

# **Initial Check-Out of the GPS/INS Instrumentation Package for the L-29 Delphin Turbojet**

*For the  
Quarterly Review of the NASA/FAA Joint University  
Program for Air Transportation Research  
Thursday April 4<sup>th</sup>, 2002*

**Presented By: Jansen Litter  
Principal Investigator: Dr. Michael Braasch**

**Avionics Engineering Center  
Ohio University, Athens  
Project Sponsor: Joint University Program**



# Purpose

- Software sensor test bed
- Software INS/GPS integration
- Noise versus dynamic tracking error trade off
- Synthetic aperture radar
- Aircraft system id/flight control design educational tool



# Flight Test Vehicle



- **L - 29 Delphin**
- **High Altitude 11 Km**
- **High Speed 354 knots**
- **Fully Aerobatic**

Flight Specs Taken From <http://aeroweb.brooklyn.cuny.edu/specs/aero/l-29.htm>



# Delphin Equipment

- Navigation Grade INS Unit
- Industrial Keyboard
- Industrial Flat Panel Display
- Novatel GPS Unit
- Tactical Grade IMU

\*The IMU will be integrated into the system at a later date

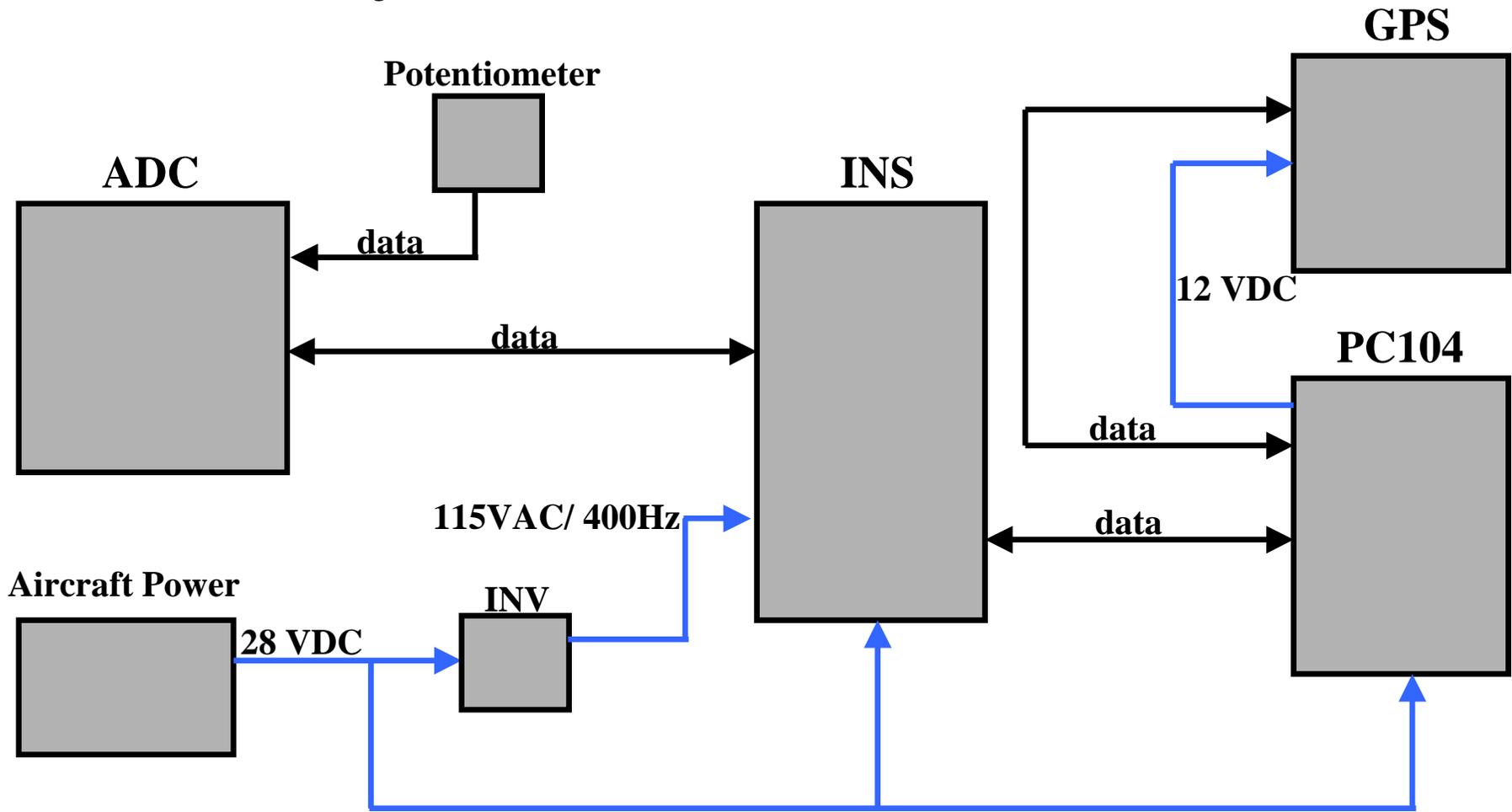


# Project Development

- Initial equipment installation is complete
- GPS and INS data collected simultaneously in real time
- In process of supplying INS unit with 28VDC



# System Block Schematic



— Power  
— Data



# GPS

- GPS data has been collected on multiple flight tests
- Data post processed
- Latitude, Longitude, Altitude and Velocity of Delphin obtained from GPS



