

Training Opportunity for Swiss Trainees

| Reference | Title | Duty Station |
|-----------------|------------------------|--------------|
| CH-2018-TEC-MSP | Additive manufacturing | ESTEC |

Overview of the unit's mission:

The Structures and Mechanisms Division TEC-MS is the centre of competence of the Agency in all areas related to spacecraft and launcher structures and mechanisms, encompassing spacecraft and launcher lightweight structures, stable structures, advanced mechanical materials applications, structural dynamics, damage tolerance, deployable structures/booms, active structures, hold-down and release devices, electrical motors for space mechanisms, launcher and re-entry vehicle hot- and cold structures, landing attenuation systems, seals, valves, parachute systems, separation systems, solar array drive mechanisms, reaction wheels, pointing mechanisms, pyrotechnics, bearings and tribology aspects. It provides support to projects, preparatory programs and technology programs.

The work proposed will be carried out in the Materials and Processes Section. The activities performed within the remit of the Materials and Processes Section include:

- The qualification for space flight of all advanced metallic and non-metallic materials, structural ceramics and glasses as well as all related manufacturing and surface treatment processes for all ESA spacecraft and launchers Programme
- The development of revolutionary materials and innovative manufacturing technologies both internally and in cooperation with other space agencies and organisations
- The failure investigation of materials and processes underperforming and impacting ESA space missions
- The development, certification and support of new European industrial capabilities, manufacturing processes and manpower skills training related to space applications of materials and components
- The establishment and implementation of requirements and standards for the development and the procurement of space grade materials and manufacturing processes
- The development, maintenance and improvement of the European Space Materials Database, storing all relevant data generated for materials and processes intended for Space use

In order to achieve its objectives, the Materials and Processes Section has also direct access to the world leading ESTEC Materials and Electrical Components Laboratory, covering the full spectrum of materials characterisation testing capabilities.

Overview of the field of activity proposed:

The European Space Agency has recently proposed the ESA Advanced Manufacturing Cross-Cutting Initiative, which captures the opportunity of adopting revolutionary manufacturing capabilities, advanced materials and associated processes and creates sustainable competitive advantage for the European Space Industry in the global market.

The current space missions are often limited in their performances and scientific achievements by the traditional manufacturing processes/concepts. Though, Advanced Manufacturing technologies are readily available in the current European industrial landscape, these can be adopted for next generation space hardware manufacturing. This will enable new and highly innovative spacecraft and launchers designs, with significantly reduced manufacturing constraints (including costs and lead-time) and tremendous performances improvement.

One crucial process is additive manufacturing, that has not only the potential to improve lead-time, weight, or costs, but may also result in advanced designs or even be mission-enabling through the additional design freedom. The agency is running a large number of technology development contracts in the area of additive manufacturing, and is complementing these activities through in-house investigations such as:

- Feasibility investigation of new materials (metallic, ceramic, and polymeric)
- Feed material characterisation
- Defect analysis
- Performance assessment
- Failure prediction

The candidate will use the world leading facilities of the ESA/ESTEC Materials and Electrical Components Laboratory, in order to cover the above activities, and will further collaborate with the ESA advanced manufacturing laboratory located at Harwell, UK.

The aim of the work will be to perform detailed materials investigations, verification testing as well as, where required, failure investigation. Final goal is to provide an in-depth understanding of the performances of the identified technologies and provide recommendations for further improvement in view of their space application in highly demanding environments.

Required education:

Applicants should have just completed, or be in their final year of a University course at Masters Level (or equivalent) in materials science material science covering metallic, ceramic, or polymeric materials. It is an asset to have understanding of diagnostic techniques such as microsectioning, optical microscopy, electron microscopy and mechanical testing.

Applicants should have good interpersonal and communication skills and should be able to work in a multi-cultural environment, both independently and as part of a team.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.