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Executive Summary – ESA Directorate of Operations and Infrastructure

ESA's operations team

The DIRECTORATE OF OPERATIONS AND INFRASTRUCTURE (D/OPS) is one of the support directorates within the European Space Agency (ESA) and is responsible for flight operations for ESA satellites and human spaceflight missions, as well as for the corresponding ground segment resources. Our personnel are distributed across all ESA establishments, but the focus of activities is at the European Space Operations Centre (ESOC), in Darmstadt, Germany.

ESOC: Europe's Gateway to Space

ESOC is responsible for the operation of all ESA satellites as well as for the development and maintenance of ground stations and related communication networks. Since its establishment in September 1967, ESOC has operated more than 55 ESA satellites and has supported numerous missions of other national and international organisations. Based on its highly developed infrastructure, technologies and specialised teams, ESOC can operate more than 10 satellites simultaneously in routine operations plus additional satellites in LEOP (Launch and Early Operations Phase). ESOC has conducted numerous satellite recovery missions and is a globally recognized competence centre for space debris and satellite navigation.

Current highlight missions operated from ESOC

- Mars Express – Europe's first mission to the Red Planet, looking for traces of water and past or present life
- Rosetta – Will orbit the nucleus of Comet 67P/Churyumov-Gerasimenko in 2014, after a 10-year cruise
- Envisat: "Caring for the Earth" – Europe's 8-tonne Earth observation flagship, monitoring global air pollution, oceans, the ozone layer and polar ice caps, as well as sudden natural disasters.

Mission analysis

ESOC's involvement in a satellite mission starts early with the selection and calculation of possible orbits, the spacecraft trajectory and the launch window.

Flight dynamics

ESOC experts calculate the position, speed and the orientation of satellites in space. This activity is not only necessary during the planning phase, but also for ongoing satellite operations and is especially critical during manoeuvres, orbit entry and transfers.

Operations Control Centre and LEOP

During the LEOP (Launch and Early Operations) phase, ESOC takes over operation of a satellite immediately after separation from the launcher. ESOC then conducts the manoeuvres required to move the satellite into its final orbit. As soon as the satellite has reached its routine orbit, operations are moved to a dedicated control room (DCR). Throughout this time, ESOC is in constant contact with the mission via the ESTRACK network of ground stations or via cooperating stations.

Ground Stations

ESTRACK, a worldwide network of ground stations, is operated by ESOC. It includes eight ESA ground stations located in Redu (Belgium), Kourou (French Guayana), Maspalomas, Villafranca & Cebreros (Spain), Kiruna (Sweden) and Perth + New Norcia (Australia). In addition, ESTRACK makes use of other ground stations in cooperation with organisations such as CNES, NASA, NASDA and DLR. ESOC also offers its spare ground segment capacity to third-party customers under commercial conditions.

Software

The Operations Directorate develops specialised software for the operation of satellites (EGOS, SCOS-2000), as well as for the processing of satellite data and simulation (SIMSAT).

Personnel

Approximately 250 ESA staff augmented by some 500 industry contractors

Contact

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