

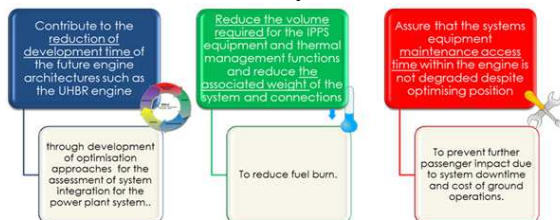
High Temperature Fire & Overheat Sensor Elements (FOSE) for aircraft Fire & Overheat Detection System (FODS)

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NIPSE Project Novel Integration of Power plant System Equipment

NIPSE Objectives



The solutions developed within NIPSE are based on the UHBR technology and take into account the whole life cycle of UHBR engines: design, production, repair, maintenance, overhaul and retrofit.

This optimization hinges on integrating the engine and the nacelle into a single assembly (Ultra High Bypass Ratio turbofan engine). This optimization means that some equipment's will be exposed to higher temperatures. To survey these equipment's THERMOCOAX was in charge of the development of a FOSE (Fire and Overheat Sensor Elements) based onto twin conductors Mineral insulated cable (MIC). These FOSE lies on electrical insulation resistance drop (decrease) when sensor is exposed to overheat or fire environment.

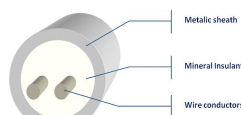
Thanks to CTTC expertise and technical support, more than 15 new mineral insulants were tested during this project. Finally one ceramic insulant was selected for the development of a new FOSE (2 mm OD MIC) with Overheat temperature detection range from 200°C to 500°C and fire detection. FOSE is a very flexible cable and can be coiled and bent with a small bending radius.

Normal condition : $IR > 10^6 \Omega$ Overheat : $5 \cdot 10^4 \Omega < IR < 10^6 \Omega$ Fire : $IR < 10^3 \Omega$

Adapted electronic measure resistance variation and translate it onto alarm information.

Achieved results :

- Good sensitivity on larger temperature range (up to 600°C),
- No signal deviation or drift after overheat & fire test,
- Reduction of MIC linear weight (up to 49% with 1,5 mm OD),



NIPSE Project 10 partners : Safran Nacelles – Safran Aircraft Engines – Safran Electrical & Power – BAE Systems – Thermocoax – Archimedes – MEGGITT – Netherlands Aerospace Center NLR – CESA – ARTTIC

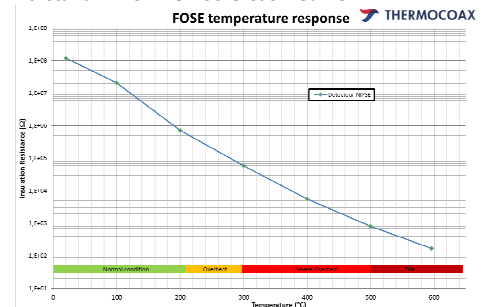
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Fire & Overheat sensor (MIC : 2 II I 20 C100)

Temperature range : -55°C / 600°C

Fire withstand : ISO 2685 (1080°C/15 min)

Vibration withstand : RTCA DO 160 G Cat R Curve W



Tests performed onto FODS (MI cable) successfully

- Thermal cycling from 50°C to 580°C (200 cycles),
- Fire test : 1080°C / 5 min & 15 min,
- Homogeneity test,
- Overheat and fire detection with ambient temperature from 20°C to 350°C with no signal deviation or drift.
- Response time <12 s for overheat (210°C),
- Response time <6 s for severe overheat (350°C)

FOSE with High temperature EN 2997 connector

Temperature range : -55°C / + 600°C

Glass seal & Ceramic metal
EN 2997 connectors for FODS



FOSE



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