Short Take-off & Landing for Unmanned Aerial System

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What Is Short Take-Off and Landing (STOL)

Short Takeoff and Landing: (DOD/NATO) The ability of an aircraft to clear a 50-foot (15 meters) obstacle within 1,500 feet (450 meters) of commencing takeoff or in landing, to stop within 1,500 feet (450 meters) after passing over a 50-foot (15 meters) obstacle. This method is also known as STOL.

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Benefits of STOL

Quick flow of airport traffic

More accessible locations for aircraft

UAV Mission Capabilities

Methods used to achieve STOL

- Wing Modification
- Thrust Modification
- Other Methods

Wing Modification

* Flaps
* Slats
* Vortex Generators
* Winglets

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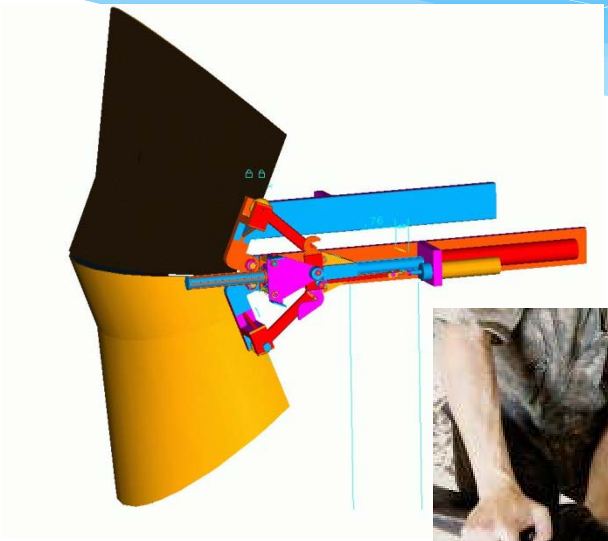
Thrust Modification

- Thrust Reversers
- Variable Pitch Propeller
- Rocket Boosters



Other Methods

- Airbrakes
- Wheel Breaks
- Parachute

Data Acquisition

* The UAV will perform as simple flight layout. This will be a simple loop in the shape of the test field.
* The crucial data required out of the mission is the distance of takeoff and landing.
* The data will be recorded using an on-board computer.

Software Design

Simulation and Flight Testing

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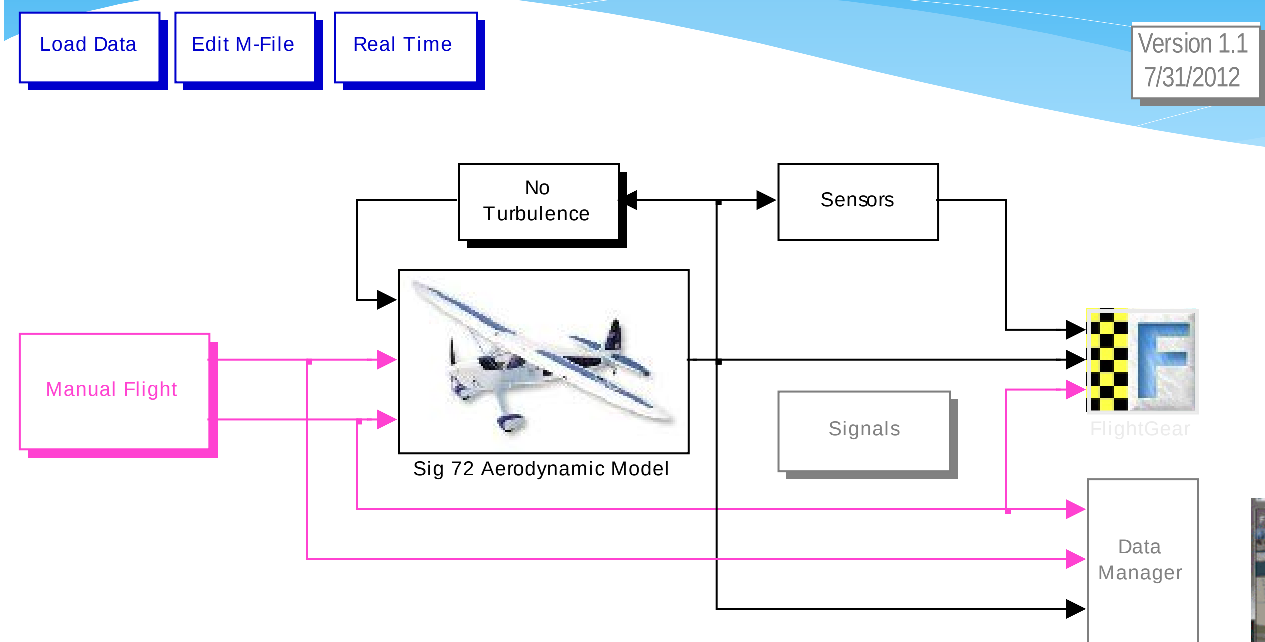
Airframe for Short-Landing Testing

