Bando CAMPUS - (2012 – 2015)

Progetto ATIMA (Applicazione Tecnologie Innovative per la Manutenzione Aeronautica),

The project in collaboration with ENEA e Università Parthenope, has the purpose of incorporating aspects of environmental importance into the engine Health Management systems by empowering the diagnostic system already in use.

A new diagnostic non-intrusive "multisensory" system has been developed and installed on a mobile platform to enhance the troubleshooting activities during Aircraft Line Maintenance. This system has been used to specify a new maintenance service to be offered at no cost to Atitech's Customers.

The basic assumptions of this service rely on a technical consideration according to which is possible to evaluate two main components of the overall engine performance deterioration during its operation. A reversible deterioration, defined as the quota that is possible to restore "On-Wing" with a specific maintenance task, and another part which requires the engine removal and the shop for restoring.

The algorithms developed uses Artificial Intelligence (AI) technology to give this ability and accurately estimate the probability associated with the amount of this reversible quota with a methodological probabilistic approach empowered by additional independent non-intrusive measures, carried out during the engine test at the regime of "Near Idle". The application of the developed method is able to characterize the decay of engine performance, without interfering with the routine line maintenance activities.

The competitive element of the new service offered by Atitech allows the Operator with a green sensibility to evaluate the possibility to anticipate a maintenance task with an environmental benefit directly related to the specific fuel consumption reduction. The trade-off analysis is presented to the Customer in terms of fuel burn saved versus the cost of the anticipated maintenance task required.

The multi-sensory system, in particular, uses three technologies, whose characterization was the objective of the research, once applied in a new context, aimed to add new functionalities to the existing health management system in use:

- analysis of the "plume" shape pattern distortions of the engine exhaust gases in the infrared region (ePlume).
- detection of exhaust gas chemical markers specifically correlated to the phenomenon of interest (eNose).
- diagnostic algorithms for GPA (Gas Path Analysis - eGPA).

The measurements obtained with the three technologies are integrated with artificial intelligence algorithms (Hidden Markov chain /Bayesian network/ Fuzzy logic), according to a probabilistic computational scheme, which allows to determine the conditional probability of the motor state from the result of the measurements made.