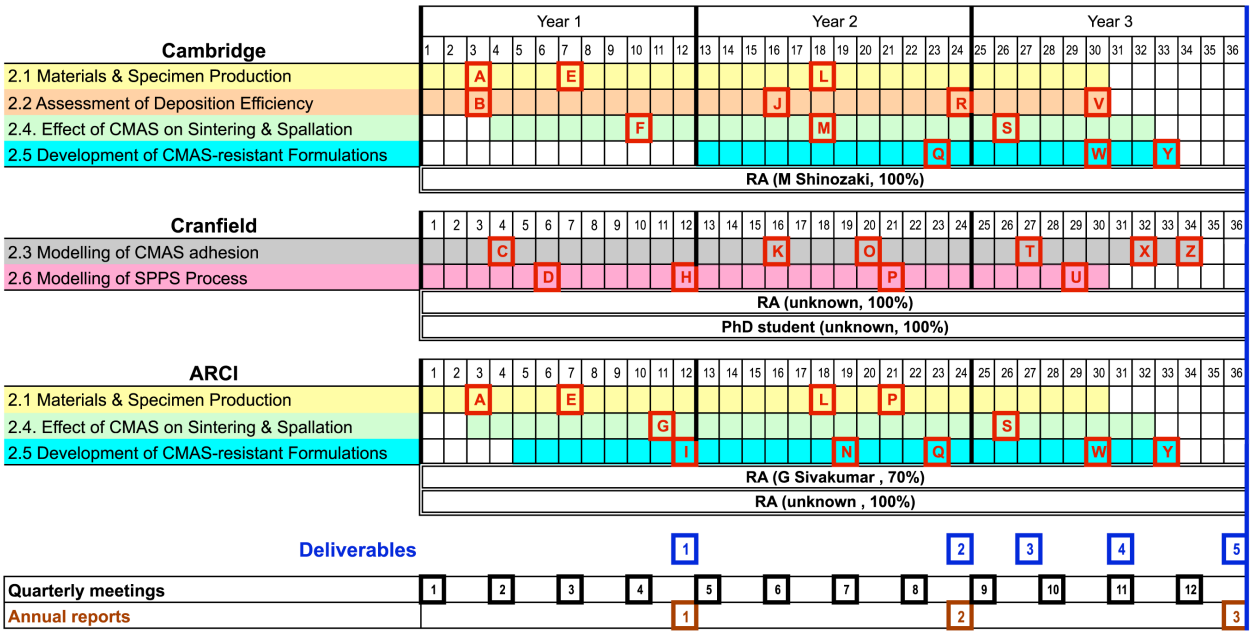
Improvements in Gas Turbine Performance via Novel Plasma Spray Coatings offering Protection against Ingested Species

Work Plan



Milestones:

- A Specimen Production and Exchange Procedures Established at Cambridge and ARCI
- B Commissioning of Turbojet Facility for Measurement of Deposition Efficiency completed
- C RA familiar with existing software at Cranfield relating to Particle Impact and Spreading
- D Preliminary Model completed for Liquid Precursor and Particle In-flight Dynamics under SPPS conditions
- E Examples of all types of Specimen exchanged between Cambridge & ARCI, and Quality Control establish
- F Microstructural (CMAS Penetration) Characterisation complete
- G Initial trials completed on effect of SPPS Coating Structures on CMAS penetration
- H Nanostructured Coating Formation Simulated via Multi-particle Model
- I Identification of Promising SPPS Precursors for CMAS Resistance
- J Systematic Deposition Efficiency results from Engine Trials conveyed to Cranfield
- K Model for Impingement of Solid CMAS Particles Functional
- L SPPS Coatings on Alumina substrates sent from ARCI to Cambridge, after Exchange Visits
- M Mechanisms established for CMAS Penetration and Sintering Enhancement
- N Study of Effect of CMAS on Erosion Resistance completed
- O Model for Semi-solid & Liquid Particle Impact functional and Comparions made with Cambridge results
- P Specimens sent from ARCI to Cranfield for Validation of SPPS Process Simulation
- Q Preliminary conclusions about "Scavenging" layers, SPPS Structures & Laser Treatments
- R Conclusions reached about Effects of Engine Conditions & Particulate Characteristics on Deposition Effic
- S Final validation of Fracture Mechanics-based Spallation Criterion, as applied to CMAS-enhanced Sinterin
- T Incorporation of Effects of Substrate Roughness and Presence of Coating on Adhesion Modelling
- U Final validation of SPPS Model
- V Completed set of experimental results on Particle Adhesion Characteristics sent to Cranfield
- W Recommendations finalised for Optimal Counter-measures against CMAS-based Degradation
- X Incorporation of Effect of Substrate Lateral Motion, using discrete phase Lagrangian method
- Y Industrial Trials completed for Knowledge & Technology Transfer
- Z Final conclusions about Measures designed to Inhibit Adhesion of Ingested CMAS

Deliverables:

1. Workshop in India
2. Workshop in Cambridge, in collaboration with UK TBC Network
3. Report concerning Viability of SPPS for Obtaining Improved Resistance to CMAS-induced Degradation
4. Report concerning Viability of "Scavenging" Sprayed Layers, with or without Laser Treatment
5. Delivery of Final Report