Sig-72 Airframe

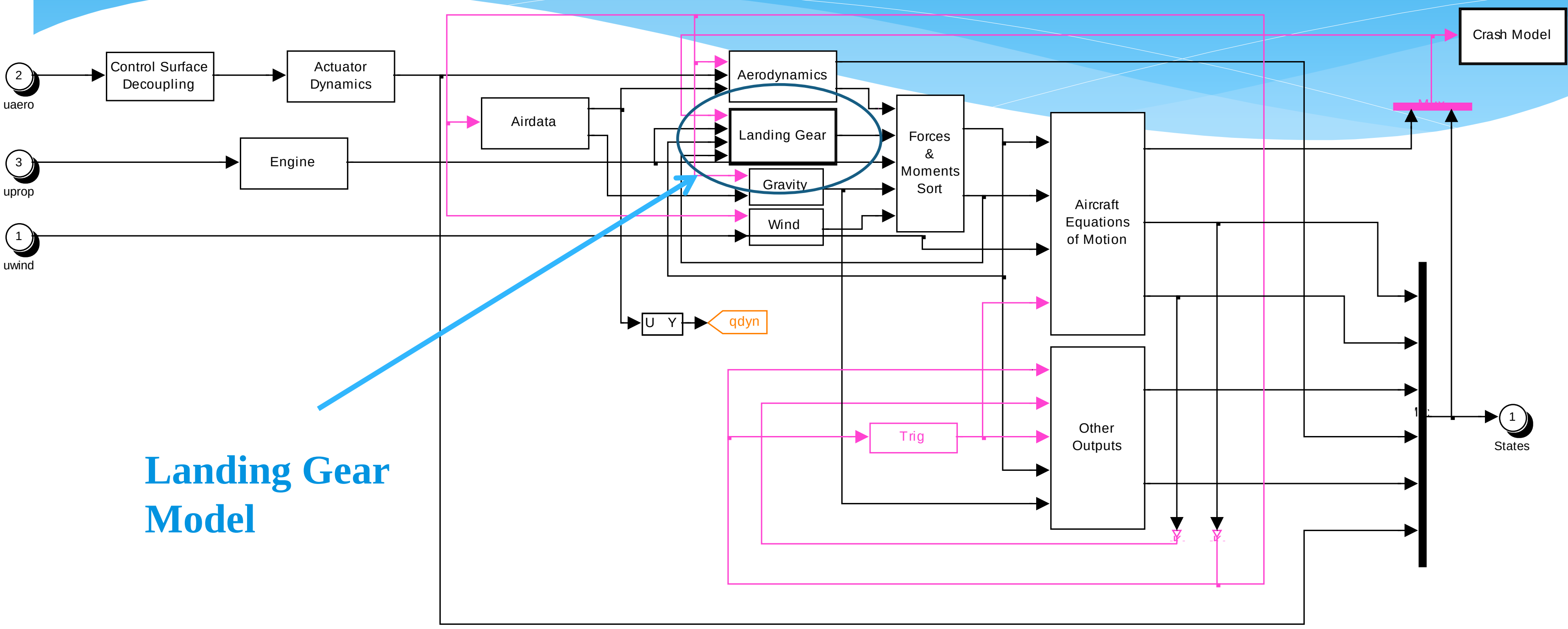
Wingspan:	72 in	1829 mm
Wing Area:	720 in²	46.5 dm²
Length:	51.75 in	1315 mm
Weight:	5 - 5.5 lbs	2268 - 2495 g
Radio Required:	4-Channel with 5 Standard Servos	
Glow Power:	2-Stroke .40-.46 cu. in. (6.5-7.5 cc) 4-Stroke .40-.54 cu. in. (6.5-8.8 cc)	
Electric Power:	500 - 800 watt (800 - 1000 kv) Brushless Motor; 50 - 60A ESC; Lipo Battery Pack	

