

Training Opportunity for Swiss Trainees

Reference	Title	Duty Station
CH-2019-OPS-OPE	Exomars Trace Gas Orbiter operations	ESOC

Overview of the unit's mission:

OPS-OP is responsible for mission preparation and flight operations for the ESA fleet of solar and interplanetary spacecraft. The division currently operates four missions (Cluster, Mars Express, ExoMars TGO, Bepi Colombo) and prepares for the launch of three others (Solar Orbiter, ExoMars Rover and Surface Platform, JUICE).

Within OPS-OP, the ExoMars TGO unit (OPS-OPE) is responsible for the operations of the Trace Gas Orbiter (TGO) in-orbit around Mars. This includes monitoring, control and mission planning of the satellite as well as the mission responsibility for the required data systems and related interfaces.

Overview of the field of activity proposed:

The ExoMars TGO is the first in a series of Mars missions undertaken jointly by ESA and Roscosmos. From its 400-km-altitude science orbit TGO shall gain a better understanding of methane and other atmospheric gases present in small concentrations (less than 1% of the atmosphere) which could be evidence for possible biological or geological activity. The Orbiter is also an invaluable Mars telecommunications asset, currently providing communication services to NASA rovers (or landers) on the Mars Surface: it acts as a data relay hub for sending commands to the rovers and downloading rover data to Earth using ESA, NASA and Russian space communication networks. This relay function will serve the ExoMars 2020 mission, combining a European Rover and a Russian science Surface Platform, planned to land on Mars in March 2021.

TGO has been successfully operated around Mars for over two years. The first year was dedicated to achieving the final low-altitude circular orbit by aerobraking, via the spacecraft friction on the upper atmospheric layers. Early 2018 it started intense science exploration with its four remote sensing instruments, as well as relay support activities in close cooperation with NASA.

TGO, which is a robust satellite and has large reserves of fuel, is only at the beginning of a potentially very long mission (until 2030 and beyond) since science surveys and relay support to robots on the Mars surface require a stable in-orbit infrastructure. In order to secure its mandatory support to the ExoMars Rover and Surface Platform, and prepare for longer-term perspectives, the operations team must systematize the monitoring of all sub-systems, on various time scales. Analysing spacecraft telemetry and modelling the evolution of the on-board hardware will allow, like on similar missions, to predict lifetime of all units, and to possibly tune the on-board software and mission profile to achieve a balanced decay, hence maintaining as long as possible this European asset in an efficiently operating status. Confirming the spacecraft health is also required when requesting funds for mission extensions.

The Trainee will report to the ExoMars TGO Spacecraft Operations Manager. His/her primary tasks will be related to quantitative monitoring of the TGO sub-systems behaviour:

- The Trainee will learn about all spacecraft sub-systems, their load profile during operations and their interaction for execution of the mission. The hardware elements with sensitive aging profiles concern most units: solar array and antenna mechanisms, batteries for energy management, gyroscopes and reaction wheels for attitude control, fuel for orbit control, amplifiers for radio-communications etc.

- To support the various sub-system engineers within the Flight Control Team, the Trainee will be assigned a number of tasks and studies for monitoring and predicting the behaviour of such on-board equipment.

- It is expected that the Trainee specifies and develops software tools that support data analysis and where relevant simulate future usage and aging trade-offs. The Trainee shall take advantage of existing tools already developed ad-hoc on TGO, or similar tools and approaches on other planetary missions.

Finally, while integrated in the TGO Flight Control Team, the Trainee may also participate in tests and operations supporting the ExoMars 2020 Rover mission, focused on, but not limited to Relay activities and interfaces on ground.

This position will grant the applicant wide insight into the different aspects of spacecraft operations, including spacecraft platform, space communications and ground segment for a complex interplanetary mission.

Required education:

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, preferably Aerospace, electronics, computer science or physics.

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.

Familiarity with spacecraft design and related sub-systems would be an asset. A basic knowledge of orbital dynamics would also be beneficial. Familiarity with office suite and basic programming skills are desirable.

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