



**Compact and cost-effective GPS-Aided  
INS for Satcom connectivity during  
Beyond Line-Of-Sight (BLOS)  
UAV flights**

## Summary

With ubiquitous Unmanned Aerial Vehicles (UAV's) getting adopted into a constantly increasing number of civil and military applications, operation capabilities are getting more sophisticated. Needs now extend further than just operating Beyond the Line Of Sight (BLOS). Remote operations for applications such as border patrol, aerial surveillance, and specialized missions require that users maintain an uninterrupted connection with a UAV for data transmission, and navigational aid. Due to the overall complexity of BLOS UAV operations, market competitors attempt to provide various solutions to customers by attracting them with a range of features related to their particular use case. A crucial role-player for a safe and successful mission is the GPS-Aided Inertial Navigation System (INS). For state-of-the-art UAVs, they are commonly crammed with costly equipment, and losing it may cause unwanted consequences. That alone puts top priority on choosing a reliable GPS-Aided INS. Besides exceptional performance, a GPS-Aided INS must meet weight and price expectations. For aerospace applications, extra weight is costly, but it is important to make sure that the trade off for weight is worth the cost of the unit. When it comes to such a strict choice, few solutions can compete with the **Inertial Labs** GPS-Aided INS-P model.



## Our Partner

## AirSatOne



AirSatOne is a Satcom service provider that specializes in aircraft satcom, for both the cabin, and the flight deck. AirSatOne also provides Hybrid Satellite/Terrestrial connectivity with IP-Sec, Leased Line, and MPLS to deliver a secure connection all the way to the customers location. Part of what makes this possible is through Flightstream SA, which includes network traffic control with prioritization where high priority data reaches its destination even when 100% of the allocated bandwidth is being used.

Visit [www.airsatone.com](http://www.airsatone.com) for more information.

## AirSatOne's BLOS UAV flight and core components

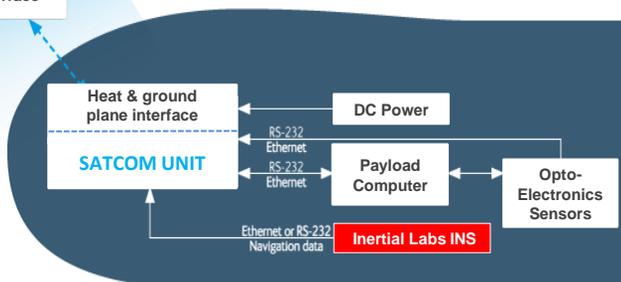
For top-tier Satcom providers like AirSatOne, choosing key components for their services involving BLOS UAV flights is no quick task. After assessments were done of various manufacturers, the combination of the **Cobham's AVIATOR UAV 200**, for **SATCOM connectivity**, and the **Inertial Labs GPS-Aided INS-P**, for **orientational data**, was deemed to be the best fit for the job.

**Challenge:** Prior to **Inertial Labs** assistance, AirSatOne had been experiencing difficulties with data format compatibilities between Satcom and other GPS-Aided INS units. The two platforms simply didn't support the same sentence structures, and this caused major set backs for them. Possible solutions had been proposed to this such as bridging data through a separate converter. The problem with this solution was that it meant: additional hardware, extra weight, resources to develop software, and budget accommodations. The problem seemed costly until **Inertial Labs** became a part of the solution.

**How It Works** *The diagram outlines interconnection between core elements of UAV designed for BLOS SATCOM communications*



Inmarsat Air Interface



**Solution:** Not only does the **Inertial Labs** GPS-Aided INS-P have an extended list of supported data formats, it has been preconfigured to work directly with Cobham's AVIATOR UAV 200 data structures without the need of a converter to solve problems like the one AirSatOne had been dealing with. After leaving the data format issue behind, the **Inertial Labs** GPS-Aided INS-P secured its place in the project because of the excellent navigational accuracy AirSatOne witnessed during testing phases.

**Feedback:** AirSatOne commented on the **Inertial Labs** GPS-Aided INS-P and its performance after putting it to the test along-side the AVIATOR UAV 200.

*"We subjected the INS-P and the AVIATOR UAV 200 to aggressive maneuvers in the pitch, roll and heading / yaw axis and found that the combination allowed connectivity at extreme angles while maintaining connectivity beyond 60° pitch and roll. To further note the INS-P came on line quickly, even faster than our requirements."*

Jo Kremsreiter,  
President of AirSatOne.

**More on performance:** Regarding navigational performance, the **Inertial Labs** GPS-Aided INS-P precisely indicated 3D orientation, velocity, as well as latitude and longitude by utilizing its powerful tactical-grade IMU (1 deg/hr gyro), high precision GNSS receiver, and Fluxgate gyro-compensated magnetic compass. During testing, connectivity remained stable with no interruptions even while rotating a full 360°, undergoing pitch variations of values greater than ±45°, and experiencing roll values up to 45°.



## Why else choose GPS-Aided INS-P?

- ✓ **Unbeatable price for the quality**
- ✓ **Certified by prominent agencies**
- ✓ **Proven reliability in Hectic Conditions**
- ✓ **Rich functionality**
- ✓ **Excellent Customer Service**



### GPS-Aided INS-P

**Inertial Labs** Inc. designed and produced a compact, enduring, and professional grade model of its GPS-Aided INS product line — the INS-P. This model utilizes: an advanced Novatel® GNSS receiver; a tactical-grade IMU (1 deg/hr gyro); and a gyro-compensated Fluxgate magnetic compass to provide accurate position, velocity, heading, pitch and roll for UAVs of any caliber. It runs on an in-house built advanced on-board sensors-fusion filter, state of the art navigation and guidance algorithms, and also comes with its own enhanced calibration software. The **Inertial Labs** INS-P surpasses many of its competitors by remarkable performance in the most challenging conditions while staying affordable.

### Real Time Specifications

<b>Horizontal position</b>	<1 m, RMS
<b>Heading</b>	0.1 deg, RMS
<b>Pitch and Roll</b>	0.08 deg, RMS
<b>Velocity</b>	0.03 m/sec
<b>Gyroscopes</b>	1 deg/hr
<b>Accelerometer</b>	0.005 mg
<b>Weight</b>	280 grams
<b>Size</b>	120 x 50 x 53 mm



## About Inertial Labs Inc.

Established in 2001, Inertial Labs is a leader in position and orientation technologies for commercial, industrial, aerospace and defense applications. Inertial Labs has a worldwide distributor and representative network covering 20+ countries across 6 continents and a standard product line spanning from Inertial Measurement Units (IMU) to GPS-Aided Inertial Navigation Systems (INS). With application breadth on Land, Air, and Sea; Inertial Labs covers the gambit of inertial technologies and solutions.



Scan me!!!

Inertial Labs, Inc.  
39959 Catoctin Ridge Street,  
Paeonian Springs, VA  
20129 USA  
phone: +1 (703) 880 4222  
sales@inertiallabs.com  
www.inertiallabs.com