Simulation Environment



FlightGear

Simulation Environment

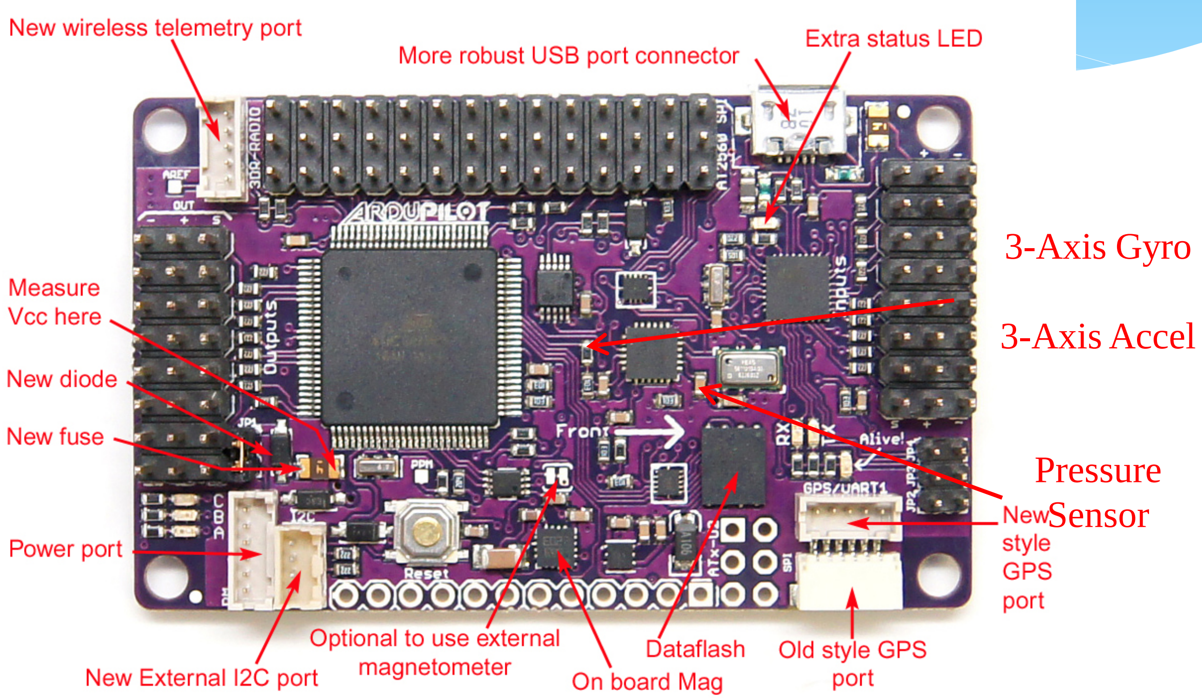


6DOF Aerodynamic Model

Fast Prototyping of On-board System
Ardupilot APM2.5

APM 2.5

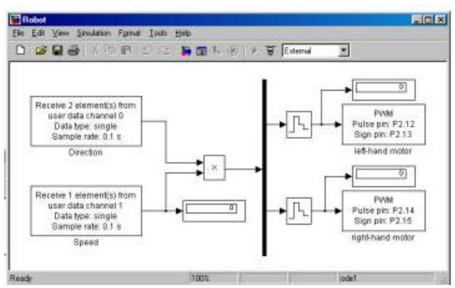
- Magnetometer
- GPS
- IMU
- Pressure Sensor
- Analog Inputs
- Barometric Sensor
- RC Channels
- Telemetry
- Flash Memory



