EUMETSAT

A New Geostationary Meteorological Satellite System for the 21st Century

Taking Meteosat into the next century

By November 2002 the current generation of Meteosat meteorological satellites will have provided reliable service for 25 years. Meteosat image data are now an essential component of the global observing system. Images and derived meteorological products are of considerable value to Numerical Weather Prediction, very short range forecasting and climate monitoring. Moving cloud sequences from Meteosat are a familiar part of weather forecasts seen daily by millions.

The current Meteosat series was designed by ESA in the early 1970s and technology has advanced considerably since then. Also, the demands of meteorologists, the climate monitoring community and other Earth-related scientists have progressed significantly.

To satisfy these demands, EUMETSAT and ESA are cooperating on the production of a completely new system to take over and significantly improve the operational service by 2003.

Meteosat First Generation (MOP/MTP)

Three-channel imaging radiometer

100 rpm spin-stabilised body

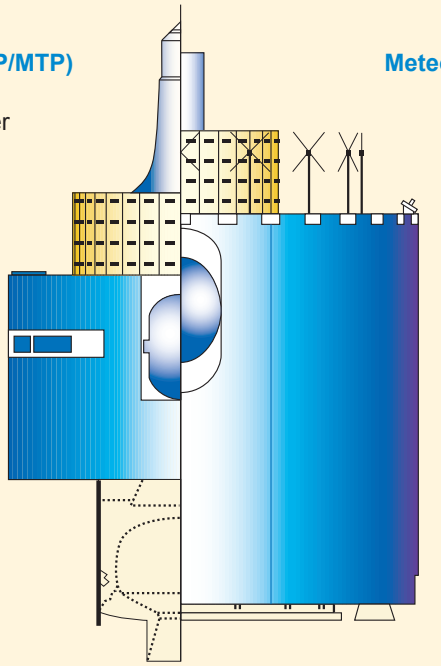
Solid Apogee Boost Motor

Five years station-keeping

200 Watts power demand

720 kg in GTO orbit

Flight qualified with
Delta 2914, Ariane-1, -3, -4



Meteosat Second Generation (MSG)

12-channel enhanced
imaging radiometer

100 rpm spin-stabilised body

Bi-propellant unified
propulsion system

Seven years station-keeping

600 Watts power demand

2010 kg in GTO orbit

Design compatibility with
Ariane-4 and -5

Important dates

1977	Launch of Meteosat-1, the first of the current series
1990	EUMETSAT Council approved the MSG Preparatory Programme
1992	ESA Council approved the MSG Programme
1993	Full MSG Programme commenced
1997	Launch of Meteosat-7, the last of the current series (planned service until at least end-2003)
1997/8	Contracts placed for the MSG Ground Segment components
1998	Testing of MSG Structure & Thermal Model of the satellite

MSG launches

The three MSG satellites will be launched by Arianespace. MSG is designed to be compatible with either of the Ariane-4 or Ariane-5 launch vehicles. The launch of the first satellite, MSG-1, is foreseen in mid-2002 on an Ariane-4. The second will be launched about 18 months later to provide a two-satellite operational system. The third will be launched about four years after the second or when it is needed, to maintain a continuous service for at least 12 years. A fourth MSG is at the planning stage.

The MSG system

There are two major components of the MSG system:

The Space Segment

The space segment comprises three satellites being manufactured by a European industrial consortium led by Alcatel Space Industries, France, under the responsibility of the European Space Agency (ESA). ESA is responsible for the development of the first satellite according to a requirement baseline coordinated with EUMETSAT, and acts, on behalf of EUMETSAT, as procurement agent for MSG-2 and MSG-3. The three MSG satellites will ensure continuity of service for at least 12 years, and a fourth is at the planning stage.

MSG will be a spin-stabilised satellite with a rotation speed of 100 rpm. It will be in geostationary orbit at about 36,000 km, positioned at 0° Longitude. Each satellite is designed for a nominal lifetime of seven years.

