

Preparations for GPS/INS Flight Testing on a High-Dynamic Vehicle

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Purpose:

- This project will develop a method of using INS data to update position and velocity data during loss of GPS lock
- Equipment installation is the primary focus at this time



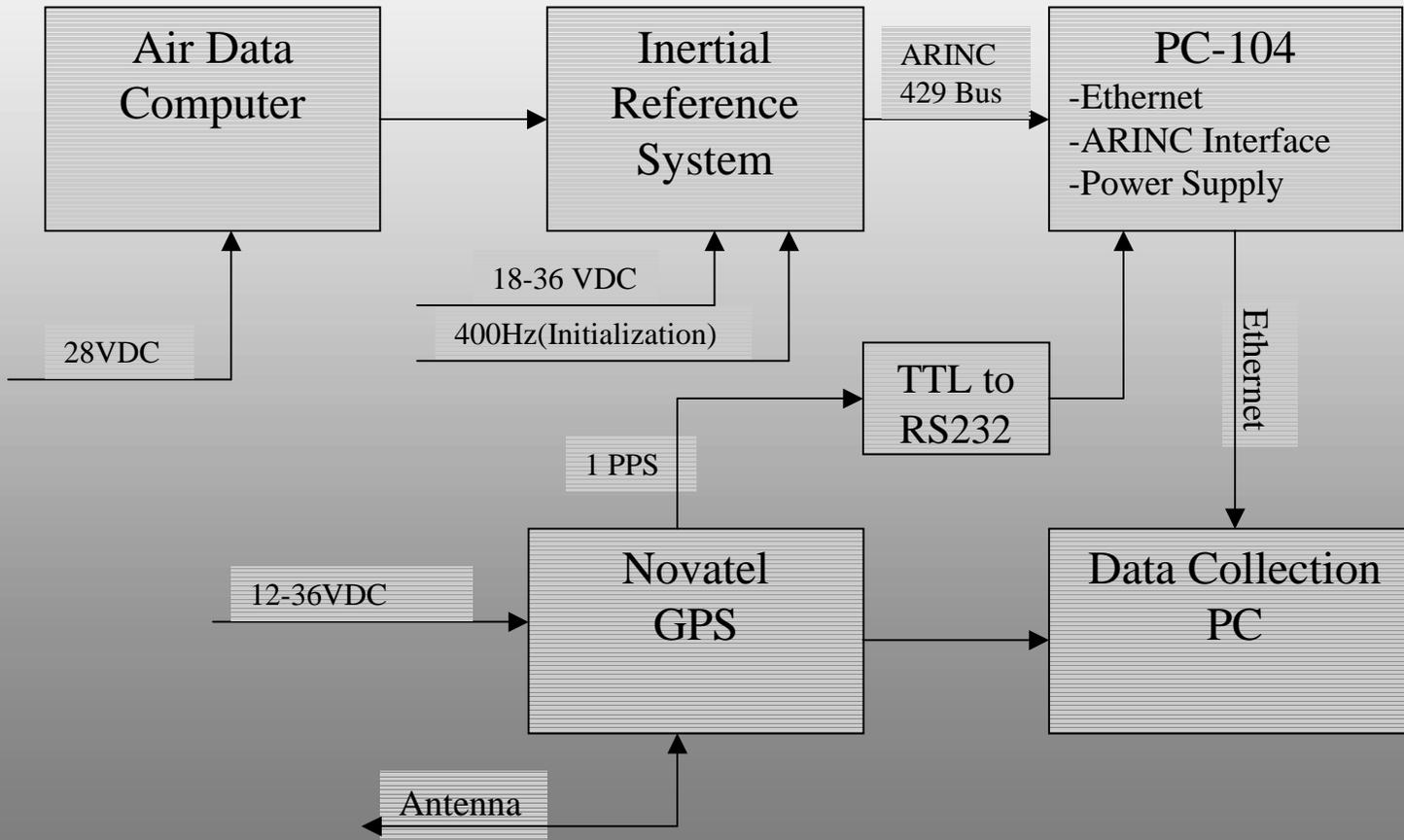
Flight Test Vehicle



- L - 29 Delfin
- High Altitude
- High Speed
- Fully Aerobatic



Data Collection System Block Diagram



IDAN PC-104 System from Real Time Devices



- Serves as the ARINC Interface
- 233MHz 686 Geode CPU
- 128MB SDRAM
- NE2000 Ethernet Card
- 75 Watt Power Supply
- Operating temperature range: -40°C to +85°C
- Provides isolation to 5g
- Noise isolation over 40Hz



CEI-400 ARINC Interface from Condor Engineering



- ARINC 429 Standard
- High and low speed buses
- 4 Tx/4 Rx Channels
- Meets PC-104 Specs



Air Data Computer from Penny & Giles Aerospace



- Provides air data measurements to the IRU
- Provides temperature and barometric corrections



Gateway Solo 5300SE



- 600MHz Intel Celeron CPU
- 10GB Hard drive
- 3COM 10/100 Ethernet Card
- 128MB SDRAM



Honeywell YG1851 Inertial Reference System

- Position
- Estimated angular values and rates of change for 3 axes of rotation
- Track angle
- Aircraft velocities
- Heading and drift information



Data Collection

- **INS data will be collected on the PC through the ARINC Bus Interface provided in the PC-104 System**
- **This data will be time tagged using GPS time from the Novatel GPS Receiver to allow for offline processing**



Plans for future testing

- **Sensors will be added to monitor control inputs and flight control surface positions**
- **This data can be used to allow for better modeling of aircraft flight characteristics based upon control inputs**



Potential Problem Areas

- Accuracy of the data collection is limited by the ARINC 429 Specifications
- All collected data must be time stamped for accurate comparison, but we must account for transmission time between the IRS Unit and the data collection PC
- Use of a laptop for data collection may limit extent of aircraft maneuvers



Conclusions

- **GPS/INS Integration will be more reliable than standalone GPS due to its ability to provide position information without satellite lock**
- **Software modifications will provide a more efficient method of data collection**
- **We have not encountered any insurmountable problems yet**
- **Initial data collection should begin soon**



Questions?

