



technology transfer programme

## → DOWN TO EARTH

How space technology  
improves our lives



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# INTRODUCTION

Innovation is not always the invention of a brand-new or revolutionary technology. The most efficient innovations actually stem from using existing technologies for purposes unrelated to their original applications. This principle is referred to as 'technology transfer'. Technology transfer is especially effective in the space field, where technologies have to be developed to very high standards, so that they are failure-proof, reliable and durable. This is why space technology is not only travelling around Mars, but also orbits our daily lives – without us even noticing.

ESA's Technology Transfer Programme (TTP) ensures that European industry and citizens benefit from Europe's most advanced space technology developments.

This publication presents a selection of the latest space technology transfers assisted by ESA's TTP and gives an insight into the different ways space technology is supporting us today.

Space not only spawns the world's most innovative and most intricate technologies, but also the most thoroughly tested and thus the safest. Many of those technologies have found their way back to Earth – space technology touches virtually every aspect of our everyday life. From intelligent textiles to car safety, from medical innovations to novel engineering solutions, from gaming technology to high-tech environmental-control systems, we are surrounded by technology that originated in the space sector and is now generating profits for businesses in a multitude of other markets.

## → SATELLITE TECHNIQUES TO MONITOR OFFSHORE OIL AND GAS FIELDS

Technology developed by ESA to monitor and control satellites such as Envisat, with its more than 20 000 parameters, is now being used in a new system offering improved remote monitoring of offshore oil and gas rigs.

“Our Remote Intuitive Visual Operations (RIVOPS) system is based on years of experience at ESA in the monitoring of satellites and handling out-of-limit situations. By combining the monitored parameters into clusters and applying a series of filtering algorithms, it is possible to build a clean graphical representation of the alarm situation. This intuitive visualisation technique has been accepted in control rooms as part of a new methodology for fast decision-making,” says Alexandre Van Damme from the French–Dutch start-up company EATOPS.



Satellite techniques to monitor offshore oil and gas fields [EATOPS]

“The operator can, within a few seconds, identify where alarms originate and, more importantly, how they are related to each other. RIVOPS is a system designed to maintain a continuous, secure overview of large installations such as those in oil and gas fields,” says Van Damme.

Van Damme is the co-inventor of the RIVOPS system, which is essentially an extra console providing an intelligent overview of the alarm situation in large oil and gas installations. It has been developed in ESA’s Business Incubation Centre at ESTEC, in the Netherlands, with support from ESA’s flight controllers, as well as expertise from the North Sea offshore oil and gas control centres at Den Haag and Den Helder, in the Netherlands, and at Stavanger, in Norway.

### Space technology enhances safety

“RIVOPS is basically an enhanced alarm-monitoring system that sits on the top of the conventional distributed control systems used by offshore oil and gas exploration companies. The groups of alarms are visualised on simplified 3D representations of the rigs, giving the operators a clear understanding of the emergency scenario,” explains Van Damme.

“The system does not interfere with the monitoring of the offshore installations. It adds functionality to the existing systems, which helps the oil and gas rig operators to identify problems and alarms faster and therefore increases safety.” At ESA, the concept of grouping parameters into major clusters that then are monitored has been developed and refined during years of satellite control. This has made it possible for relatively few operators to monitor a large number of parameters continuously. For Envisat, Europe’s largest satellite, the operators have to monitor more than 20 000 parameters continuously, which is comparable to the situation of a larger offshore oil and gas installation.



RIVOPS is a monitoring and graphical user interface system that provides an intelligent overview of a large number of oil & gas installations in operations [EATOPS]

### Novel 3D displays for improved overview

“Another innovative technology we use in the RIVOPS system, when compared with many conventional industrial monitoring systems, is the use of a 3D representation to display the status of all parameters. Again, this was developed for satellite control, to improve visibility and give a rapid overview. We have transferred this methodology and its technology to our RIVOPS system and enhanced it with a whole range of specific features designed specifically for offshore oil and gas rigs,” adds Van Damme.

The RIVOPS system is already under evaluation for several North Sea installations in Norwegian and Dutch waters. Van Damme foresees that the RIVOPS system could provide additional safety for explorations planned for Arctic areas, where the fragile polar ecosystem, in combination with extremely harsh conditions, calls for extra-careful monitoring. “A consortium of Russia’s Gazprom, Norway’s StatoilHydro and France’s Total has started a project to explore the Shtokman gas field in the Barents Sea, which has recoverable reserves of 3800 billion cubic metres – making it one of the world’s biggest gas fields. Located 600 km north of the Kola Peninsula, icebergs, 27 m waves and temperatures down to  $-50^{\circ}\text{C}$  place extreme requirements on the technology and systems needed to safely extract the gas and transport it to the shores of Europe, Russia and North America. For such installations, our RIVOPS system could provide extra safety,” says Van Damme, who plans to discuss with the consortium the possibility of using his space-technology-based RIVOPS system for the Shtokman project.



Engineers working on console [EATOPS]

### Spin-off through ESA’s Business Incubation Centre

“This is an excellent example of how space technology can benefit society. EATOPS has based their system on a well-proven technology we use at ESA to monitor all our satellites. Located at our Business Incubation Centre here in ESTEC, Van Damme has been able to accelerate the spin-off to the offshore business. Our specialists in satellite monitoring have helped him with transferring the best and most well-proven functionality from our applications,” says Frank M. Salzgeber, Head of ESA’s Technology Transfer Programme Office.