Contributions to GRAIN2

KGT1 and KGT3 contributor

UCRAN – Cranfield University
- Wholly postgraduate university specialising in science, technology, engineering and management
- Cranfield has been at the forefront of aerospace development for nearly 70 years and brings together the disciplines of aeronautical engineering, materials, manufacturing and management to create new solutions for the industry

Technical contribution

KGT1: to develop a better understanding of the fundamental science and the physical processes in
- **Contrails** - formation of a contrail, specifically the mixing process that takes place between the jet engine exit plane and the point where the fully mixed plume is established.
- penalty for avoiding contrails by flying at different altitudes to avoid the supersaturated air
- **NOx** - survey new technologies associated with further reducing emissions in the LTO cycle to improve airport capacity, and the potential for technology to reduce cruise NOx

KGT3: to design, model and test of novel composite materials and efficient structures
- design and applications to airframe structures
- durability and damage tolerance (fatigue, impact, delamination)

Current Projects

- **CleanSky**: efficient engine design for emission reduction; contrails and NOx models; Flight trajectory research and aircraft systems
- **Airstream**: integral airframe structures with bonded crack retarders
- **Bridging the Divide**: joining composites to metals to enhance performance and damage tolerance
- **COINS**: cost effective integral metallic structures using friction stir welding process
- **SADE**: integrated wing with morphing high lift devices

Future activities

- Novel solutions for structural integrity, e.g. fibre tow steering, through-thickness reinforcement
- Bio-sourced composite materials: mechanical performance investigation
- Thermoplastic composites: performance
- Development of models and methods for design analysis (fatigue damage model, impact model)
- Hybrid material structures: joining methods and performance
- Light-weight metallic structures: by welding, adhesive bonding, additive manufacturing

Selected Publications (related to GRAIN2 objectives)


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