Guest editorial

Special issue dedicated to the NATO applied vehicle technology research specialists' meeting AVT-RSM-306 "transitioning gas turbine instrumentation from test cells to on-Board applications"

The harsh high-temperature environment of a gas turbine engine presents a significant challenge to the instrumentation community, requiring robust and dependable technologies for sensing and monitoring vibration, mass flows, fuel properties, exhaust gas composition and gas path debris. On-board sensors are expected to operate for thousands of hours, as opposed to test-cell instrumentation running tens of hours, and their reliability has to be much higher than the components of which they are monitoring the health. Many of an engine's functional parameters cannot be measured directly due to the adverse internal environment. This challenge can be addressed by the usage of high temperature materials, non-contact measurement techniques and gas path models.

This issue of the *Journal Aircraft Engineering and Aerospace Technology* reviews advances in gas-turbine instrumentation and recommends routes to transition onto engine platforms. The articles present different sensors and measurement technologies that can be readily transitioned into on-board applications. Their implementation will enable safe and efficient operation of modern gas turbine engines throughout their life and adapt to changing internal and external environments by providing "optimum" achievable performance based on operation mode and current condition.

The special issue includes nine selected papers presented during the NATO Applied Vehicle Technology Panel AVT-306 Research Specialists' Meeting on Transitioning Gas Turbine Instrumentation from Test Cells to On-Vehicle Applications, held in Athens, Greece, 10-12 December 2018. The event was sponsored by NATO Science & Technology Organization and Hellenic Ministry of National Defence. The programme covered advanced sensing technologies grouped into the following gas-turbine applications: engine controls, inlet systems, Blade Health Monitoring, transitioning methodologies, hot section technologies, exhaust systems and fuel systems. Compelling keynotes and papers were presented by speakers from universities, government research centres and industry from six nations.

The meeting was thoroughly successful in achieving its goals of:

- enhancing the understanding of test cell and control instrumentation sensors and the requirements and problems associated with transitioning the technology;
- providing a forum to allow users to discuss best practices and new technology procedures of use;
- informing the wider community of the technologies that are currently being transitioned to On-Wing applications; and
- allowing "End Users" an opportunity to identify other on-wing needs.

A number of presented instrumentation technologies have potential to be used in novel on-board applications with high degrees of success and could unlock new opportunities and better trades. Beyond simply replacing existing sensors with newer technologies, there is a possibility to sense previously unmeasured parameters such as gas composition, burning pattern factor, fuel properties, real-time turbine blade temperature measurement and tip clearance. It is with great pleasure I thank and congratulate the authors of nine accepted manuscripts who successfully revised their conference papers to be published in this peer-reviewed special issue.

I also wish to thank Dr Veronika Gumpinger from AVT Executive Office and William Stange, the AVT-306 technical evaluator, senior expert in gas-turbine instrumentation and testing for their involvement and hard work associated with the specialists' meeting papers. Furthermore, the invited reviewers deserve praise and appreciation for their insightful critique and suggestions, which contributed directly to improving the technical content of the journal articles.

I would like to express my gratitude to Dr Askin T. Isikveren, the Editor-in-Chief of the *Aircraft Engineering and Aerospace Technology* Journal for offering a possibility to publish a number of AVT-306 papers and for his continuous support in preparing this special issue. I would also like to thank Raymond Harvey Niska, the senior gas-turbine instrumentation specialist and AVT-306 co-chair, for his valuable support and advice.

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