

Summary and Recommendations

Dr. Ion STIHARU
Concordia University
1455 de Maisonneuve Blvd. West,
Montreal, QC, H3G1M8
istih@encs.concordia.ca

ABSTRACT

Intelligent Propulsion Systems can potentially meet future challenges related to capability, affordability, safety, and environmental compatibility. The key enabling technologies for an intelligent GTE are:

- 1) Increased efficiencies of components through active control;*
- 2) Increased overall engine gas-path performance and extended “on wing” life of the engine through model-based control and health monitoring; and*
- 3) Reduced weight ratio of control system to engine through distributed control with smart sensors.*

For these future capabilities sensor and actuator requirements were identified, current status and emerging sensing and actuation technologies were discussed, and roadmaps for developing the new technologies were developed.

The report describes the following promising applications in detail:

- **Inlet:** Active Inlet Control, Active Noise Suppression, Active Noise Cancellation
- **Compressor:** Active Surge Control, Active Flow Control, Active Clearance Control, Active Vibration Control
- **Combustor:** Active Combustion, Instability Control
- **Turbine:** Active Clearance Control, Cooling Air Control, Active Flow Control
- **Nozzle:** Active Noise Control, Adaptive Nozzles, Thrust Vectoring, Active Core Exhaust Control, Afterburner Stability Control

Requirements for improved and new sensors have been identified as:

- 1) To improve model accuracy, reliability and enhance observability of virtual sensors;*
- 2) To allow sensors at stations within the engine gas path that are currently not instrumented due in part to the harsh conditions including high temperatures; and*
- 3) To allow additional monitoring of vibration, mass flows, fuel properties, exhaust gas composition, and gas-path debris.*

The benefits of enabling technologies for the “More Intelligent Gas Turbine Engines” in terms of improved Performance, Safety, Affordability and Reliability, and reduced Environmental Impact are summarized in a table in which the predicted availability is indicated.

Summary and Recommendations

