Safran’s HRG Crystal™ and Onyx™: a revolution in high-performance naval inertial reference systems

Safran Electronics & Defense is a pioneer in inertial navigation. The HRG Crystal™ hemispherical resonator gyro, patented by Safran, was developed in recent years, and more than 15,000 HRG type gyros have been delivered to date. The HRG Crystal™ offers the highest performance in its market segment.

Because of its simple design and mature technologies, the HRG Crystal™ allows Safran to develop new inertial navigation systems featuring ultra-high reliability for both civil and military applications, and offering a wide choice of performance specifications.

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The HRG Crystal™ gyro is based on the principles behind Foucault's pendulum and resonance; it could be compared to making a crystal wine glass "sing". The slight deformation of the glass generates a wave, and detecting the position of the wave allows measuring its rotation. The HRG Crystal™ does not need to communicate externally to determine its position, which makes it fully independent and undetectable.

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The HRG Crystal™ is a hemispherical resonator gyro. It comprises a small number of parts in a silica half-shell, made of extremely pure glass and called a "resonator". It offers a virtually unlimited lifetime, a robust design that stands up to even the most extreme environments and a very high reliability (with mean time between failures exceeding 1 million hours) allowing a low total cost of ownership. What makes HRG Crystal™ a unique gyroscope is that it addresses standard to very high performances keeping the exact same size.

Safran has also developed an innovative inertial navigation module, the Onyx™, based on the HRG Crystal™ gyro. Safran’s inertial navigation systems, whether civil or military, for land vehicles or ships, are now based on these Onyx™ inertial navigation core, which feature ITAR Free technologies and a modular design.