Training Opportunity for Portuguese Trainees

Reference	Title	Duty Station
PT-2014-TEC-ECN(2)	**Advanced Navigation Systems Prototyping**	**ESTEC**

Overview of the Unit missions:

The Guidance, Navigation and Control Section (TEC-ECN) is responsible for the:

- Definition and implementation of GNC systems for Planetary Exploration Orbiters and Landers, for Launchers and Re-entry Vehicles, and for specialized applications such as Formation Flying.
- Conception, initialization and supervision of corresponding enabling GNC technology R/D: Automated Rendezvous, Safe Precision Landing, Re- entry techniques, Vision-based and Hybrid Navigation Systems, Precision Formation Flying.
- Coordination of Advanced Control and Estimation Techniques Research and Development for all applications of the Control Systems Division.
- Provision of functional support to projects (Planetary Exploration, Launchers, Re-entry Vehicles and specialized applications), involving GNC requirements analysis, design and modeling, performance evaluation, GNC verification and validation, AIT (Assembly, Integration and Test) and LEOP (Launch and Early Orbit Phase) support.
- Definition, maintenance and operation of the necessary computing and laboratory facilities in support of above activities.

Overview of the field of activity proposed:

Activities

The selected Trainee will be involved in the following activities:

- T1) Simulation, prototyping and testing of advanced navigation systems (using vision-based sensors, 3D cameras, Infrared camera, IMU, GNSS, etc) including image processing systems for the following applications:
    - Active Debris Removal (ADR): new and smarter sensors for non-cooperative rendezvous, as well as image recognition and processing for fully autonomous navigation.
    - Multi-phase navigation systems for a Mars Sample Return mission (Descent, Ascent, Rendezvous).
    - Descent and landing systems with advanced navigation sensors for Mars (ExoMars), Moon (lunar lander type) and asteroids exploration (Marco Polo R).
    - Hybrid Navigation Systems for launchers (VEGA).
- T2) Prototyping of navigation systems in the Control Hardware Laboratory (GNC Test Facility) based on the ESA Avionics Test Bench infrastructure, MATLAB/Simulink models, and/or sensor stimulators (dSpace components).

Background

ESA is working on advanced navigation systems for complex tasks in future missions. In this field, prototyping is of primary importance. The advanced navigation research uses the GNC Test Facility of the Control Hardware Laboratory. The GNC Test Facility allows establishing proof of concept of innovative GNC systems and algorithms through closed-loop tests with SW and HW in the loop. It is an ideal place for increasing knowledge, experience and capability and hands-on experience for ESA trainees and PhD students.

Tools and Facilities

The Trainee will learn how to use the tools and facilities available in TEC-ECN (control hardware laboratory).

Required Education:

University degree or equivalent qualification in aerospace, control engineering or mathematical methods for aerospace applications. Good command of MATLAB and knowledge of C computer programming language and realtime systems and test benches.

A good knowledge of English is required. The knowledge on dSpace systems is an asset.