Training Opportunity for Belgian Trainees

Reference	Title	Duty Station
BE-2016-OPS-L(2)	**Space weather impacts on space systems**	**ESOC**

Overview of the unit's mission:

The objective of the SSA programme is to support Europe's independent utilisation of, and access to, space through the provision of timely and accurate information, data and services regarding the space environment, and particularly regarding hazards to infrastructure in orbit and on the ground.
The SSA programme will, ultimately, enable Europe to autonomously detect, predict and assess the risk to life and property due to remnant man-made space objects, re-entries, in-orbit explosions and release events, in-orbit collisions, disruption of missions and satellite-based service capabilities, potential impacts of Near Earth Objects, and the effects of space weather phenomena on space- and ground-based infrastructure.
The programme is active in three main areas:

- Survey and tracking of objects in Earth orbit - comprising active and inactive satellites, discarded launch stages and fragmentation debris that orbit the Earth
- Monitoring and forecasting space weather - comprising conditions originating from the Sun that can affect communications, navigation systems and other networks in space and on the ground
- Watching for near-Earth objects - comprising natural objects that can potentially impact Earth and cause damage and assessing their impact risk and potential mitigation measures

Overview of the field of activity proposed:

This training opportunity will fall within the scope of the Space Weather segment of the SSA programme and will focus on analysis of the space weather impacts on ESA space missions. This analysis may be extended to other European space missions subject to availability of the satellite telemetry data and anomaly information.
Space weather refers to the environmental conditions in the Earth's magnetosphere, ionosphere and thermosphere due to the Sun and the solar wind that can influence the functioning and reliability of space-borne and ground-based systems and services or endanger property or human health.
Space Weather can impact a spacecraft in different ways. Most of the impacts are related to charged particles and their interaction with the spacecraft materials including semiconductors and the materials of the spacecraft body. Energetic particles from SEPs damage the spacecraft solar panels and permanently reduce the power production. Energetic particles can penetrate inside the spacecraft structure and directly interact with the electronics causing Single Event Upsets (SEUs) or permanent damage. Particles stopped by the structure generate bremsstrahlung increasing the radiation dose accumulated by the electronics. Lower energy particles cause charging of the satellite structure creating a risk of electrostatic discharges. Energetic protons cause blurring of CCD images and may cause attitude control problems in satellites using star imagers. Geomagnetic storms may cause attitude control problems in spacecraft using magnetic torquers. Space weather of course impacts radio signal propagation through the ionosphere and can cause disturbances in the satellite operations and telemetry tracking.
This challenging project will elaborate and expand the analysis of the space weather impacts on ESA missions that was performed by the SSA SWE team in 2013. The analysis in 2013 was limited to a few solar events and the related satellite anomaly recordings in the ESA database. The objective of this new project is to carry out an extensive analysis considering all recorded ESA spacecraft anomaly events, satellite telemetry recordings and space environment data. The objective is to achieve a much more comprehensive understanding of the space weather impact on spacecraft missions and the impact mechanisms. Particular attention will be given to potential delayed impacts, i.e., cases where spacecraft anomaly takes place some days after a space weather event. This requires analysis of the satellite telemetry data and satellite design to identify causes and mechanisms that may have caused the anomaly.

Required education

Applicants shall have a degree in engineering or physics preferably with a background and interest in satellite systems, optics and interaction of energetic particles and radiation with matter and related detection methods.
Applicants should have just completed, or be in their final year of a University course at Masters Level (or equivalent) in a technical or scientific discipline.
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.