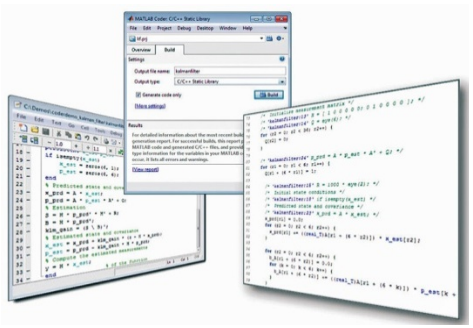
Fast Prototyping of On-board System

<u>Software</u>

MATLAB SIMULINK



Real-Time Workshop
C++ Compiler

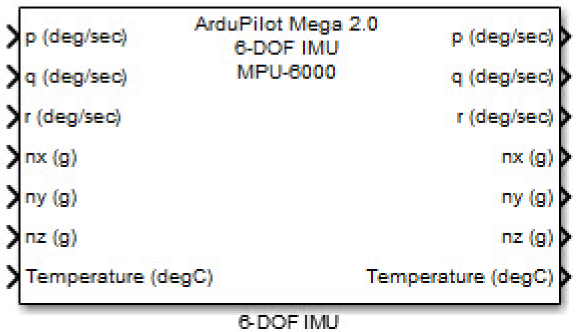


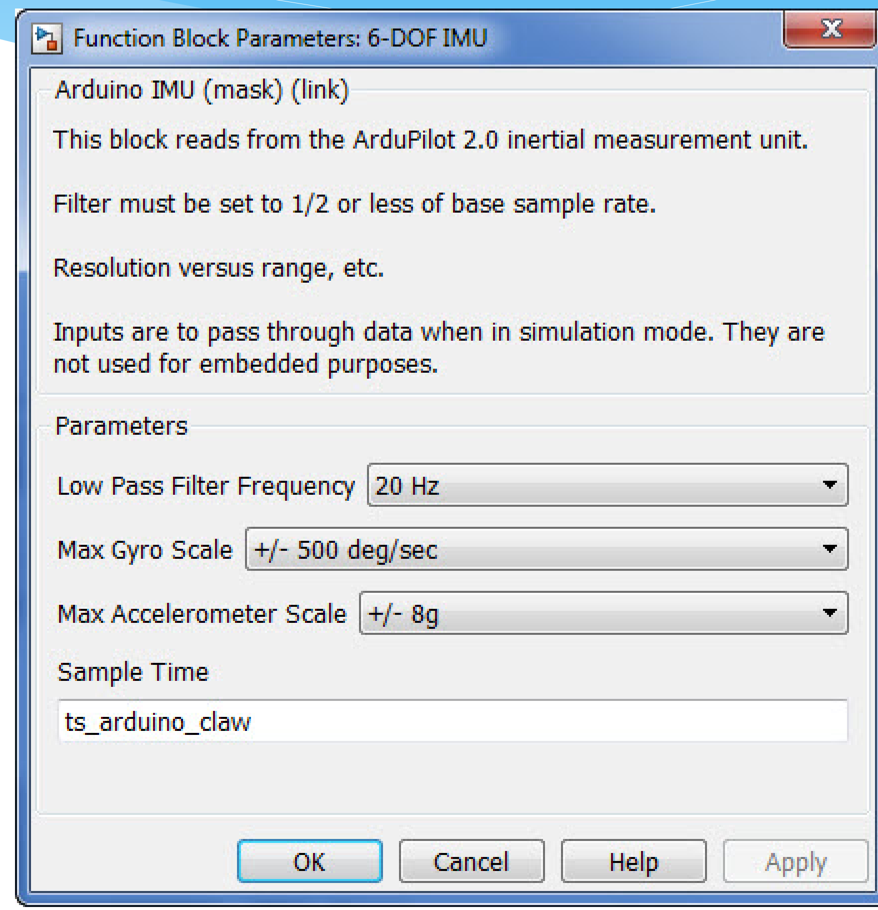
ERAU Support Blockset

