Impact of Overall Pressure Ratio (OPR) on NOx

To reach the 2020 targets: need for breakthrough technologies.

ACARE Target

-80%
Overview of Integrated Projects in FP 5-6-7

- **NEWAC**
  - Th. efficiency, new architectures,
    - (HP Rig / Core, TRL 5)

- **VITAL**
  - Propulsion efficiency, noise, weight
    - (LP components, TRL 5)

- **Power Optimized Aircraft**
  - ANTLE with electric components

- **SILENCE(R)**
  - Component tests for noise reduction

- **EEFAE**
  - CLEAN (MTU – SM) GTF - IRA
  - ANTLE (RR) DDTF

- **Engine Validation**
  - TRL 6 concept 1
  - TRL 6 concept 2

Timeline:
- **FP 5**: 2005
- **FP 6**: 6/2006
- **FP 7**: 2009, 6/2010
Evolution of Engines for Noise

Datum: Engine in service in 2000

Evolutionary Technologies

SILENCER FP5

Noise reduction technologies on conventional aircraft/engine configuration

Revolutionary technologies for SRA Objectives

Conventional Fan

Geared Fan

Contra Fan

VITAL FP6 IP 2nd Call

Novel engine architecture for noise and fuel burn reduction
Evolution of Engines for NOx and CO2 Emissions

Datum: Engine in service in 2000

-12% CO2 - 60% Nox

EEFAE FP5

ANTLE

-20% CO2 partial demonstration -80% NOx

CLEAN

SRA objectives

-20% CO2 mainly from propulsive efficiency

VITAL FP6 IP 2nd call

NEWAC FP6 IP 3rd call

-20% mainly from thermal efficiency
STREP’s in 1st & 2nd CALL of FP6

• 15 STREPS with engine leadership were retained (success rate 1:3, total budget ca. 85 mio €, ca. 45 mio € funding, 150-200 partners)

• Subjects covered:
  • Combustion for less emissions
  • Turbine and compressor technologies
  • Advanced control systems
  • Advanced material technologies
  • Manufacturing technologies
  • Engine noise (modelling, testing, ANC development…)


Presented by: Dr. Ralf v.d. Bank, Rolls-Royce Deutschland
STREP’s in 3rd CALL of FP6

- 20 STREPS with engine leadership in preparation (total budget ca. 120 mio €, ca. 65 mio € funding requested, success rate 1:3 expected)

- Subjects covered:
  - Combustion for less emissions
  - Turbine and compressor aerodynamics, aeroelasticity
  - Advanced monitoring and measurement systems
  - Advanced material technologies
  - Manufacturing technologies
  - Advanced rotordynamics
  - Advanced bearing lubrication systems
  - Engine fan and jet noise modelling & testing
Conclusions

- FP6 engine makers objectives are consistent with ACARE objectives
- Environment is the priority
- Technology breakthroughs will be necessary to achieve 2020 targets
- All European aero-engine manufacturers are working together
- All Integrated Projects include participation of aircraft and equipment sectors
- All projects involve widely Research Establishments, Academia and SME
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