

SANDWICH

Harvest | Detect | Locate | Monitor | Transmit
Self-powered Autonomous Device for wireless structural Health monitoring

Self –Powered Autonomous Device for Wireless Structural Health Monitoring

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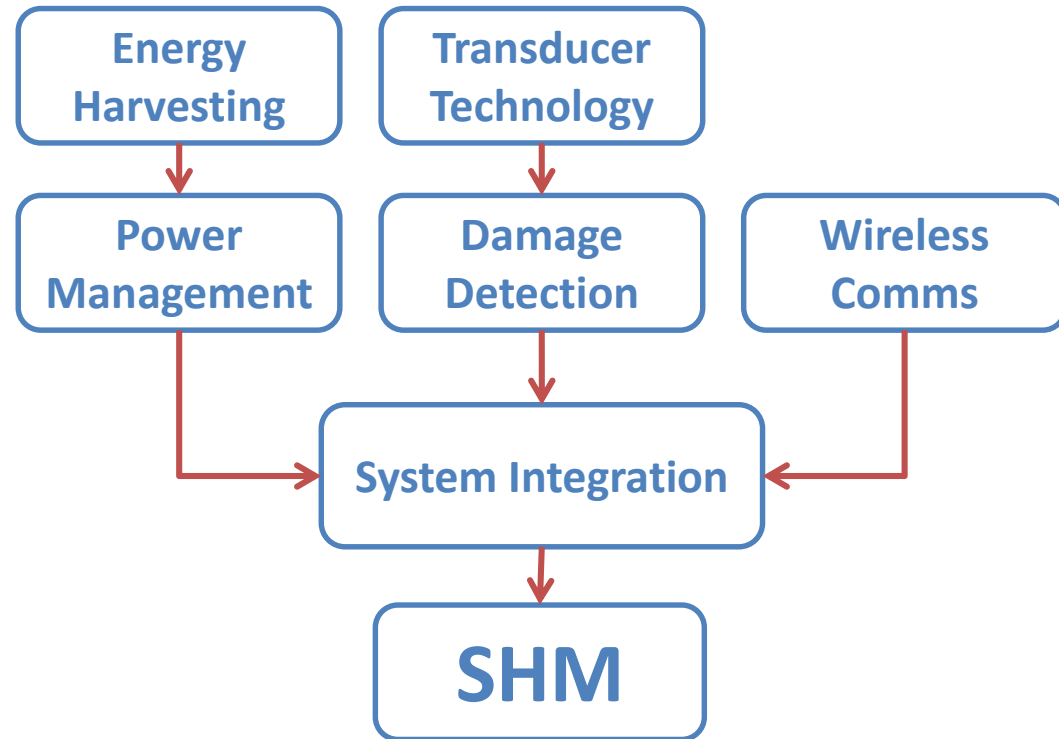
Self-powered Autonomous Device for wireless structural Health monitoring

Motivation

- Wireless SHM for aerospace applications

Project Aims

- Develop EH and power management solution to power a SHM system
- Investigate the use of:
 - Thermoelectric
 - Piezoelectric
 - RF power delivery
- Develop a multiple input power management solution

