TLC - Research Project Fact Sheet

Title of Project	**Towards Lean Combustion - completed**
Project Acronym	TLC
Funding Program	FP6-AEROSPACE, FP6-2003-AERO-1,
Project Identifier	AST4-CT-2005-012326
Total Budget	7.55 M€
Starting – Ending Date	03/2005 – 03/2010
Consortium	1. Rolls Royce Deutchland (DE) 2. MTU Aero Engines (DE) 3. Avio S.P.A. (IT) 4. Turbomeca (FR) 5. ONERA (FR) 6. DLR (DE) 7. Lunds University (SW) 8. CNRS (FR) 9. Ecole Central de Nantes (FR) 10. Karlsruhe Institut für Technologie (DE) 11. Univesita Degli Studi di Genova (IT) 12. Univesita Degli Studi di Napoli (IT) 13. CERFACS (FR) 14. Universidad de Zaragoza (SP) 15. University of Rome ":a Sapienza" (IT) 16. Instytut Maszyn Przeplywowych (PL) 17. ACIES (FR) 18. IRD (FR)
Project Objectives	The mitigation of aviation emissions in terms of their environmental impact is a priority for both air quality (local impact) and the greenhouse effect (global impact). For a fixed engine cycle, the margin of progress depends on the combustor technology. Lean combustion is the breakthrough which should enable high-level reductions in NOx emissions both during the LTO cycle (air quality) and at cruise speeds (global impact). In addition, lean combustion also enhances particulate reduction. Injection systems form the most critical issue in achieving a satisfactory level of lean combustion and will be the technological focus for the project. Within this framework, a wide range of experiments will be carried out on mono-sector or tubular combustors. This new program will be a crucial effort in achieving sufficient maturity for the single annular combustor application. The objectives will be an 80% reduction in NOx emissions in relation to the CAEP2 regulation limit during the LTO cycle, and low NOx emission indices at cruise speed (EINOx=5g/kg as target). Other gaseous emissions and soot performance characteristics will be also precisely evaluated. In this prospect, the project will support the adaptation of most advanced, non-intrusive laser-based measurement techniques to combustors actual conditions and their application (in addition to intrusive techniques) to experiments of various concepts of injection systems. The injection systems tested will derive from the LOPOCOTEP program or other projects and from advanced CFD optimization of new concepts. The entire range of operating conditions will be experimentally evaluated (LTO points, cruise speeds). Auto-ignition and flashback risk issue as well as lean extinction limit will be assessed. Advanced CFD simulation will also exploit the data from the fundamental experiments, thereby enabling calibration of the latest codes in emissions predictions.
External References	http://cordis.europa.eu/project/rcn/74772_en.html https://doi.org/10.1115/1.2749279 https://doi.org/10.1007/s10494-009-9205-3
Role in the project	Principal Investigator