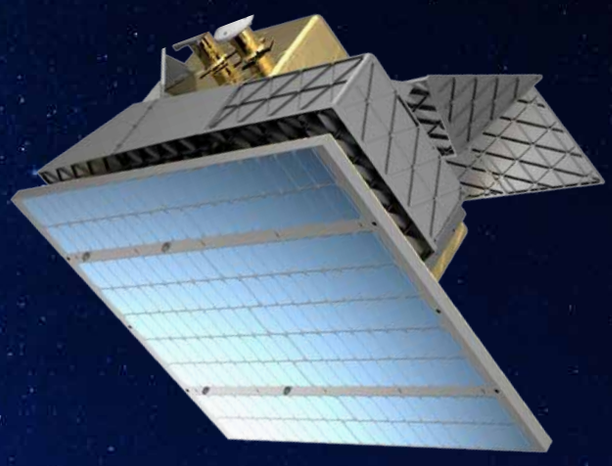
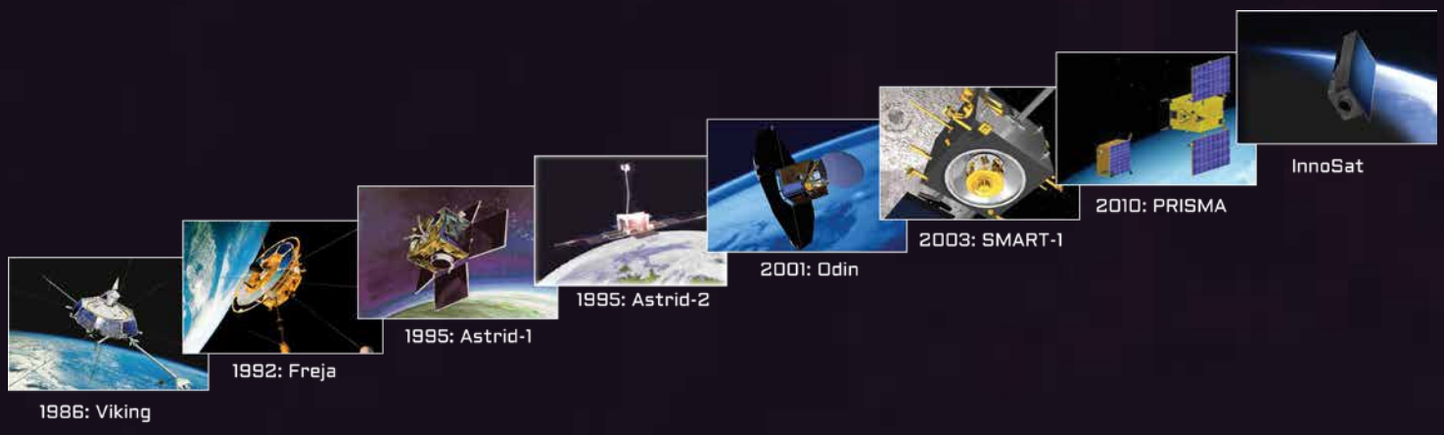
OHB
SWEDEN

OHB Sweden AB, a member of the OHB Group, is a provider of complete space missions as well as spacecraft subsystems. With more than 30 years of proven success from a wide range of space missions in low and geostationary orbit as well as spacecraft for interplanetary missions, OHB Sweden has acquired a first-class reputation offering reliable and innovative solutions to its customers. Building its success on the passion and exceptional talent of its employees and its extensive knowledge base, OHB Sweden stands strong to take on new innovative space missions together with its ever growing network of partners and customers.



CORE BUSINESS AREAS:

- Space Mission Architecture and System Design
- Small Satellites
- Attitude and Orbit Control System
- Satellite Propulsion
- Checkout and Ground Control Systems
- Space Software



Real photo from space of Tango, taken by PRISMA´s mother ship Mango.

SMALL SATELLITES
EXPERIENCED SMALL SATELLITE PRIME

OHB Sweden has a strong heritage in providing first class small satellite missions for science and technology:

- The **Viking** and **Freja** magnetospheric research missions pioneered the use of small satellites for advanced science projects in the 80th and early 90th.
- The **Astrid** missions showed already in the 1990th that miniaturized microsatellites are useful tools for low cost space science. **Astrid-1** – Sweden's first microsatellite – performed auroral spectroscopy and imaging while **Astrid-2** explored electric and magnetic fields in the upper ionosphere.
- The **Odin** satellite has a dual astronomic and atmospheric research mission. It was developed for the Swedish National Space Board and the space agencies of Canada, Finland and France and was launched in February 2001, Odin still today delivers very useful data on the atmospheric chemistry.
- **SMART-1** was Europe's first Moon probe, developed by OHB Sweden on behalf of the European Space Agency - ESA. Launched 2003, the mission successfully demonstrated the use of Electric Propulsion for deep space applications. The satellite performed first class lunar exploration during two years until the spacecraft impacted the moon surface in 2006.
- The **PRISMA** two-satellite technology mission launched 2010 successfully demonstrated Rendezvous and Formation Flying in space using an advanced set of novel sensor and propulsion technologies.
- Currently in development the **MATS** atmospheric research satellite is the first mission using the innovative InnoSat satellite platform. Innosat is designed to provide high performance for a wide range of different mission types, while maintaining a low price.

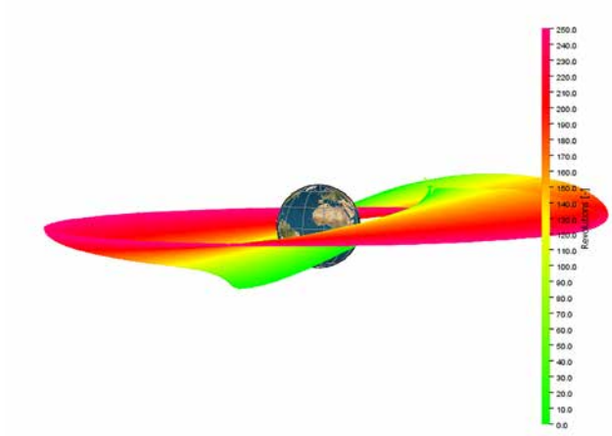
AOCS
– ATTITUDE AND ORBIT CONTROL SYSTEMS

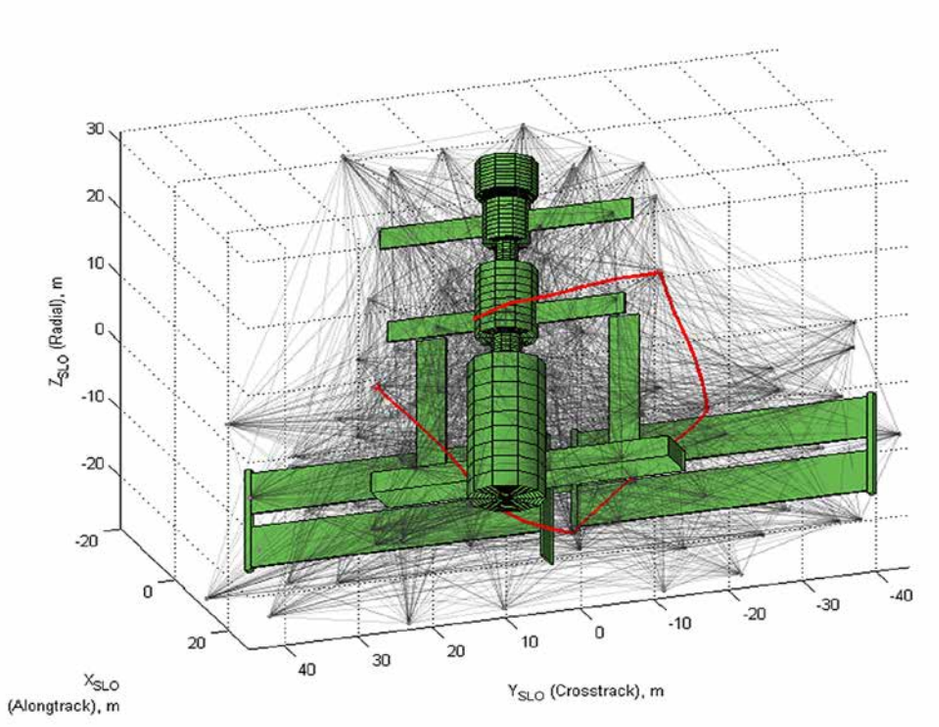
OHB Sweden develops Attitude and Orbit Control Systems for all types of space projects ranging from large telecommunication platforms, innovative technology demonstrators and scientific missions to small low-cost satellite solutions.

OHB Sweden offers world-leading technological and innovative capabilities within AOCS and GNC, and has extensive experience from developing systems for:

- low-cost and high-performance 3-axis stabilized pointing
- guidance, navigation and control for formation flying and rendezvous
- interplanetary science
- telecom platforms
- weak thrust orbit control systems

OHB Sweden has experience from all aspects of AOCS development including early feasibility studies and mission analysis, preliminary and detailed design, sensor and actuator procurement, software development and verification, assembly, integration and test, and flight operations.