<u>APM 2.0</u>
Ardupilot

Fast Prototyping of On-board System

Software





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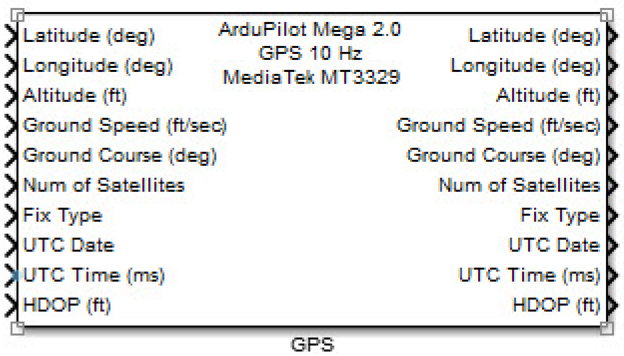
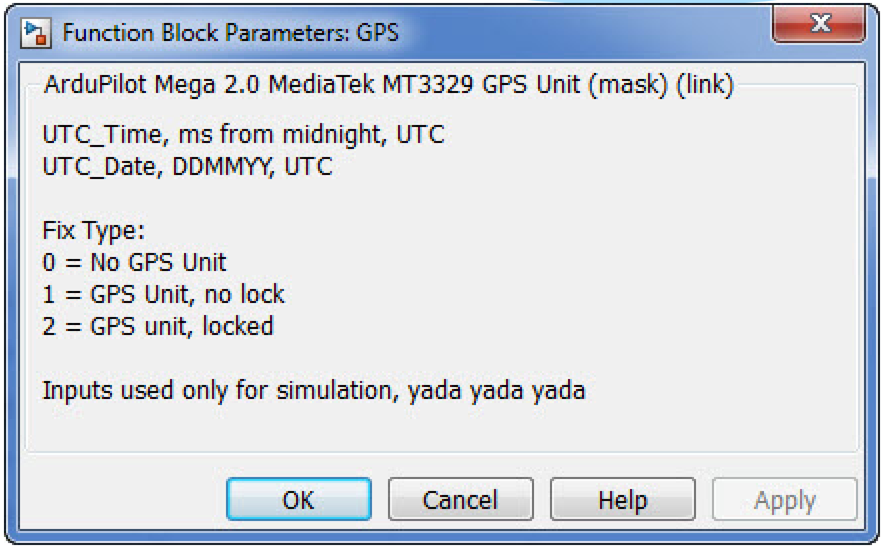
Fast Prototyping of On-board System

