Project ESPOSA - Efficient Systems and Propulsion for Small Aircraft.

The project aims at developing and integrating novel design and manufacture technologies for a range of small gas turbine engines up to approx. 1000 kW to provide aircraft manufacturers with better choice of modern propulsion units. It will also focus on the engine related systems which contribute to the overall propulsion unit efficiency, safety and pilot workload reduction. Through the newly developed design tools and methodologies for the engine/aircraft integration the project will also contribute to the improved readiness for new turbine engines installation into aircraft. New technologies and knowledge gained through the ESPOSA project will provide European general aviation industry with substantially improved ability to develop and use affordable and environmentally acceptable propulsion units and reliable aircraft systems minimizing operating costs, while increasing the level of safety. The new engine systems and engine technologies gained from ESPOSA should deliver 10-14% reduction in direct operating costs and reduce significantly the pilot workload.
The measurable objectives of the project follow the ACARE SRA2 goals by providing European general aviation industry with substantially improved ability to develop and use affordable and environmentally acceptable propulsion units and reliable aircraft systems, minimizing the operating costs, and increasing the level of safety. The overall project objective the improvement on the cost efficiency of air transport services provided by small commercial aircraft, achievable through the development of modern, efficient propulsion units, affordable for general aviation aircraft operators. The envisaged reduction in the direct operating costs will follow from achieving the following goals:

- Better engine affordability and choice incl. reduction of depreciation costs
- Reduction of fuel costs, i.e. fuel consumption reduction
- Reduction of maintenance and maintenance related costs
- Weight and mass reduction

The project consortium consists of 39 partners, from fifteen European countries:

- Prvni Brnenska Strojirna Velka Bites - Czech Republic (Project Coordinator)
- SE Ivchenko-Progress- Ukraine
- Avio S.P.A. - Italy
- Universite Libre de Bruxelles- Belgium
- Motor Sich JSC - Ukraine
- Wytwornia Sprzetu Komunikacyjnego PZL - Rzeszow SA - Poland
- Honeywell International S.R.O. - Czech Republic
- Tusas Motor Sanayi AS - Turkey
- Unis AS - Czech Republic
- Zollern GMBH & CO KG - Germany
- Atard Savunma ve Havacilik Sanayi Ileri Teknoloji Uygulamalari Arastirma ve Gelistirme A.S. - Turkey
- Materials Engineering Research Laboratory Limited - United Kingdom
- Sysgo AG - Germany
- Jihostroj AS - Czech Republic
- Piaggio Aero Industries S.P.A. - Italy
- Zaklady Lotnicze Marganski & Myslowski SP Zoo - Poland
- Grob Aircraft AG - Germany
- Evektor, Spol. S.R.O. - Czech Republic
- Winner SCS - Belgium
- Fundacion Tecnalia Research & Innovation - Spain
- Centro Italiano Ricerche Aerospaziali SCPA - Italy
- Instytut Lotnictwa - Poland
- Vyzkumny A Zkusebni Letecky Ustav A.S. - Czech Republic
- Centre de Recherche en Aeronautique ASBL - CENAERO - Belgium
- Institutul National de Cercetari Aerospatiale Elie Carafoli - I.N.C.A.S. SA - Romania
- Stichting Nationaal Lucht- en Ruimtevaartlaboratorium - NLR - The Netherlands
- Central Institute of Aviation Motors - CIAM - Russia
- Institutul National de Cercetare - Dezvoltare Turbomotoare COMOTI - Romania
- Teknologian Tutkimuskeskus VTT - Finland
- Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V - Germany
- Technische Universiteit Delft - The Netherlands
- Technische Universitaet Munchen - Germany
- Politechnika Warszawska - Poland
- Budapesti Muszaki es Gazdasagtudomanyi Egyetem - Hungary
- Vysoke Uceni Technicke v Brne - Czech Republic
- Technical University Kosice - Slovakia
- Politechnika Rzeszowska im Ignacego Lukasiewicza PRZ - Poland
- Tobb Ekonomi Ve Teknoloji Universitesi - Turkey
- Universita Degli Studi di Padova - Italy

The Romanian research team of INCDT COMOTI was involved in three of the nine sub-projects of ESPOSA:

- Consortium and Project Management (SP 0):
  - WP 0.1 - Consortium Management

  - WP 0.3 - Dissemination, exploitation and IPR
- Optimal Engine Components (SP 2):
  - WP 2.2 - Advanced cooled small turbine: experimental measurements of the pressure and velocity fields inside the inter-turbine duct connecting the high and the low pressure turbines;
  - WP 2.3 - Efficient combustion concept: experimental campaign aimed at validating the novel Jet Induced Swirl combustor concept;
  - WP 2.4. - Optimum gearbox concept: design, manufacturing and testing of optimized gears, development of high speed gears computational model and design and manufacturing of specialized gear testing rig;
- Lean Manufacturing Technologies (SP 3)
  - WP 3.1 - Low cost machining for compressors: design of technologies for compressor wheels
  - WP 3.4. - Low cost gearbox manufacturing: design and testing of low cost machining technologies

COMOTI's facilities involved in the project include a thermo – gas-dynamic complex for the study and the experimentation of liquid, gas, biomass or biomass derivatives (bio-fuels) fuel combustion, heat transfer, thermal resisting coating, and industrial or aircraft micro gas turbine engines using liquid, gas or biomass (bio-fuels) fuels interconnected and mandatory assisted during experimentation by a tri-sonic air blowing station, equipped with 2,000 m^3 air tanks, able to provide air up to a pressure of 16 bar and a velocity up to Mach 3. High speed velocity measurements will be carried out using Particle Image Velocimetry, by means of the LaVision PIV system owned by COMOTI. For cutting edge combustion stability measurements in the detonation front, COMOTI can provide high speed instantaneous OH concentration measurements through a LaVision spectroscopic planar LIF system that includes a Quanta-Ray Nd:YAG pump laser, a Sirah Dye Laser-Cobra Stretch dye laser using Coumarin 153 dye for a wavelength of 535 nm, and ICCD cameras.

Since the project is still in its early stages, only the work included in WP 2.2 has been completed so far. In order to carry out the experimental program, the experimental setup has been designed and manufactured. Figure 1 presents the experimental sector model, the actual inter-turbine duct, and the diagram of the location of pressure probes used for the experimental measurements.

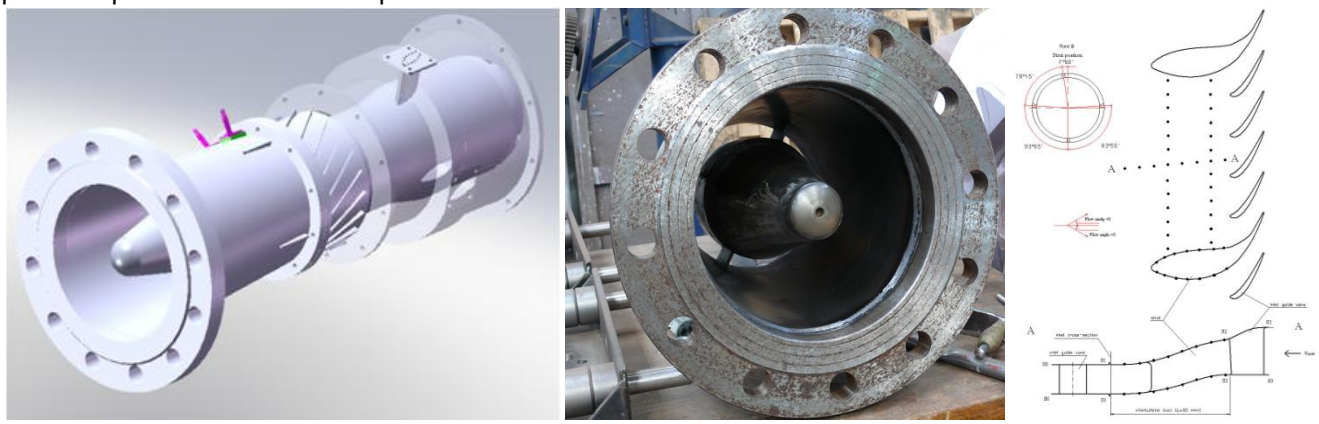

Figure 1

One of the strategic interests of COMOTI is pursuing its increase in visibility and prestige at international level and the increase in scientific proficiency and technical expertise of its research staff. The project benefitted this strategic goal by allowing a significant contribution in a very complex and highly visible research field. COMOTI's position in the European scientific community was consolidated by the dissemination of the results through scientific papers and participation in conferences, fairs and exhibitions, increasing its attractiveness for European and Romanian industrial or academic partners for future joint research projects. It also contributed to enhancing the proven expertise required for participating in European research projects, thus the potential of Romanian research to attract European funding. In support of this, COMOTI's research team involved in ESPOSA had been awarded, as coordinator, two new FP 7 research grants. Furthermore, the experimental testing database resulting as foreground from this project is, and will further be, used, in partnership with the "Politehnica" University of Bucharest and the Technical University of Iasi, as validation database for the numerical studies carried out by their students.