EP motor PPS-1350 during hot firing test on integrated SMART-1 spacecraft.

A LEADING PROPULSION SUPPLIER

OHB Sweden is one of Europe's leading propulsion suppliers. Our knowledge and experience cover the complete range of different propulsion technologies; from cold gas to electric propulsion encompassing monopropellant or bipropellant chemical propulsion. We are addressing all project phases from the very early mission design phase through manufacturing, integration and operations, to end of life passivation.

OHB Sweden has worked on demanding and innovative national and ESA systems, such as the highly efficient propulsion technology for SMART-1 Moon mission, the bipropellant propulsion system for SoLO, the accurate cold gas system for Euclid and the innovative implementation of Hall Effect thrusters on GEO telecom satellites Hispasat AG1 and Electra.

Our advanced electric propulsion subsystem providing both the orbit transfer and station-keeping abilities, resulting in a significant mass saving and consequently larger payload mass, are optimized by constant interactions with our mission analysis and AOCS colleagues. The capabilities allows OHB-Sweden to also deliver to top demanding human flights customers, for example integrating the Orion Propulsion Qualification Module where a variety of material, diameters and integration constraints are met.

Assembly of propulsion subsystem on jig in OHB Sweden facility

INNOSAT – THE NEW SWEDISH MICROSATELLITE PLATFORM

COLLABORATION BETWEEN OHB SWEDEN & ÅAC-CLYDE.

The InnoSat platform is the result of collaboration between OHB Sweden and ÅAC-Clyde. It is a new microsatellite platform aiming to address the needs of customers with high requirements on performance at an affordable cost. The InnoSat platform is developed and marketed as a collaborative effort between OHB Sweden and ÅAC-Clyde. OHB Sweden is the overall satellite and mission prime, and ÅAC - Clyde provides key subsystems and equipment.

INNOSAT PLATFORM

InnoSat is a new, highly integrated, capable satellite platform intended for a wide range of applications such as earth observation, telecom and scientific research. It is designed to provide high performance in pointing, power and data downlink.

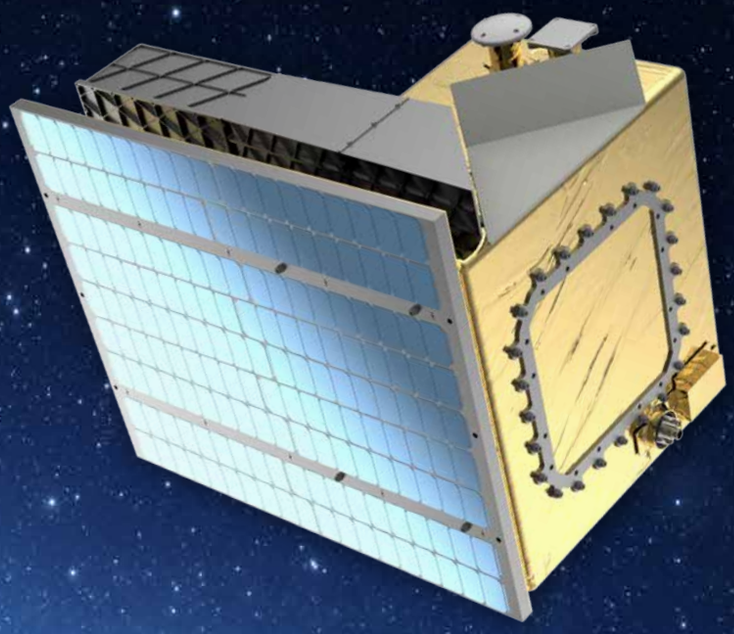
The platform is designed to interface with multiple types of payloads and can easily be tailored to the customers' requirements. The platform is ready for the market with the first mission in preparation.

MATS MISSION

The first mission using the InnoSat platform is the atmospheric research project MATS (Mesospheric Airglow/Aerosol Tomography and Spectroscopy) for the Swedish National Space Board, currently in development.