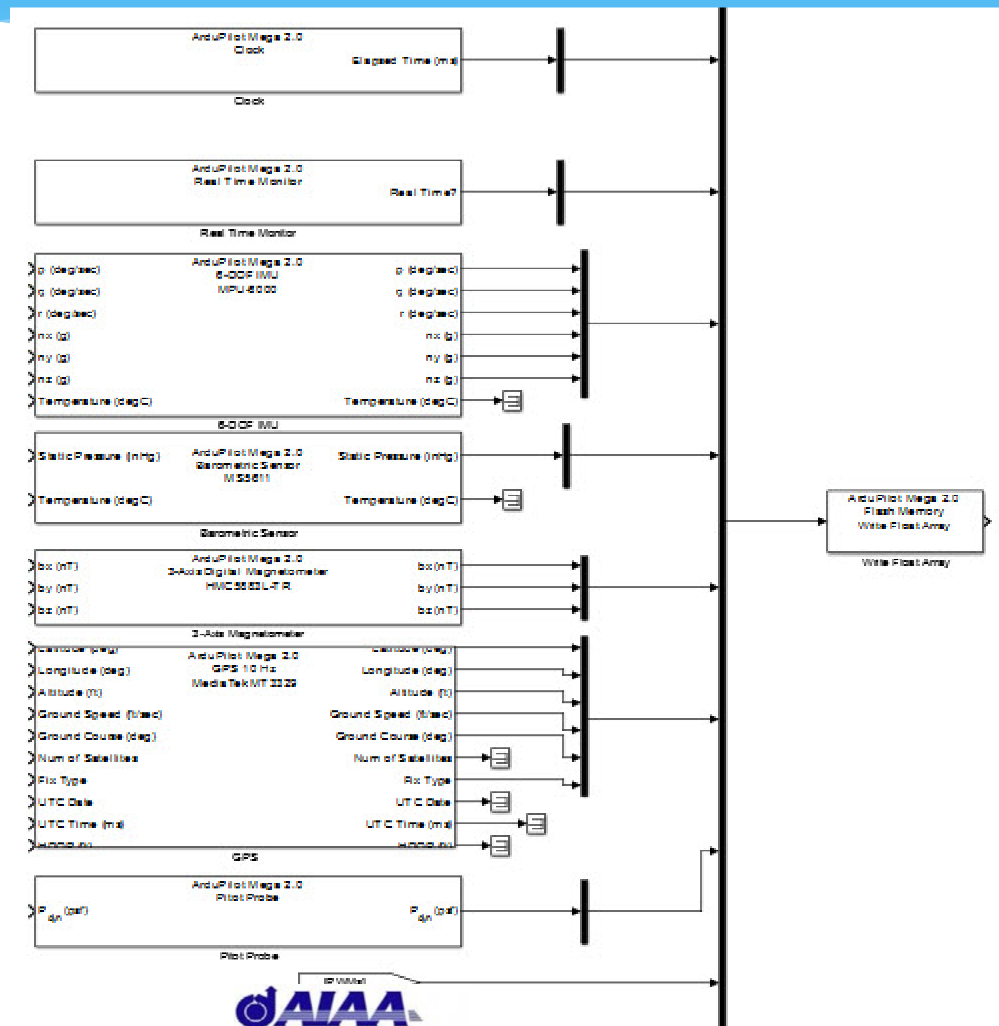
Software





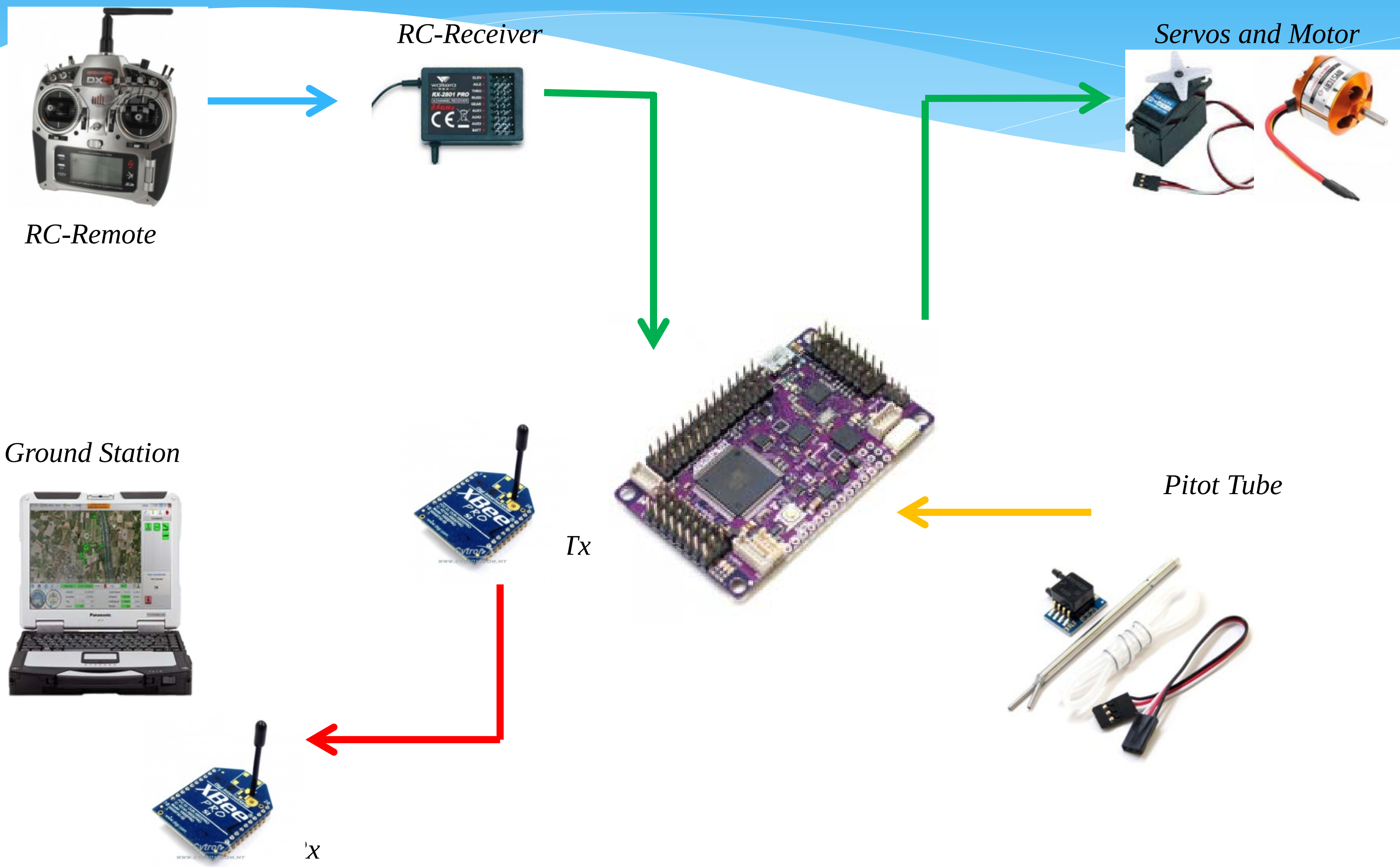
Fast Prototyping of On-board System

Software



Fast Prototyping of On-board System

Hardware



Fast Prototyping of On-board System

Motor Test-bed

Fast Prototyping of On-board System

Flight Testing

The Academy of Model Aeronautics' (AMA) Daytona Beach field was chosen for