MSG will carry a new radiometer, the Spinning Enhanced Visible and Infrared Imager (SEVIRI). In addition to this there will be the Geostationary Earth Radiation Budget (GERB) instrument. The GERB will provide valuable data on reflected solar radiation and thermal radiation emitted by the Earth and atmosphere. In addition to these two instruments, MSG will carry a comprehensive communications payload serving the needs of satellite operation, data communication and user data dissemination. The Search and Rescue transponder is also included in this communications package.

The Ground Segment

The Ground Segment consists of a Mission Control Centre (MCC) at the EUMETSAT Headquarters in Darmstadt, Germany. The MCC will perform mission spacecraft control, rectification of image data, extraction of meteorological products, and archive and retrieval. Some products that require close user interactions and specialised methods are extracted in the Satellite Application Facilities (SAFs) operated by Member States and remotely located. Archiving and retrieval of MSG data will make use of a Meteorological Archive and Retrieval Facility that will be common to all EUMETSAT programmes.

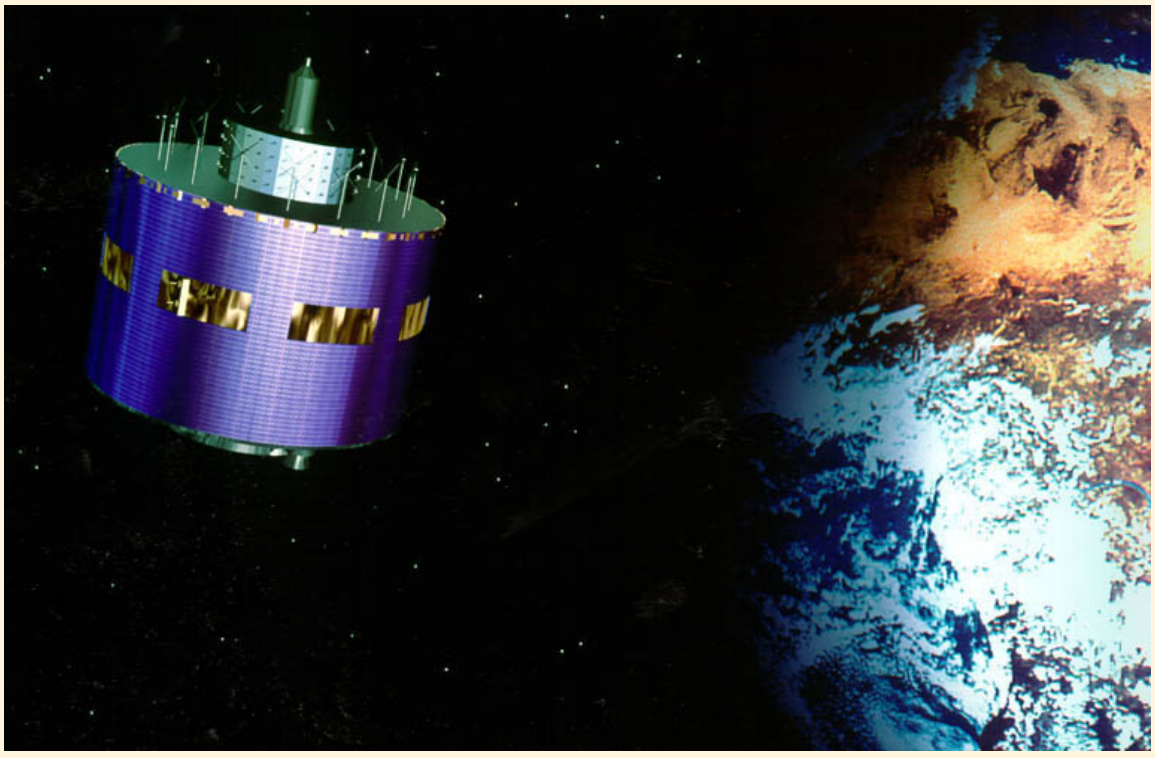
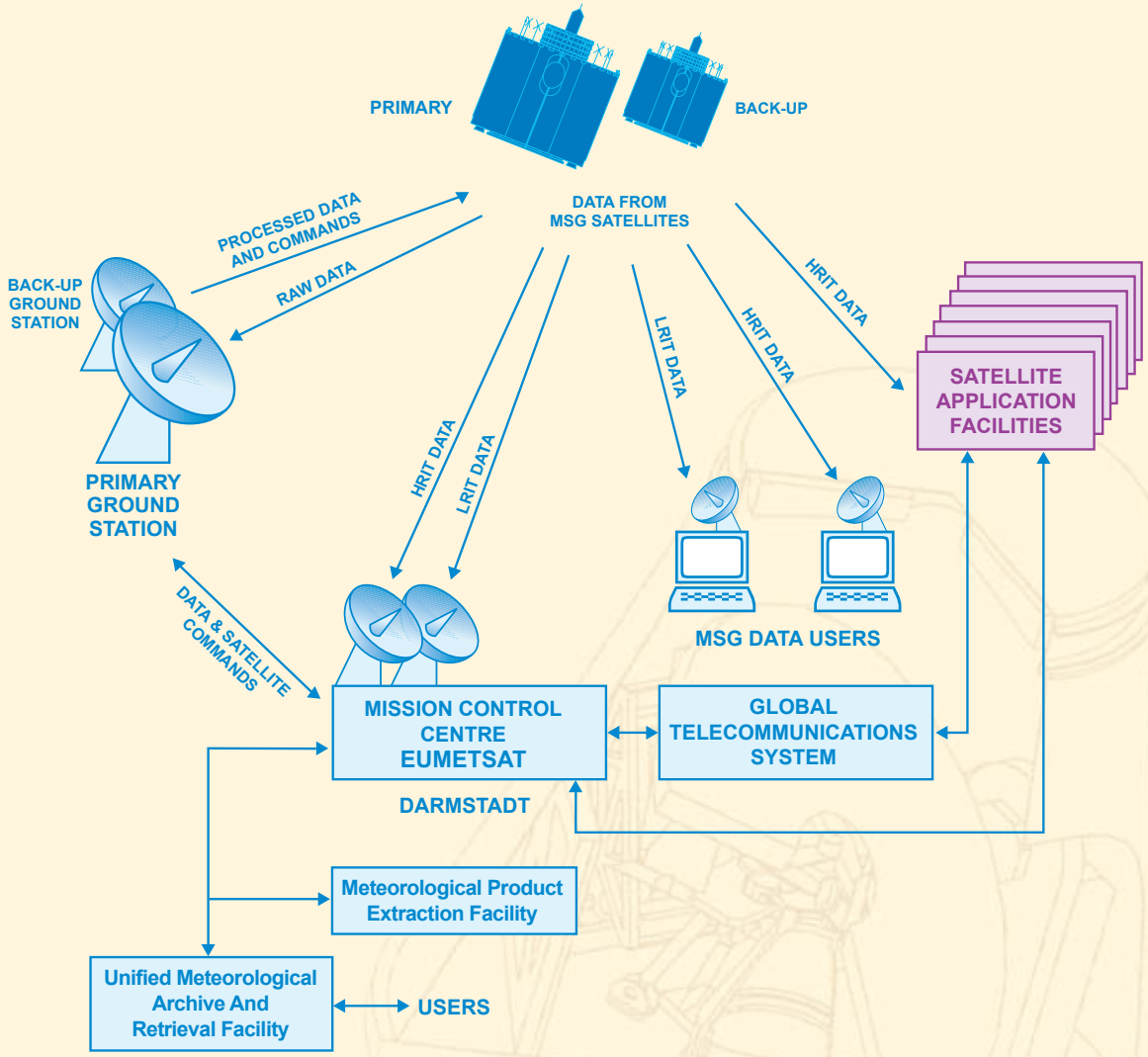


PHOTO: ESA

User stations

Two new types of user station, Low Rate User Stations (LRUS) and High Rate User Stations (HRUS), will be needed to receive MSG data. These will make use of either the Low Rate Information Transmission (LRIT) or High Rate Information Transmission (HRIT) data communications from the MSG satellites. LRUS and HRUS will have different front-end processors to receive the LRIT and HRIT signals from the satellite. As well as signal reception, the stations will decrypt and decompress the data. EUMETSAT has published the full detailed design specifications of the prototype user stations (available from the MSG Web page).