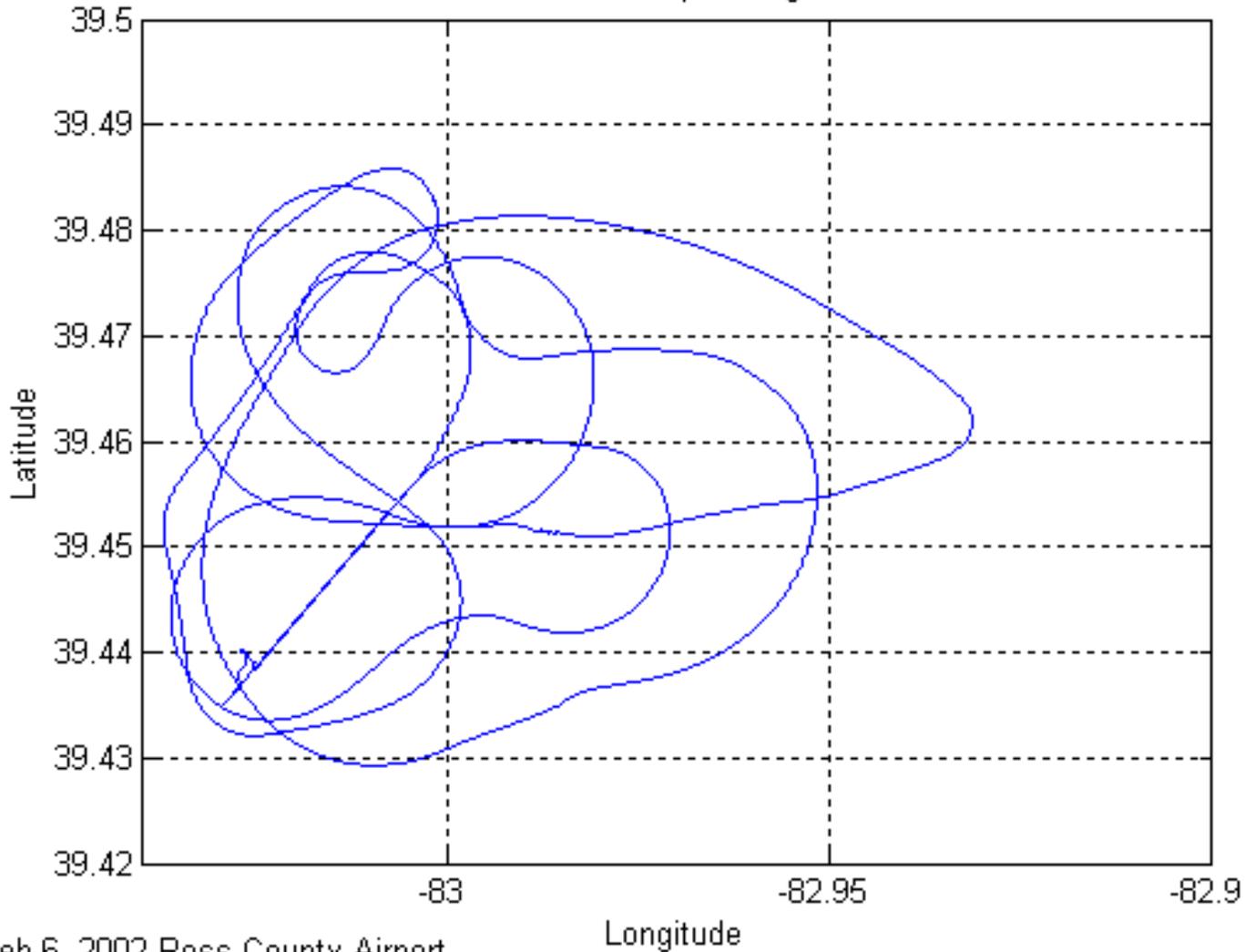
# INS

- INS Data has been collected on one flight test
- Latitude and Longitude was post processed from the collected data
