



## **Bringing the coldness of space to the Sahara**

8 January 2003

Paris, 03 Jan 2003

Cooling is key in the Sahara Desert, especially when you're in the middle of it, trying to win a race.

Cooling technology developed by ESA for space is helping one of the teams in this year's '2003 Dakar Rally,' commonly known as the Paris-Dakar Rally.

The 25th series of this famous rally started 1 January from Marseille, France, when 342 contestants gunned their engines and commenced 19 days of the gruelling endurance race through France and Spain before entering the Sahara and racing across North Africa.

This year's route has been altered by an ugly geopolitical reality. Instead of finishing in Senegal's capital, Dakar, in West Africa, the cars, trucks and motorcycles will bypass the war-torn countries of Mali and Mauritania and travel east through Tunisia and Libya. They will cross the finish line on 19 January in Sharm El Sheikh in Egypt on the Red Sea coast after travelling 8 552 km.

One of the teams in the race will be using ESA-developed space technologies to, literally, stay cool, in one of the hottest places on Earth where temperatures can reach as high as 58 degrees C. ESA is contributing several of its space cooling technologies to assist the Pescarola team, headed by racing veteran and four-time Le Mans champion Henri Pescarolo. Participating in his 14th Paris-Dakar rally, Pescarolo is driving a modified 255-HP, V6 Nissan Terrano bearing the ESA logo. He and his team will even eat like astronauts.

"We have pulled together several technologies, which will help the Pescarolo team during the Paris-Dakar race this year," says Pierre Brisson, Head of ESA's Technology Transfer and Promotion Office.

If all works as planned, the team will feel some of the coldness of space during their time in the desert.

### **Exhaust cooling from Ariane**

A special thermal screen using technology developed for the European launch vehicle Ariane provides highly advanced protection and thermal insulation on the Pescarolo car.

The thermal screen is fixed below the car around the exhaust manifold. It reduces the temperature of the exhaust pipe to 100 degrees C, which otherwise would reach 800 degrees C. Thanks to the thermal screen, the team enjoys a significant safety boost with the decreased risk of fire in case of oil or

gasoline leaks. In addition, the temperature inside the car is decreased significantly, adding to the drivers' comfort and lessening their fatigue.

#### Drivers' helmets with innovative cooling system

An Italian company, Grado Zero Espace from Sovigliana, near Florence, is providing a cooling system for the drivers' helmets incorporating several ESA space technologies.

The cooling system uses solid-state Peltier elements to 'pump' the heat out from the inner side of the helmet and a circulating fluid system to transport the heat away to a special heat 'sink', where the heat is absorbed. The millimetre-thin, solid-state Peltier elements use electricity to produce the cooling effect without any moving parts.

The system combines two space technologies already applied in non-space applications. The Spanish company NTE (Nuevas Tecnologías Espaciales) from Lliçà d'Amunt, near Barcelona, has adapted the Peltier elements in thermal-regulated clothing. A Canadian space firm, Med-Eng in Ottawa, has produced the cooling circuit for a special suit developed by Grado Zero Espace for the McLaren Formula 1 team.

#### Mediaeval cooling boosted by space calculations

Drinks are being served in a completely new type of self-cooling container that may revolutionize the world of beverages over the coming years.

Used for centuries, the principle of using evaporated water to cool the contents of terra cotta jugs and goatskins, is being applied by a French company, ThermaGen, which has developed a self-cooling container that lowers any beverage by 15 degrees C within minutes. It works by evaporating one centilitre of water using the cooling properties of the terra cotta clay. The performance has been boosted for this race to over 20 degrees C cooling to meet the extreme desert conditions.

Where does space fit into this? The use of special advanced numerical simulation techniques developed for ESA for satellite mission calculations made it possible for ThermaGen to calculate precisely the behaviours of the complex physical phenomena creating the cooling effect and to design the self-cooling container.

The rally will be the first test in a series before this innovation is ready for general use by sportsmen and people travelling in hot and isolated areas.

#### 'Space food' for the crew

Originally developed for the French-Russian Cassiopeia mission in 1996, special space menus have enabled Russian European and American astronauts to savour southern French cuisine, far from their native tables.

The 'space food' has to pass extremely severe qualifying tests to be authorised as astronauts' food, including bacteriological quality control and flight-certified packaging. Lycée Hôtelier de Souillac, a leading French culinary institute located outside Toulouse, developed in partnership with the French space agency (CNES) a special space menu that fulfils all the stringent requirements for space, yet maintains the famous French gourmet standard. This 'haut cuisine' is highly appreciated by space consumers, and greatly contributes to the morale and good mood on the International Space Station.

Catering with these menus for the 2003 Dakar Rally proves that it is possible to enjoy good food even in the harshest of conditions.

### Space technology improving daily life on Earth

The European space industry has built up an impressive portfolio of technologies and know-how. Since 1991, ESA's Technology Transfer Programme has promoted the use of these technologies outside space systems. This has <http://www.timeshighereducation.co.uk/story.asp?storyCode=173914&sectioncode=26> provided many innovative solutions for non-space products and services that today improve our daily lives.

"Our programme validates the technology developed in the European space programmes. More than 150 ESA space technologies are today improving life on Earth. In addition the use of these space technologies in non-space areas opens new markets, increases European businesses competitiveness and is a new sources of income," emphasizes Brisson.

There is work to be done before the advanced space technologies find their way to non-space systems on Earth. They must be evaluated, adapted to the specific use on Earth, and tested for duration and performance.

Testing systems incorporating these new technologies in extreme races like Paris-Dakar and Le Mans have always been a good way to verify if a new system is valuable in everyday automobiles.

"If a space technology proves its worth in these tough races, it has a future in everyone's car," Brisson added.

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