Inertial Navigation System/Inertial Measurement Unit (INS/IMU) Specification

The Contractor shall provide an INS/IMU system suitable for aircraft installation and operation that conforms to the following specifications:

1.0 INS/IMU Absolute Accuracy

The INS/IMU system shall have the following absolute accuracies assuming GPS (Global Positioning System) aided solution:

- **1.1** Position: 10.0 m CEP (RMS (Root Mean Squared))
- **1.2** Velocity: 0.1 m/sec (RMS)
- **1.3** Roll Angle: 0.02 deg (RMS)
- **1.4** Pitch Angle: 0.02 deg (RMS)
- **1.5** True Heading: 0.05 Deg (RMS)

2.0 Relative Accuracy

The INS/IMU system shall have the following relative accuracies:

- **2.1** Noise: 0.01 deg/√hr
- **2.2** Drift: 0.04 deg/hr

3.0 Operational Altitude

The INS/IMU system shall be capable of operating from:

- **3.1** 0 ft to 20000 ft in altitude.

4.0 Dynamic Operational Conditions

The INS/IMU system shall be capable of providing valid position, velocity, and attitude information to the accuracies specified in the other sections under the following dynamic operating conditions:

- **4.1** Velocity: up to 600 m/sec
- **4.2** Acceleration: up to 50 m/sec2
- **4.3** Yaw Rate: up to 180°/sec
- **4.4** Pitch Rate: up to 180°/sec
- **4.5** Roll Rate: up to 180°/sec

5.0 Operational Temperature

The INS/IMU shall be capable of operating over the temperature range of:

- **5.1** -20deg Celsius to +55 deg Celsius

6.0 Dimensions and Weight

The INS/IMU system's unit dimensions shall not exceed:

6.1 14"L x 12"W x 12"H and the weight shall not exceed 25 lbs.

7.0 Power

The INS/IMU system shall be capable of operating off of:

7.1 28V DC power and shall consume less than 80W of power.

8.0 Interfaces

The INS/IMU system shall provide at least one of each of the following interfaces:

- 100 base-T Ethernet or MIL-STD-1553 Bus
- RS-232/422 Serial
- 1 Pulse-per-Second time sync

8.1 Control Interface

The INS/IMU system shall provide the capability to send system commands to the unit using either the Ethernet, MIL-STD-1553 Bus, OR the RS-232/422 interface. If the unit uses Ethernet for sending system commands, this shall be done using the TCP/IP (Transmission Control Protocol/Internet Protocol) protocol.

8.2 INS/IMU Attitude Messages

The INS/IMU system shall output Position, Heading, Track and Speed, and Statistics information using National Marine Electronics Association (NMEA) Standard ASCII format or if a binary format, detailed documentation on the format must be provided. The system shall be capable of updating this information at a rate of 50 Hz and lower update rates should be available, selected by the user.

8.3 Raw IMU Data

The INS/IMU system shall output the raw (unfiltered) IMU data at a rate of at least 200 Hz using either the Ethernet, MIL-STD-1553 bus, or RS-232/422 interface. If the unit uses Ethernet for sending system commands, this shall be done using the TCP/IP protocol.

8.4 Stabilization Outputs

The INS/IMU system shall provide stabilization information to an external device. This can be either analog Syncro outputs OR digital attitude (roll, pitch, yaw) outputs. The update rate of the stabilization information shall be at least 200 Hz and the latency of the information shall be no more that 5 msec.

8.5 Logging Data Interface

The INS/IMU system shall provide an output for logging data using either the Ethernet, MIL-STD-1553 bus OR the RS-232/422 interface. If the unit uses Ethernet for sending system commands, this shall be done using the TCP/IP protocol. The logging information shall include; Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, and raw IMU data.

9.0 Cables

The INS/IMU system shall include cables for all electrical interfaces (power and data) and where applicable, shall provide standard connectors for the interfaces (e.g., RJ-45 for Ethernet connections).

10.0 Integrated GPS

The INS/IMU system shall have an integrated GPS unit with a connector that provides for an external antenna. An external antenna shall be provided with the system along with at least 10m of cable.

11.0 GPS Denied Operation

The INS/IMU system shall be capable of operating and providing at reduced accuracies when the unit is denied updates from the GPS unit.

12.0 Documentation

The INS/IMU system shall include manuals that provide detailed information on physical installation, mechanical and electrical interfaces, INS/IMU commands, and data formats.

13.0 Training/Support

The INS/IMU system shall include at least 3 days of training or onsite support for installation, integration, and operation of the INS/IMU unit.