Rovsing A/S

The chritical docking operation

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The docking and de-docking activities are the most critical operations of the ATV mission. The actual docking will be fully automatic and the 20 tonne spacecraft could severely damage the ISS if control were lost during these manoeuvres.

The on-board Fault Tolerant Computer (FTC) controls the navigation and the manoeuvres. The FTC is designed with three computers that control each other during the flight. The computers are pre-programmed to shut down if severe failures occur during critical manoeuvres.

In case the FTC shuts down or ceases to provide output (crashes), the Monitoring and Safing Function (MSU) takes over. This unit is continuously monitoring the position and attitude of the ATV and comparing it to a pre-programmed set of data. If it detects a potentially dangerous situation, it immediately takes control over the vehicle and activates thrusters that will bring the ATV at a safe distance of the ISS and to an attitude that ensures the provision of sufficient power from the solar panels for survival.

The Monitoring and Safing Function is designed with two identical Monitoring and Safing Units (MSU). The two MSU computers will take over from each other at any moment in case one of them should fail.

The crew of the ISS or the ATV Control Centre may also trigger the pre-programmed sequence of Collision Avoidance Manoeuvres (CAM).

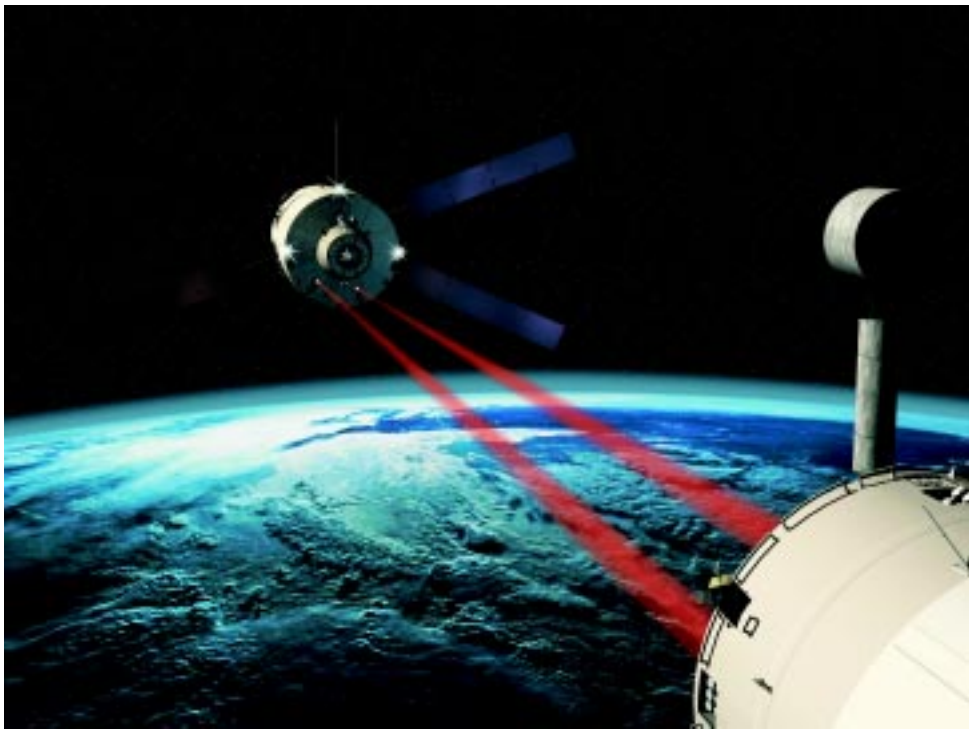
The operations of both the FTC and the MSU are fully dependent on the reliable operation of the software.

It is therefore obvious that there is great concern that this software will operate such as to keep the ATV in a safe position. To this end, ROVSING A/S has been assigned the task of providing an independent evaluation of the software in terms of robustness and safety.

This is not an easy task. It begins already when the FTC and MSU software has been specified. The Technical Specification is analysed for requirements that could possibly be the root of a malfunction. The analysis continues throughout the development life cycle based on design documents and the source code and concludes with a comprehensive test where the software is subjected to virtually all the 'stressing' effects that could possibly occur in abnormal situations. The point is that the software should behave in the best possible way such as to minimise consequences of failures. Such behaviour is referred to as 'Graceful Degradation' and 'Failure Containment'.

ROVSING has built a facility for the testing of the software, which allows running the software on the same hardware as used on-board the ATV, while allowing for all kinds of failure injection.