- Initially, data seemed to be fine



# GPS Data

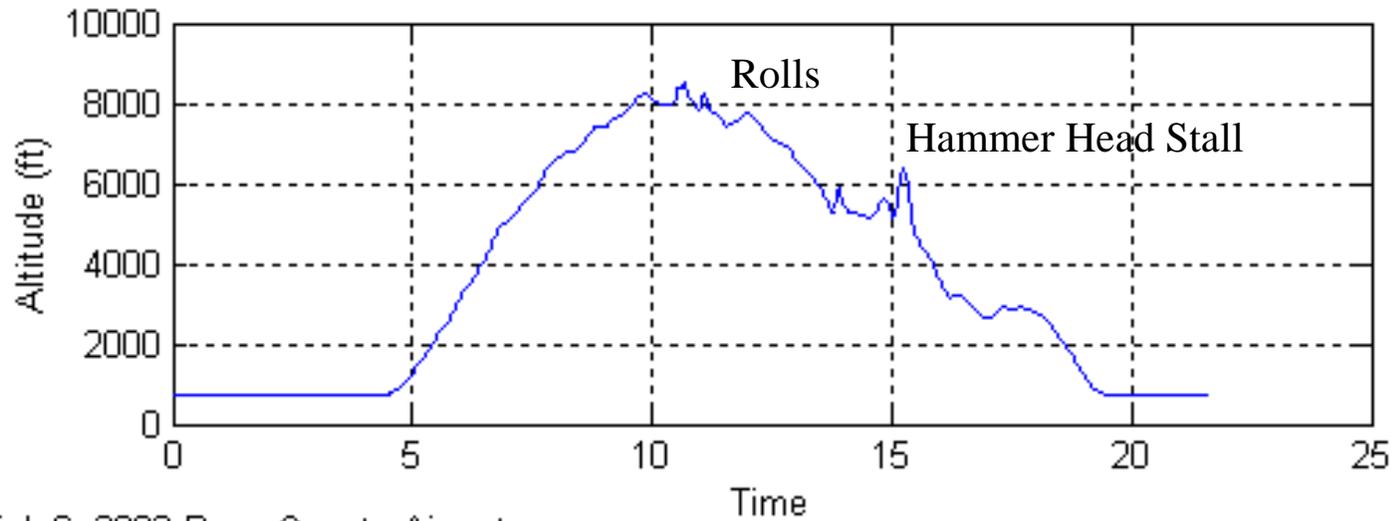
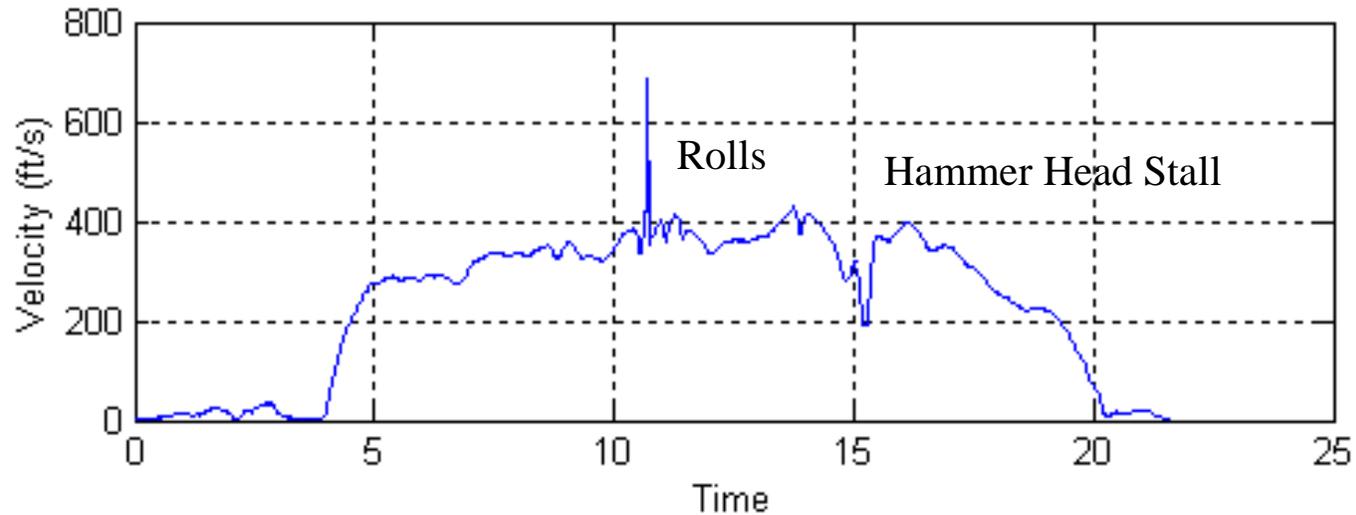
Lat/Lon from Delphin Flight Test