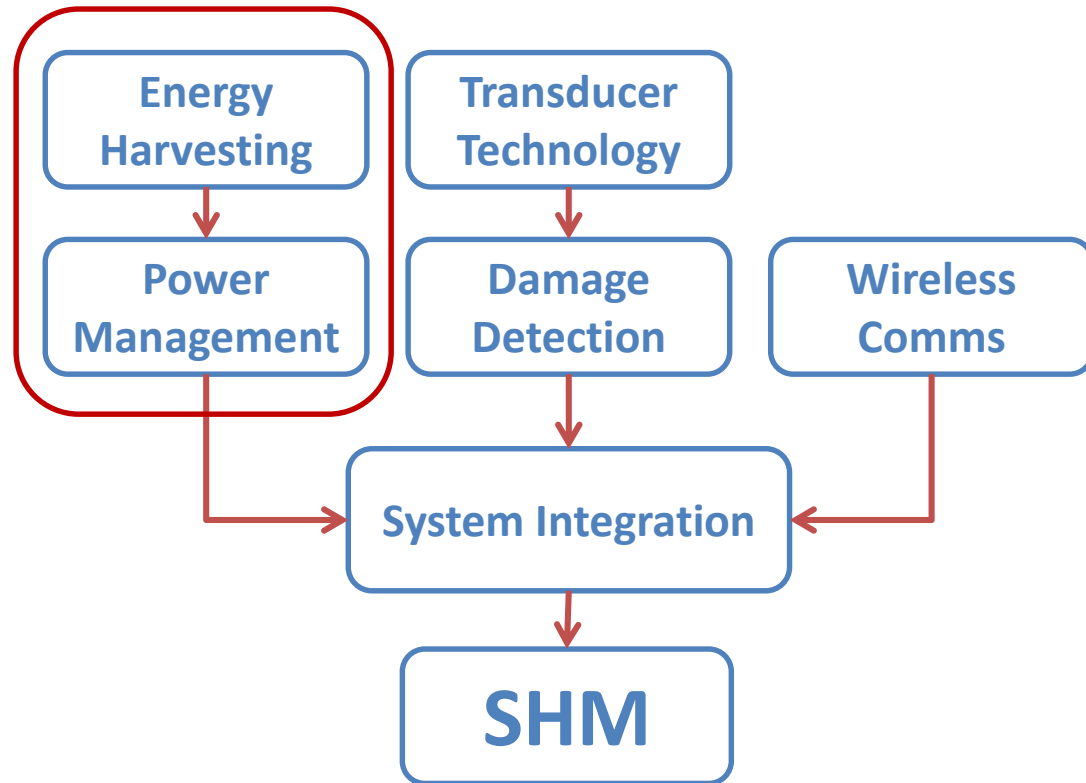


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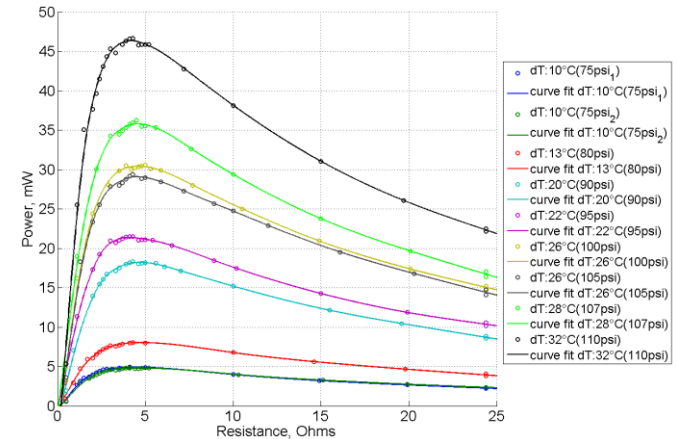
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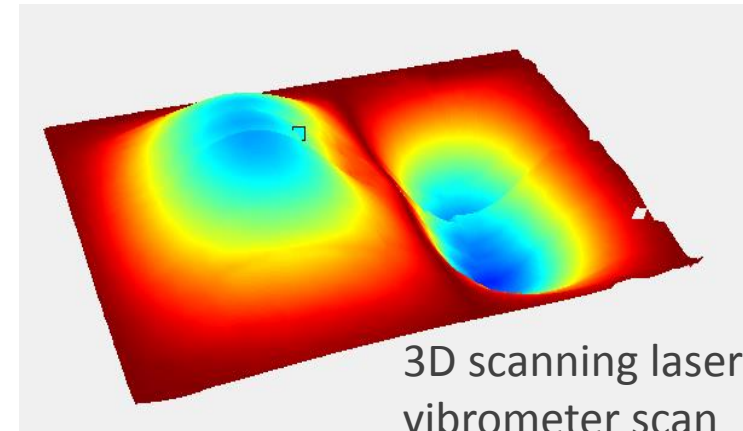


Key Achievements

- Assessed performance of commercial TEGs
- Typical positive and negative aircraft gradients up to 30°C
- Developed optimisation programme for placement of piezoelectric vibration harvesters
- Feasibility study into developing power delivery system utilising reversed RF power amplifiers
- Developed multiple input power management system using charge transfer circuit



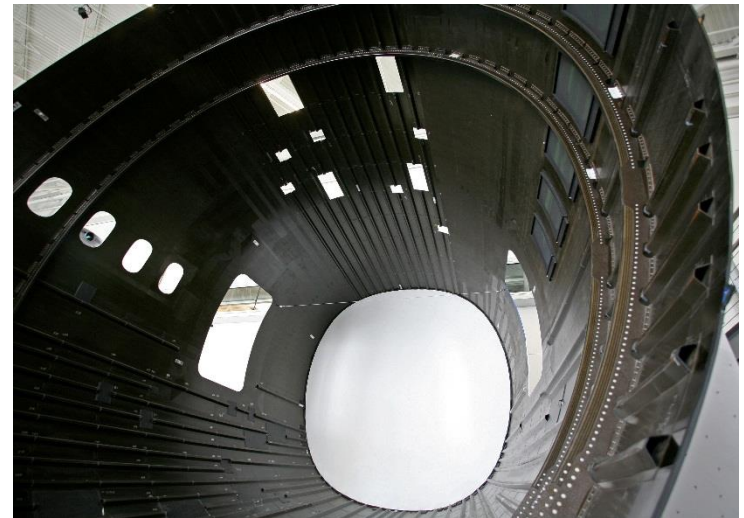
TEG power profiles



3D scanning laser vibrometer scan

Conclusions

- For aircraft temperature gradients:
 - TEG power levels from 13-45mW
- Significant increased piezoelectric harvested power
 - Doubled average power levels over the frequency bandwidth
- Feasible to reverse RF power amplifier to generate power delivery system
 - Able to receive 200mW
- Developed power management system for multiple input using charge transfer circuit



Future Work

- Successfully led to TSB grant project:
 - Montagu a continuation of Sandwich project
 - Aim is to fully develop a lightweight, miniaturised power management solution for autonomous SHM systems
- Further work ongoing on another TSB grant entitled Sentient
 - Aim to develop low power SHM system

