

Laseref VI Special Missions

Frequently Asked Questions

Q1: How does the Laseref "Special Missions" (SM) technology differ from conventional Laseref?

A: The original Laseref® (laser-based inertial reference system) was designed as an all-digital ring laser gyro based inertial reference system providing ARINC 429 and aircraft standard communication bus digital outputs. Over the years, Laseref has provided flawless service from more than 50,000 commercial inertial reference systems in service around the world.

Honeywell's most recent iteration, the sixth-generation Laseref VI micro inertial reference system (IRS), continues the steady evolution of this critical navigation system by simplifying pilot workload while dramatically reducing installation time, weight, size, power, and cost using the industry standard GG1320 digital gyro.

In brief, the **Laseref SM** is much more accurate than the traditional commercial marketplace Laseref VI. High-performance gyros enhance inertial navigation and hybrid GPS/IRS performance.

Q2: Who uses the Laseref SM?

A: Laseref VI SM is used by the FAA, U.S., and international governmental agencies utilizing commercial aircraft who need a near-military-grade level of performance for missions ranging from paramilitary and covert operations to high-performance flight inspections.

Q3: What are the system components?

A: The Laseref VI micro inertial reference system contains the following components:

- HG2195BB micro IRU – a self-contained inertial reference unit that provides long range navigation using high-accuracy inertial sensors. Industry standard outputs are provided for flight management systems, primary displays, forward-looking infrared (FLIR) cameras, head-up displays, flight control, antenna stabilization (satcom, weather radar, direct broadcast satellite), EGPWS, and other critical aircraft systems.

When GPS inputs are applied, the IRU provides tightly coupled GPS/inertial hybrid outputs, initializes automatically, and performs alignment-in-motion.

- IM-950 Aircraft Personality Module – The memory module contains aircraft configuration data and mounting tray misalignment terms. The IRU can be removed and replaced without any realignment or reprogramming procedures.
- WG2001 Mounting Tray

Q4: What advanced features does the system provide?

A: Advanced features of the Laseref VI SM include:

- Integrated vertical acceleration output for integration with flight inspection equipment
- Electronic mounting tray alignment reduces installation cost and increases accuracy
- Greater than 25,000 demonstrated flight hours in-service reliability – highest in the industry
- Automatic mode control logic and automatic initialization for reduced crew workload and elimination of mode select unit
- Passive cooling eliminates the weight and cost of cooling fans and ARINC mounting trays
- Maximum integration of GPS creates hybridized GPS/inertial navigation with integrity protection, while still preserving pure inertial navigation

Q5: What are the GPS hybrid advantages of Laseref VI SM?

A: The advantages are as follows:

- **HIGH** integrity (**H**oneywell Inertial **G**NSS **H**ybrid) provides protection from GNSS-denied environments with integrity coasting which allows for 100 percent availability of RNP navigation at 0.1 nmi. This enables RNP 0.1 nmi approaches without the possibility of “Unable RNP” alerts and subsequent missed approach procedure requirements.
- Enhanced automatic realignment uses GPS to refine alignment between flights.
- Interrupted stationary alignment dispatch is a revolutionary new feature that takes advantage of GPS integration to seamlessly allow for inertial alignment in motion and even dispatch prior to navigation mode. This revolutionary feature eliminates delays while waiting for the IRS to gyro-compass align. Gyro-compassing continues in Align-In-Motion (AIM) after only one minute of stationary time from power-up. This preserves the heading alignment already completed and drastically cuts the AIM time to full performance navigation mode.
- 20 seconds following interrupted stationary alignment
 - AIM attitude mode performance
 - True and Magnetic heading become valid
 - Normal departure aircraft motion will provide the optimum dynamics to enter navigation mode within minutes

Q6: Why buy the Laseref SM?

A: There are three key reasons why organizations may desire the unique accuracy and performance characteristics of Laseref VI Special Missions technology.

1. The system has been designed for integration into flight inspection equipment used to ensure that instrument approaches are designed, implemented, validated, and maintained properly.
2. The system offers high-accuracy heading performance for surveillance and communication antenna pointing.
3. The Laseref VI SM offers high-performance positioning capabilities with or without Global Navigation Satellite System (GNSS) availability.

Q7: What additional new features does Laseref VI have?

A: Additional new Laseref VI Special Missions features include:

- Center-of-gravity and GPS antenna lever arm compensations
- Rapid dispatch in AIM (Align-in-Motion) for very quick dispatch
- 100 Hz attitude and 50 Hz heading parameter outputs
- Configurable output filter selections
- At-sea and moving platform leveling

Q8: What are the key performance characteristics of the system?

A: The key performances are as follows:

- **Attitude:** 0.05 degree 2σ (two sigma 95% accuracy) output at 100Hz
- **Heading:** 0.1 degree 2σ output at 50Hz
- **Position (inertial):** 0.8 NMPH CEP or 1.67 NMPH R95 (nautical miles per hour)
- **Position (hybrid):** Typically <18 Meters 2DRMS
- **Hybrid position coasting performance:** >20 minutes @ RNP 0.3 NM
- **Velocity (inertial):** 6 knots R95
- **Velocity (hybrid):** 0.25 knots R95
- **Cooling:** Passive
- **Accelerometer sensor technology:** Quartz
- **Gyro sensor technology:** GG 1320 digital ring laser
- **Interfaces:** ARINC 429 configurable inputs, high speed outputs

Q9: What are the physical characteristics of the system?

A: The physical characteristics are as follows:

- **Reliability:** 25,000 operating hours MTBF
- **Mounting tray:** 0.5 lbs
- **Volume:** <265 cubic inches (4.32 liters)
- **Outline:** 6.52" x 6.43" x 6.28"
- **Weight (typical):** < 9.0 lbs (4.1 kg)
- **Power (typical):** 20 watts

Q10: What certifications has the system achieved?

A: Laseref VI SM has earned the following certifications:

- **Software certification:** DO-178B Level A
- **Hardware certification:** DO-254 Level A
- **Environmental/EMC qualification:** DO-160G, now including typical helicopter environments (i.e., vibration for helicopters with unknown rotor frequencies, salt spray, sand and dust etc.)
- **Technical standard order (TSO and ETSO):** C3e, C4c, C5f, C6e, C196b

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