

# Multisensor Inertial Measurement Unit (MIMU)

For Navigation, Stabilization, Guidance and Control Applications

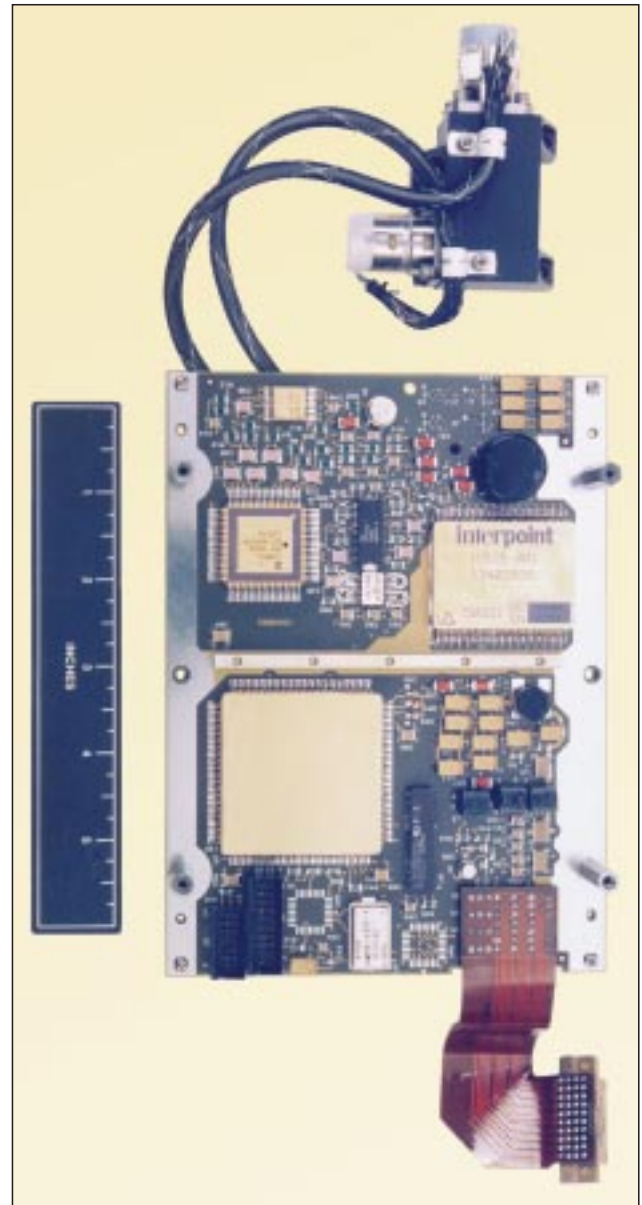
- ▶ Proven, Qualified, Flight Tested Technology
- ▶ Large Production Base
- ▶ Robust Environmental Capability
- ▶ 2 deg./hour and 0.6 mg Bias Stabilities
- ▶ Low Cost, Low Power, Light Weight, Small Size, Strapdown

## System Description

The MIMU provides fully compensated measurements of vehicle angular rates ( $\Delta\theta$ ) and linear accelerations ( $\Delta V$ ) which are suitable for stabilization, navigation, autopilot guidance and control.

The MIMU consists of a single card of support electronics (5.1 x 7.0 x 0.5 in, 0.65 lb) and a sensor block assembly (3.4 x 2.5 x 1.1 in, 0.5 lb) with a total running power of 13W. The electronics card can be remotely mounted from the sensor block for a distance of up to 20 feet. The inertial sensing elements are two Multisensor gyro-accelerometers, with their spin axes 90° to each other mounted on an integral sensor block. These sensors generate signals proportional to vehicle angular rates and linear accelerations including a redundant measurement of one axis of rate and one axis of acceleration. Redundant data are used for Built-In Test.

The Multisensor Gyro-Accelerometer outputs are pre-filtered, converted to digital format, and processed through the microprocessor. The data are then converted to suitable format for transmission via the I/O. Autopilot/stabilization data are transmitted at a 1800 Hz rate in both analog and digital format and inertial quality data are transmitted at a 100 Hz rate. Rates can be customized per



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**GEC-Marconi Hazeltine Corporation**  
**CNI Systems Division**

164 Totowa Road  
P.O. Box 975  
Wayne, New Jersey 07474-0975

Telephone: (973) 633-6000  
Facsimile: (973) 305-2468

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## Digital MIMU Performance Characteristics:

### Gyro:

- Bias .....  $\pm 2^\circ/\text{h}$  ( $1\sigma$ )
- g-Sensitivity .....  $\pm 2^\circ/\text{h/g}$  ( $1\sigma$ )
- g<sup>2</sup>-Sensitivity .....  $\pm .015^\circ/\text{h/g}^2$  ( $1\sigma$ )
- Scale Factor Accuracy .....  $\pm 350^\circ$  ppm ( $1\sigma$ )
- Alignment\* .....  $\pm 0.5$  mrad ( $1\sigma$ )
- Random Walk .....  $0.07^\circ/\sqrt{\text{hr}}$
- Range \*\* .....  $1000^\circ/\text{s}$

### Accelerometer:

- Bias .....  $\pm 0.6$  mg ( $1\sigma$ )
- Scale Factor Accuracy .....  $\pm 350^\circ$  ppm ( $1\sigma$ )
- Alignment\* .....  $0.5$  mrad ( $1\sigma$ )
- Random Walk .....  $0.6$  ft/s/ $\sqrt{\text{hr}}$
- Range \*\* .....  $\pm 40$  g

### Power:

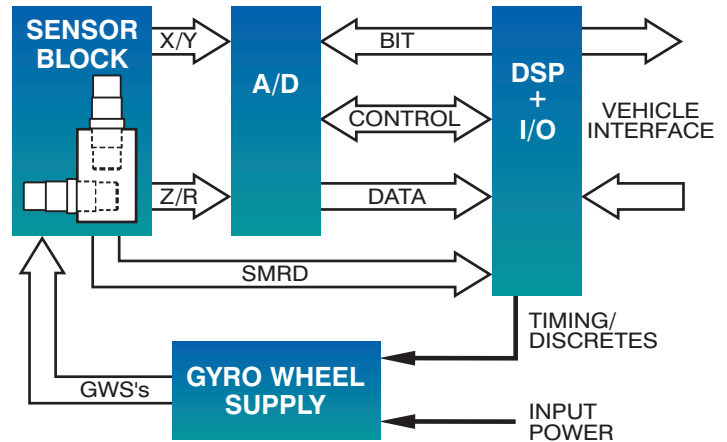
- Power Requirements .....  $\pm 28$  V,  $\pm 15$  V,  $\pm 5$  V
- Total ..... 13 W

### Environment – Operating:

- Temperature Range .....  $-54^\circ\text{C}$  to  $+85^\circ\text{C}$
- Vibration ..... 4.0 grms (20-2000 Hz)
- MTBF ..... 32,000 h (Airborne Rotary Wing,  $25^\circ\text{C}$ )
- Shock ..... 40g, 10 ms,  $1/2$  sine

\* Alignment is to two pins located near sensor block mounting pads.

\*\* Range can be increased/decreased for specialized application.



MIMU Functional Block Diagram

## Current Applications:

- ▶ Longbow Hellfire Missile
- ▶ Advanced Medium Range Air-to-Air Missile (AMRAAM)
- ▶ Brimstone
- ▶ BAT
- ▶ Classified Program