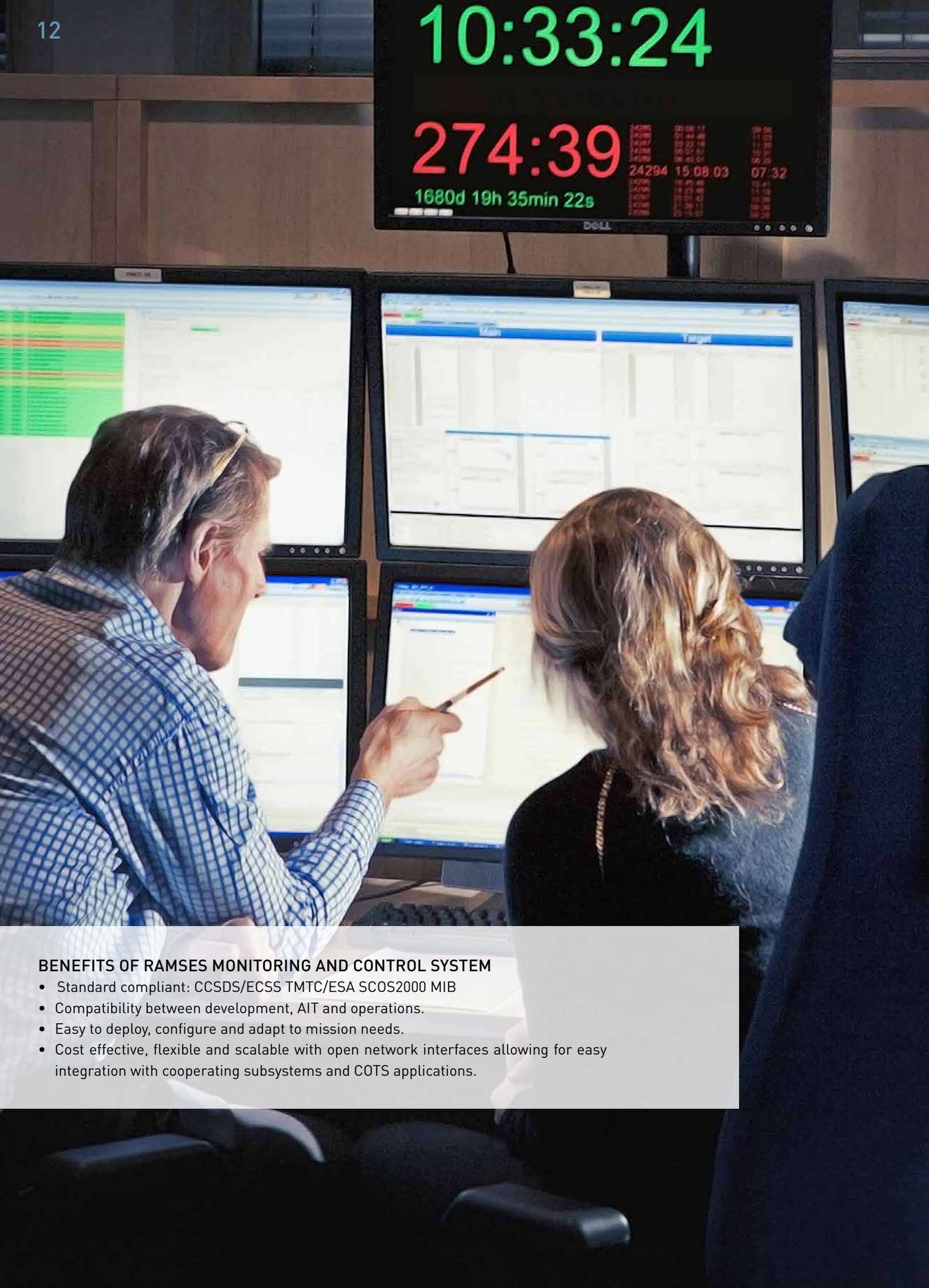
INNOSAT MAIN FEATURES

- Highly Integrated platform for Earth Observation, Telecom and Science
- Designed to easily interface with a variety of payloads, ICD readily available
- Large unobstructed payload accommodation volume providing maximum operational envelope
- Designed to fit within a piggyback launch envelope maximizing launch opportunities
- 3-axis stabilized platform with star tracker and reaction wheels
- Accurate orbit determination time correlation through on-board GNSS equipment
- Fault Tolerant COTS approach with optimal balance of cost versus reliability
- New generation of radiation tolerant avionics and data handling subsystems
- Fully qualified and flight proven equipment providing a strong basis for a reliable solution
- High power and data downlink capabilities optimized for science missions
- CCSDS Compliant communications for compatibility with ESA ground network



INNOSAT KEY PERFORMANCE

Spacecraft mass	<55 kg
Platform mass	25 kg
Size	70x65x85 cm
Max payload mass	Up to 25 kg
Max payload power	38 W (orbit average, 06:00/18:00 LTAN SSO), extendable up to 120 W if required
Design lifetime	5 years
Downlink bitrate (S-band)	Up to 6250 kbps (depending on ground station)
Downlink bitrate (X-band) (optional)	10-50 Mbps (depending on Ground Station).
Pointing performance requirements	Max 0.02 deg absolute pointing error Max 0.01 deg pointing knowledge error (reconstructed)
Orbit determination	< 10m accuracy (on-board GPS)