As it is not possible, for cost and schedule reasons, to make available for ROVSING all the relevant ATV equipment, so therefore software has to be developed for the simulation of this environment. The simulators are designed according to the specifications of the environment (the Architectural Design Documents and the Interface Control Documents), thus providing a further verification that the software is consistent with the key documents.



The Automatic Transfer Vehicle (ATV) during docking with the international Space Station
Figure: ESA

Swedish chair for ESA Council.

Per Tegnér, currently Director General of the Swedish National Space Board, is the new Chairman of the ESA Council for the next two years.

Per Tegnér, born on 22 April 1944, holds a Master in Economics and worked for more than 25 years for the Swedish Ministry of Industry. In 1998 he was appointed Director General of the Swedish National Space Board and has been the Head of the Swedish delegation to ESA since then.

Swedish computers in Herschel and Planck but for all that to implement cutbacks in Gothenburg.

Saab Ericsson Space has agreed on terms to become a major supplier of computer equipment for the two new European large scientific satellites, Herschel and Planck. The order value is in the order of 16 million Euros.

Saab Ericsson Space will design and produce computer equipment that keeps track on satellite status and via telecommand controls the satellites. Also the satellite positioning and orientation in orbit is controlled using Saab Ericsson Space computer equipment. The highly reliable computer systems that will be produced will be built around the European ERC-32 processors, operating at 20 MHz clock frequency.

The equipment to be built represents the latest available technology in space applications, including several Application Specific Integrated Circuits (ASIC's) to reduce weight, volume and power consumption of the equipment. The Software of the systems will be a co-operative effort with the customer where Saab Ericsson Space will focus on the Operation System Software and parts controlling the company's hardware.

The undertaking will engage a team of company engineers for three years and will result in flight equipment deliveries mid 2004 and will also result in spare units to be flown on a future, still to be defined mission.

The Herschel mission is intended to find answers to questions on how stars and galaxies are born through the use of infrared astronomy while the Planck mission will try to answer questions related to how the universe was formed and what size it may have and how old it is.

Despite the new contracts Saab Ericsson Space is giving notice to 60 employees at its Gothenburg plant. The measures being taken now are the result of a decreasing international telecommunications market and a shrinking Swedish space budget.

Saab Ericsson Space has operations in Gothenburg, Linköping and Austria, employing a total of 680 personnel. There are 490 employees in Gothenburg and the notice applies especially to those involved in international telecommunications projects and state-financed space projects in all service categories and product areas.

"Significantly fewer telecommunications satellites were procured in 2001 than in previous years. This trend seems to be holding in 2002 and we believe there will be a recovery at the earliest by next year. Since an increasing part of our activity has been focused on telecommunications satellites, this has a direct effect on the company. At the same time there has been a reduction in Sweden's participation in areas of the European space project that is relevant for us. The measures that we are now taking are a necessary adaptation to prevailing market conditions and they are essential in order for the company to continue to be competitive and profitable in the long term," says Bengt Mörtberg, CEO for Saab Ericsson Space.

Kongsberg participating in developing better rocket engines.

Kongsberg Defence & Aerospace AS (KDA) has signed a contract valued at MECU 4.5 with the French company Snecma Moteurs, for the development of mechanisms to unfold the exhaust nozzles on a whole new type of engine for the European carrier rocket, the Ariane 5.

The new engine, which will be fuelled by liquid hydrogen/oxygen, is part of a development programme designed to enable Ariane 5 to carry larger payloads and more satellites at each launch.

KDA's development contract runs until 2005, when serial production is scheduled to begin. The development contract will be followed by series production for the Ariane 5, entailing contracts worth a potential MECU 25.

Finnish instruments to the Moon.

SMART-1, ESA's moon probe will carry two Finnish measuring devices in his payload. For the first an X-ray spectrometer called XSM, which has been designed by the High Energy Astrophysics research group at the Observatory of the University of Helsinki and constructed in Finland. In addition, the Observatory has greatly contributed to the scientific programme on the AMIE micro imager. The second is a device called SPEDE, fabricated by the Finnish Meteorological Institute for measuring the emissions of the ion engine of the lunar probe. The detection devices of SMART-1 are small and progressive, and its computers can steer the spacecraft almost without assistance from the Earth Station. Its main engine is an ion engine, which science films have made familiar to us.
The aim of the first European lunar probe is not only to explore the Moon but also to test many new solutions related to space technology. Finns delivered the instruments they had developed for the probe to ESA at the beginning of June.