The EnMAP satellite consists of both a spacecraft platform and a payload. The in-orbit proven platform provides a very suitable and cost-effective solution for accurate, high-resolution Earth observation. Key advantages are the modular and flexible configuration, a highly accurate attitude control system and a high-rate payload data processing chain including on-board storage and downlink capability.

The EnMAP payload, the Hyper Spectral Imager (HSI), is accommodated on top of the spacecraft bus in a manner to provide maximum thermal and structural decoupling. This accommodation supports the demanding stability and thermal requirements of the optical system and enables parallel assembly and integration of both payload and platforms.

Key figures of the EnMAP satellite bus are:
- Dry mass (approx.): 553 kg (incl. margin)
- Propellant mass: 59 kg
- Overall Volume Bus (approx.): 1.2 x 1.3 x 1.8 m³
- Solar Panel: body mounted, ~6.1 m², EOL 970 W @ 33.4V
- In-orbit storage: 512 Gbit (EoL)
- X-band downlink: 320 Mbit/s

In 2015 the EnMAP platform entered the integration phase at OHB System AG. After completion of mechanical assembly and OCS testing the platform was transferred to OHB’s “Optics and Science” center active Optiksysteme GmbH at the Oberpfaffenhofen site in May 2017 for further integration and, finally, the assembly with the optical payload.

The EnMAP Space Segment had successfully completed its Critical Design Review in October 2012 and is in its ongoing manufacturing, assembly, integration and test phase since then. Complementary, the EnMAP Ground Segment has finished its Delta Critical Design Review in July 2015.

Since Q2 2016 the IOU (Instrument Optical Unit) structure is under flight integration with the pre-assembled optical elements (mirrors and prisms) in the newly created ISO-5 OHB clean room, forming the EnMAP spectrometer. In parallel, the flight electronics units - in particular the two cameras (SWIR and VNIR) - are manufactured by the vendors, to be integrated and fine aligned in the IOU structure.
The German Aerospace Center (DLR) entrusted OHB System AG to develop the hyperspectral EnMAP (Environmental Monitoring and Analysis Program). The prime contract for the realization and launch of this technically challenging satellite covers the following mission aspects:

- Space Segment including the satellite bus as well as integration and test of the entire satellite.
- Development and manufacturing of the payload, the instrument-driven instrument.
- Procurement of the flight opportunity including launch support and properties, and the launch vehicle.

Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument Mass</td>
<td>360 kg</td>
</tr>
<tr>
<td>Data downlink rate</td>
<td>320 Mbps via X-Band</td>
</tr>
<tr>
<td>Data storage capacity</td>
<td>512 Gbit</td>
</tr>
<tr>
<td>Maximum ground coverage</td>
<td>5,000 km x 30 km per day</td>
</tr>
<tr>
<td>Life time</td>
<td>5 years</td>
</tr>
<tr>
<td>Repeat cycle</td>
<td>27 days</td>
</tr>
<tr>
<td>Inclination</td>
<td>98°</td>
</tr>
<tr>
<td>Altitude</td>
<td>642 km</td>
</tr>
<tr>
<td>Pointing feature</td>
<td>±30°</td>
</tr>
</tbody>
</table>

Fig. 1 shows EnMAP, characterized by high spectral and spatial resolution with a number of spectral bands compared to other multi- and hyperspectral systems. EnMAP enables the global retrieval of vegetation parameters with high spatial and spectral resolution with a simultaneously high resolution rate. It provides unique data which due to its outstanding parameter set is particularly suitable for monitoring similar satellite systems. The hyperspectral data of EnMAP not only provide new answers to current scientific problems, but also have a high potential for several future satellite applications.

EnMAP Data Sets

- Where and in what extent and rate is land degradation processes (deforestation, ground erosion, salinization, soil acidification and others) and land use (land cover changes) observed at local to global scale?
- How can land degradation be reduced or prevented in view of food security and environmental sustainability?
- What are the driving forces, anthropogenic and/or natural, for changes in land use (land cover and land use characteristics)?

Biodiversity and ecological stability

- What is the spatial pattern of species and diversity distributions from local to global scale?
- How are ecosystems changed over time by human activities and the effects on biodiversity?
- How are ecosystems processes and services being altered by human activities or natural causes and how can harmful consequences of ecosystem degradation be reduced or prevented?

Environmental and risk assessment

- Which areas are prone or susceptible to hazards such as floods, fires, and others?
- Which land use characteristics affect the vulnerability to hazards, which are the most important and which are the most severe?
- In case of a natural disaster, which areas are at what extent affected and how can this information be provided for short-term coordinated emergency response?

Land use and land cover changes and land surface processes

- What are the spatial patterns of changes in land use and land cover from local to global scale?
- How do human activities such as industry, mining, agriculture and others affect the natural resources?
- How can environmentally harmful impacts such as water pollution, land contamination, air pollution, waste and others be traced, monitored and managed in order to conserve and sustain natural resources?
- What impact do human activities such as industry, mining, agriculture and others have on natural resources?
- How can environmentally harmful impacts such as ground water sources and others be traced, monitored and managed in order to conserve and sustain natural resources?

Climate change impacts and countermeasures

- How does climate change affect state, composition and seasonal cycles of atmospheric and aquatic ecosystems?
- What measures can effectively combat climate change and how can these be implemented (e.g., reduced emissions from deforestation and forest degradation (REDD), carbon emissions inhibitors and etc)?

Water availability and quality

- Which areas are affected by water scarcity and water quality problems in a local to global and a seasonal to decadal scale?
- How do climate change and human activities such as intensive agricultural water demanding industries and high population density deplete water scarcity problems?
- How is land and coastal water quality affected by land use change, climate change, land use and coastal zone management and other factors?

Natural resources

- How can natural resources such as mineral deposits, energy resources (oil, gas, ground water sources and others) be explored, managed and sold in a sustainable way?
- What impact do human activities such as industry, mining, agriculture and others have on natural resources?
- How can environmentally harmful impacts such as air pollution, land contamination, air pollution, waste and others be traced, monitored and managed in order to conserve and sustain natural resources?