**NAVIGATION.** With the development of an inertial navigation system for the Airbus A400M military transport aircraft that also meets civil aviation requirements, Sagem Défense Sécurité has reached a turning point in its drive to join the small circle of companies active in this sector.

# INERTIAL NAVIGATION: MEETING MILITARY AND CIVIL STANDARDS

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The GPS Air Data and Inertial Reference System for the A400M military airlifter will also be certified to civil aviation standards.



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Sagem Défense Sécurité (a Safran Group company) is embarking on a new stage of its history with GADIRS. The GPS Air Data and Inertial Reference System, an ultra-high-performance inertial navigation system, will be fitted to the Airbus A400M military airlifter, but it will also conform to civil aviation standards. Fabrice Delhaye, sales director of the Navigation department, confirms that the objective for Sagem Défense Sécurité is to gain access to new markets: "GADIRS is just a first step. In the near future we are going to introduce hemispherical resonating gyros in civil aviation. This is a revolutionary technology that doubles the reliability of inertial units. It is also 'ITAR Free', meaning that it can be exported without needing special authorization from the US government. This system would immediately allow us to join what are still the only other suppliers of civil aircraft navigation equipment, Honeywell and Northrop Grumman (formerly Litton)."

## Unequaled flight safety

This hybrid navigation system, combining inertial guidance with secure (anti-compromise) military GPS, ensures that the aircraft flies along a virtual corridor 30 to 40 meters in radius, and will continue to do so in the event of an internal failure (electronic breakdown) or an external failure (GPS network). "It's a system that guarantees an exceptional level of integrity," explains Hervé Blanc, director of Navigation programs. The secret lies in the expertise of Sagem Défense Sécurité's engineers, who have perfected integrity algorithms able to detect low-frequency or long-term drift. Because they are particularly difficult to quantify and detect, these errors are often excluded from the analysis. Current detection algorithms focus essentially on clear faults, ignoring the more subtle errors that often pass unnoticed when they develop very gradually. Faults like these can become dangerous when their detection is delayed. With GADIRS, these risks are substantially reduced.

## A wide range of missions

Such is the integrity of the system that aircraft can undertake low-altitude flights with a high level of safety, even over steep terrain. Landing at the bottom of a deep valley is no longer a high-risk undertaking. GADIRS also makes instrument approaches safer, even at night and in difficult weather conditions, or when landing on very basic, unprepared airstrips. The A400M will thus be capable of a wider range of missions, from military resupply to humanitarian rescue operations. "This makes it possible to conduct operations anywhere, in almost any weather and at night," emphasizes Fabrice Delhaye.

Sagem Défense Sécurité, which already had the necessary experience and skills, took just a few months to bring together a multidisciplinary team of 150 experts to develop GADIRS. They were already well accustomed to military requirements, but had to go a step further to accommodate the demands of Development Assurance Level A (DALA), needed for civil certification. The team was able to successfully design this system, drawing on proven expertise in inertial systems and the methodologies needed for the development of critical systems.

**G. SEQUEIRA-MARTINS**

### THE A400M, A NEW-GENERATION MILITARY AIRLIFTER

In 2003, seven European countries launched the design of this new military cargo aircraft, built by Airbus Military as prime contractor. The A400M will have a range of 4,540 kilometers (2,450 nautical miles) carrying a 30 metric ton payload, or 6,575 kilometers (3,550 nautical miles) with a 20 metric ton payload. Cruising at 36,000ft and 460 mph (about 400 knots), its performance will equal that of jet cargo aircraft. But its true strength is that it will retain the ability – essential in tactical military aircraft – to operate from rough fields and airstrips. The first flight is scheduled for 2008 and delivery of the first production units for 2009. Each aircraft will be fitted with three Sagem Défense Sécurité inertial guidance systems. Numerous other Safran Group companies are involved in this program.

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