Feb 6, 2002 Ross County Airport



# GPS Data Continued

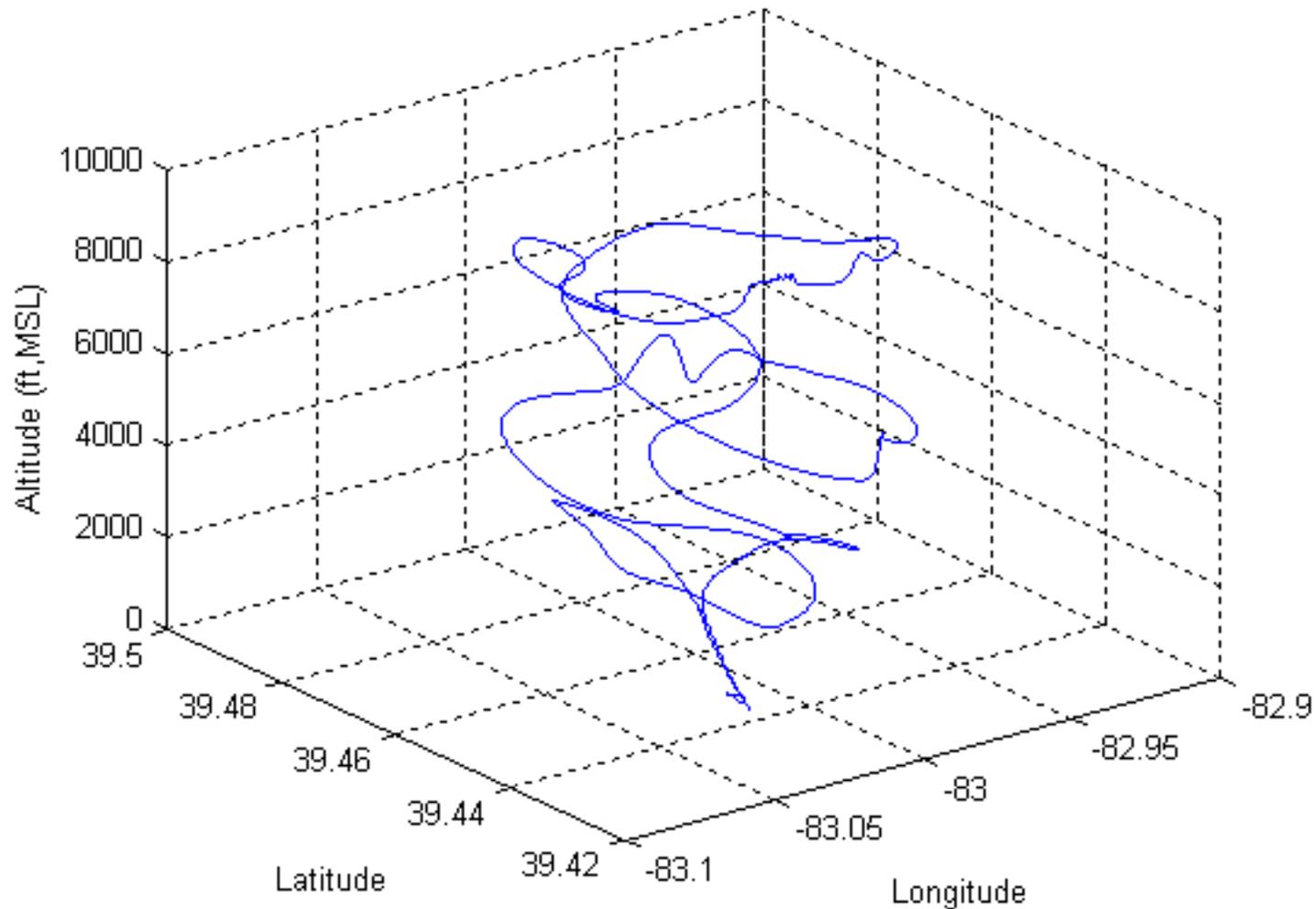


Feb 6, 2002 Ross County Airport

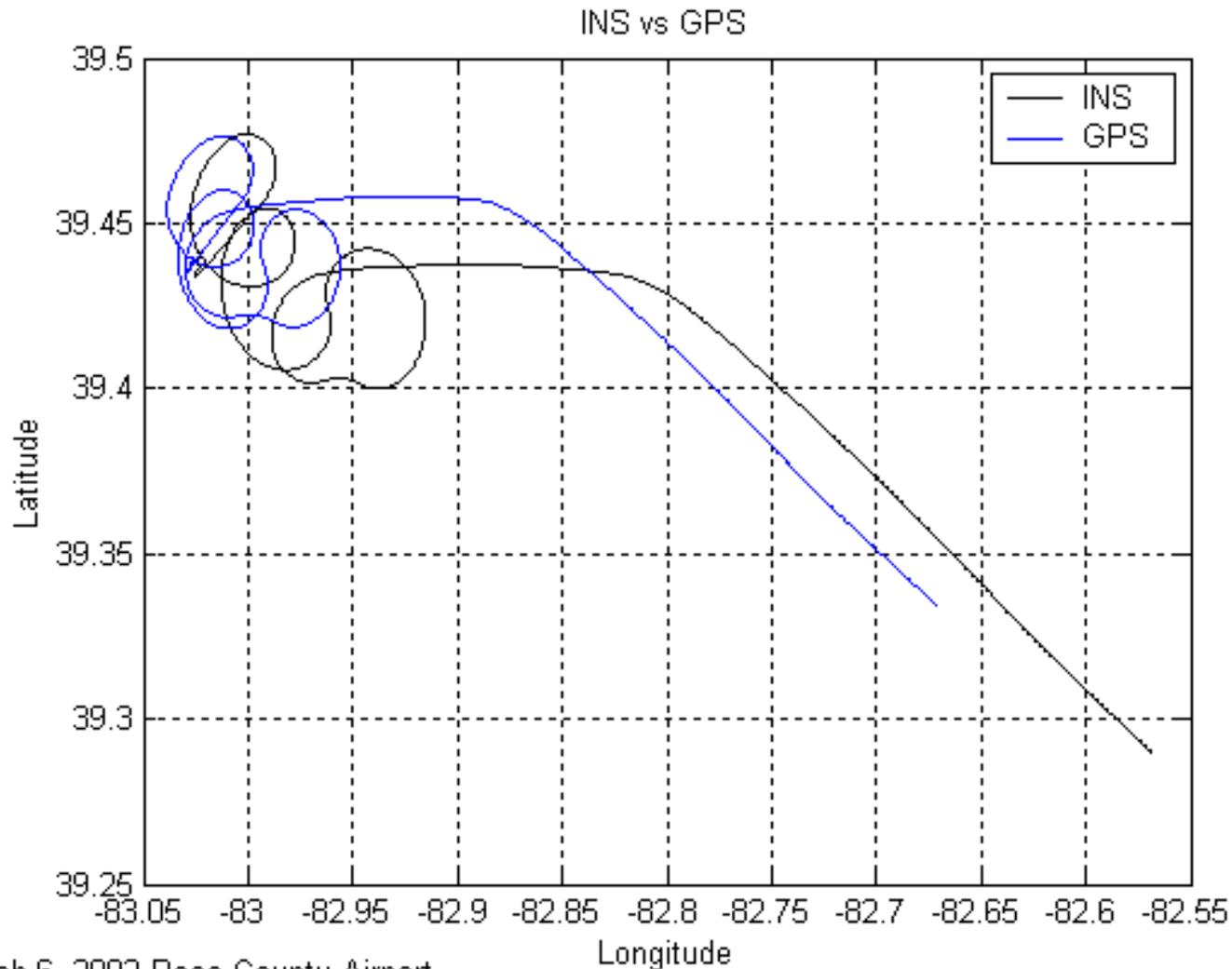


# GPS Data Continued

Delphin Flight Path with Respect to Mean Sea Level on Feb 6, 2002