The MSG Ground Segment



MSG missions

Imaging mission

Imaging will be the main mission of MSG. Its operational observations of the Earth's surface and atmosphere in 12 different spectral channels will upgrade and continue the meteorological applications known from Meteosat, provide enhanced support to nowcasting applications and climate monitoring, and add a land surface monitoring capability.

Product extraction mission

The product extraction mission will provide meteorological, geophysical and oceanographic products from Spinning Enhanced Visible and Infrared Imager (SEVIRI) imagery. These products will continue the product extraction mission of the current Meteosat system, and provide additional new products.

MSG products will be delivered to the meteorological user community in near real-time via the Global Telecommunication System (GTS) of the WMO or via the satellite. They will also be archived.

Data collection and relay mission

The data collection and relay mission will collect and relay environmental data from automated Data Collection Platforms (DCP) via the satellite. This will be a follow-on of the current Meteosat data collection mission but with significant enhancements. There will be increases in the number of international and regional DCP channels, and DCP data will be distributed in near real-time via the satellite. A Search and Rescue relay capability is also included.

Dissemination mission

The dissemination mission will provide digital image data and meteorological products through two distinct transmission channels:

- High Rate Information Transmission (HRIT) for the full volume of processed image data in compressed form

- Low Rate Information Transmission (LRIT) for a reduced set of processed image data and other meteorological data in compressed form

Different levels of access to HRIT and LRIT data will be provided through encryption. The Meteorological Data Distribution (MDD) mission of the current Meteosat system will be integrated into the dissemination mission.

Meteorological products

The EUMETSAT central processing facility in Darmstadt will produce a range of meteorological products derived from satellite data:

- Atmospheric wind vectors at various altitudes, derived from the motion of clouds and other tracers such as water vapour and ozone

- Cloud Analysis providing identification of cloud layers with coverage, height and type for weather forecasting, Numerical Weather Prediction, and climate research

- Tropospheric Humidity at medium and upper levels for weather forecasting, Numerical Weather Prediction, and climate research
- High Resolution Precipitation Index
- Cloud Top Height images for aviation meteorology
- Clear Sky Radiances, for Numerical Weather Prediction models
- Global airmass instability, for Nowcasting
- International Satellite Cloud Climatology Project (ISCCP) data set
- Total Ozone Product
- Calibration Monitoring

In addition to these centrally produced products there will be a wide range of specialised products from SAFs documented in another EUMETSAT brochure.

Benefits of the MSG system

Meteosat Second Generation will be a significantly enhanced follow-on system to the current generation of Meteosat. It has been designed in response to user requirements and will serve the needs of Nowcasting applications and Numerical Weather Prediction in addition to provision of important data for climate monitoring and research.

The Spinning Enhanced Visible and Infrared Imager (SEVIRI) will bring major improvements in the service to meteorologists, climate monitoring and other related disciplines through:

- Twelve spectral channels (three on the current system) will provide more precise data throughout the atmosphere giving improved quality to the starting conditions for Numerical Weather Prediction models
- Fifteen-minute cycle of imaging (30 minutes on the current system) will provide more timely data for Nowcasting, improving the accuracy in forecasting of severe weather such as thunderstorms, heavy rain, snow or fog
- Improved horizontal image resolution for the visible light spectral channel (1 km as opposed to 2.5 km on the current Meteosat) will also greatly aid weather forecasters in detecting and predicting the onset or cessation of severe weather
- The Geostationary Earth Radiation Budget (GERB) instrument carried on MSG will provide important data for climate research
- An additional humanitarian payload on MSG satellites will be a Search and Rescue transponder that will relay distress signals from ships, aircraft and others in peril
- All-digital transmission of MSG data will improve performance and simplify equipment maintenance
- MSG satellites will have a nominal life in orbit of seven years (two more years than the current system), this leading to an extended and more cost-effective life-span
- A completely new Ground Segment will harness the proven operations skills of EUMETSAT and the specialised expertise in its Member States

Further information

For more information about EUMETSAT or any of its programmes please contact the EUMETSAT User Service:

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More specific information about the MSG System may be found on the following Internet Web pages:

EUMETSAT: www.eumetsat.de

ESA: www.esa.int

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