BENEFITS OF RAMSES MONITORING AND CONTROL SYSTEM

- Standard compliant: CCSDS/ECSS TMTC/ESA SCOS2000 MIB
- Compatibility between development, AIT and operations.
- Easy to deploy, configure and adapt to mission needs.
- Cost effective, flexible and scalable with open network interfaces allowing for easy integration with cooperating subsystems and COTS applications.

GROUND SEGMENT
- SPACECRAFT MONITORING AND CONTROL

For the last 30 years, OHB Sweden has built its own applications for monitoring and control of different space projects. RAMSES (Rocket and Multi-Satellite EMCS Software) is a general monitoring and control system, developed by OHB Sweden, which includes the core functionality of a mission control system while offering great advantages compared to other control systems available on the market. The system can be applied to both satellite and sounding rocket missions and is designed to be used during all the phases of a space project, (development, integration, validation, and operation), thereby significantly decreasing project costs.

RAMSES has been successfully used throughout project lifetime in several missions, such as Prisma (two-satellite formation flying), InnoSat/MATS (Swedish science) and a number of Sounding Rockets missions.

INTERPLANETARY MISSIONS
-TO THE MOON AND BEYOND

To "boldly go where no man has gone before" has always been an alluring concept for mankind, whether on earth or beyond. There are more stars in the Universe than there are grains of sand on Earth and billions of these stars are believed to have one or more planets in a zone that's not too hot, neither too cold, to be able to contain life.

To go to other stars with today's technology is not feasible. It would take us around 18 000 years to get to the nearest planet outside our solar system, Proxima b, which orbits our closest star Proxima Centauri, 4.3 light years away. So until we overcome those technical limitations we are confined to our own solar system and its vicinity. Luckily, within that realm there are still many things to explore. The moon, the solar system planets and the asteroids are still surrounded by enough mysteries and unknowns to be worthy of explorations, for us to learn from and better understand the universe. OHB Sweden is a pioneer in exploring the solar system. The lunar probe SMART-1, designed and developed by OHB Sweden, was launched in 2003 and is still today the only major European spacecraft that has reached the moon and even stranded on the lunar surface. Electric propulsion which is one of our specialties is a key technology for going far out in the universe. The Solar Orbiter that will go closer to the sun than ever before carries important OHB Sweden technologies. Many other mission to the moon, to Mars and to asteroids are now in preparation. OHB Sweden intends to join the ride into the unknown.

FACILITIES

OHB Sweden is located in Kista, just north of Stockholm. The state-of-the-art lab and cleanroom facilities allow OHB Sweden to work efficiently and with a high quality level, with a practical layout of the development, process and manufacturing area, including cleanroom facilitates specialized for propulsion manufacturing, including handling of large telecom satellites. All parts of the facility are approved in accordance with ISO class 8, and upgradeable to class 5.

CAREERS
– WORK WITH SPACE

The vastness of space and its secrets has always fascinated us. Mankind has always wondered what is out there and searched for answers. Still there are so many things we haven't figured out, and we may never know them all. But we keep on trying and we would like to have you onboard for the challenge.

OHB Sweden is a very stimulating workplace. As we are part of the major European OHB space company group there are possibilities to work with the latest space technology, also internationally. We have a close cooperation with the European Space Agency (ESA) and with most major space companies in Europe. The work is very diverse and makes you constantly hone your skills and develop new ones.

We pride ourselves of being an exceptional team with a strong team spirit. Our staff is covering a broad range of skills and qualifications but we all share a strong passion for using space to increasing the knowledge of our own earth, our closest space surroundings and beyond. We hope that you feel the same and would like to join our team!

CORPORATE IN BRIEF

- OHB Sweden AB is a member of the OHB SE, a leading European space company group with headquarter in Germany.
- The OHB Sweden office and facility in Kista, Stockholm, is home to 70+ highly qualified engineers with experience from numerous successful space missions, including 9 satellites in the prime role.
- OHB Sweden develops, builds, tests and operates satellites and subsystems for all kinds of space missions.
- OHB Sweden is proud of its ability to create complete space missions together with end users.
- OHB Sweden customer base is space agencies and many leading international space companies.

Cover: Real picture from space of Tango, taken by PRISMA´s mother ship Mango.

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