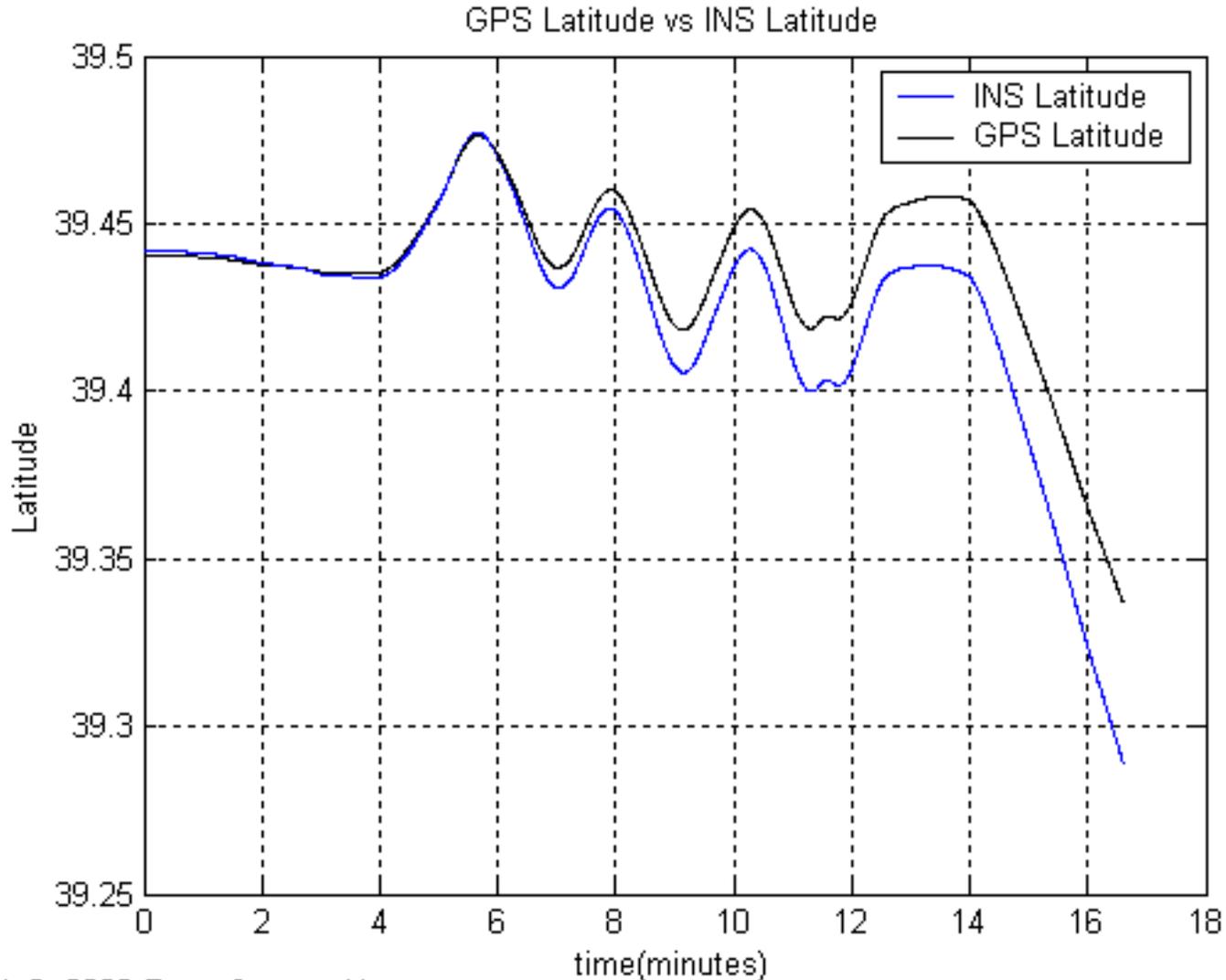
# GPS and INS Data



Feb 6, 2002 Ross County Airport



# GPS and INS Data Continued

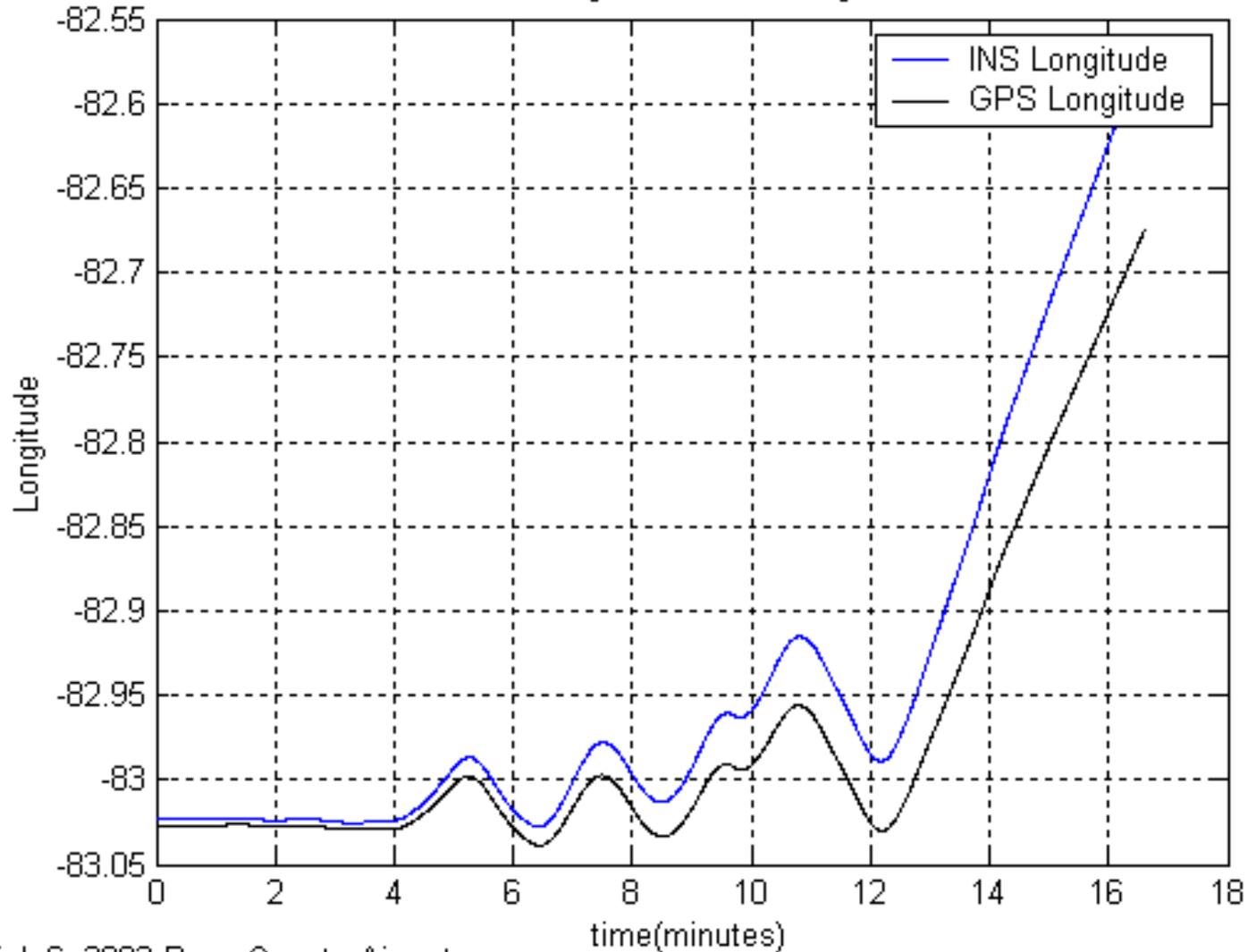


Feb 6, 2002 Ross County Airport



# GPS and INS Data Continued

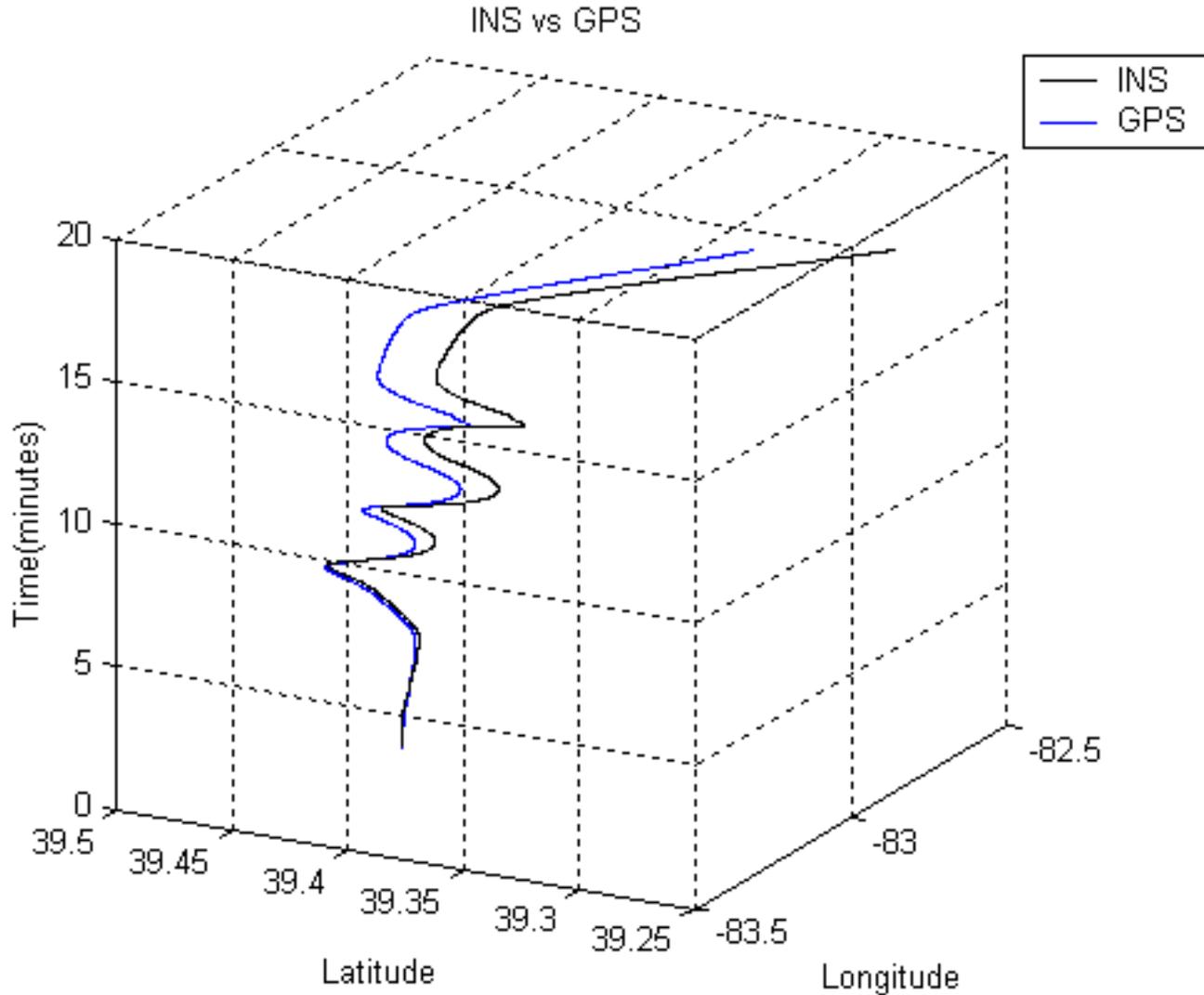
GPS Longitude vs INS Longitude



Feb 6, 2002 Ross County Airport



# GPS and INS Data Continued



# Analysis

- GPS and INS drift apart as expected
- 6 Mile difference by end of flight test
- Error much too large for INS unit
- There must be some problem with the INS unit or system setup



# Analysis Continued

- INS can send unreliable data if not initialized properly
- Error was masked from view



# Conclusion

- INS and GPS data collection is ongoing
- Need to isolate and correct INS error
- INS data collection software is still being refined and updated



# Contact Information

Principle Investigator: Dr. Michael Braasch

[Braaschm@ohiou.edu](mailto:Braaschm@ohiou.edu)

Research Engineer: Curtis Cutright

[Cutright@ieee.org](mailto:Cutright@ieee.org)

Research Associate: Jansen Litter

[JansenLitter@hotmail.com](mailto:JansenLitter@hotmail.com)

