

Data Concentrator

For modular and distributed control of propulsion systems

Orbital Research, Inc., developed, built, and tested three high-temperature components for use in the design of a data concentrator module in distributed turbine engine control. The concentrator receives analog and digital signals related to turbine engine control and communicates with a full authority digital engine control (FADEC) or high-level command processor. This data concentrator follows the Distributed Engine Controls Working Group (DECWG) roadmap for turbine engine distributed controls communication development that operates at temperatures at least up to 225 °C.

In Phase I, Orbital Research developed detailed specifications for each component needed for the system and defined the total system specifications. This entailed a combination of system design, compiling existing component specifications, laboratory testing, and simulation. The results showed the feasibility of the data concentrator.

Phase II of this project focused on three key objectives. The first objective was to update the data concentrator design modifications from DEWCG and prime contractors. Secondly, the project defined requirements for the three new high-temperature, application-specific integrated circuits (ASICs): one-time programmable (OTP), transient voltage suppression (TVS), and 3.3V. Finally, the project validated each design by testing over temperature and under load.

Applications

NASA

- ▶ NASA space programs will benefit from the development of the high-temperature electronic (HTE) component chips, data concentrator, and multichip modules.

Commercial

- ▶ Next-generation military and civilian aircraft turbine engines:
 - Rotorcraft
 - Unmanned aircraft systems
 - Land vehicles
- ▶ Downhole drilling and geothermal drilling controls
- ▶ Ground testing rocket and turbine engines
- ▶ Prognostic/Integrated system health management (PHM/ISHM)
- ▶ Chemical, nuclear, refinery, and process plant instrumentation
- ▶ Powertrain controls for gas or diesel internal combustion engines (e.g., improved waste gate turbobooster)



Phase II Objectives

- ▶ Update data concentrator modifications from DEWCG and prime contractor
- ▶ Define requirements for the OTP, TVS, and 3.3V linear regulator
- ▶ Validate each design by testing over temperature and under load

Benefits

- ▶ Enables replacement of the large bundles of noise-sensitive analog cable interfaces between sensors/actuators and the FADEC with a digital data bus, thus reducing weight
- ▶ Optimizes actuator performance through closed-loop control
- ▶ Lowers maintenance costs through condition-based maintenance (CBM) and PHM capabilities
- ▶ Lowers costs for FADEC upgrades

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