the flight test program. Approximately 1400 ft long and 1300 ft wide, the field has enough space to perform the necessary maneuvers. It has a single, hard-surface runway located on the east side. Figure 5 shows a satellite image of the field.

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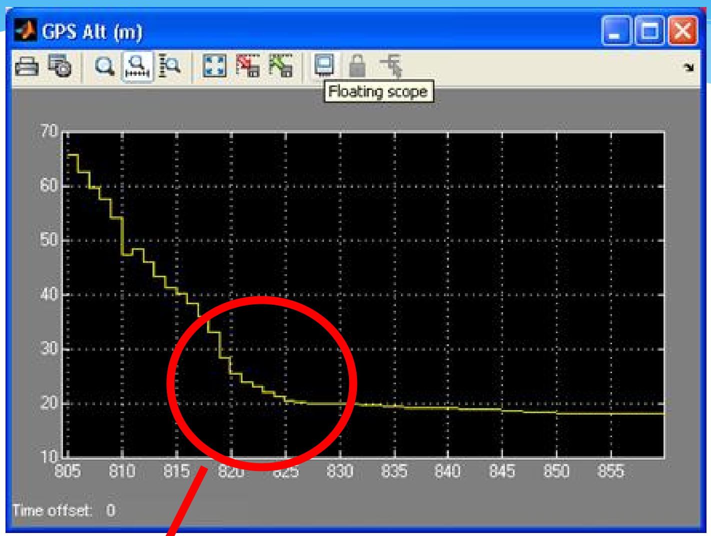
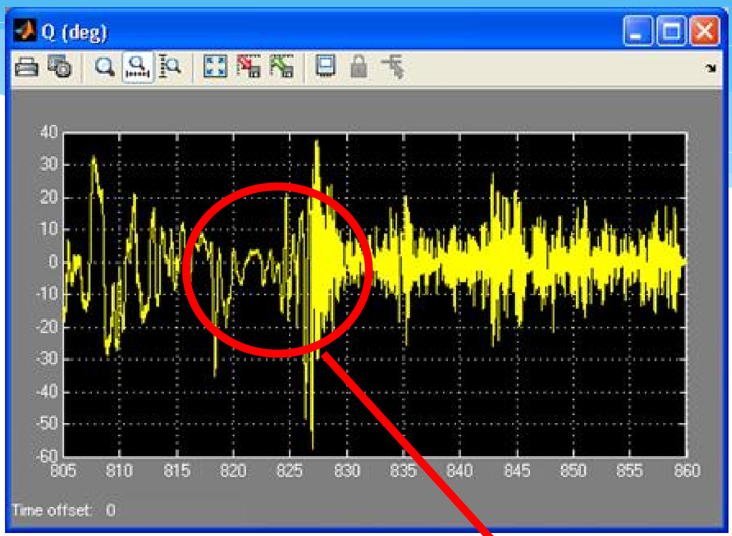
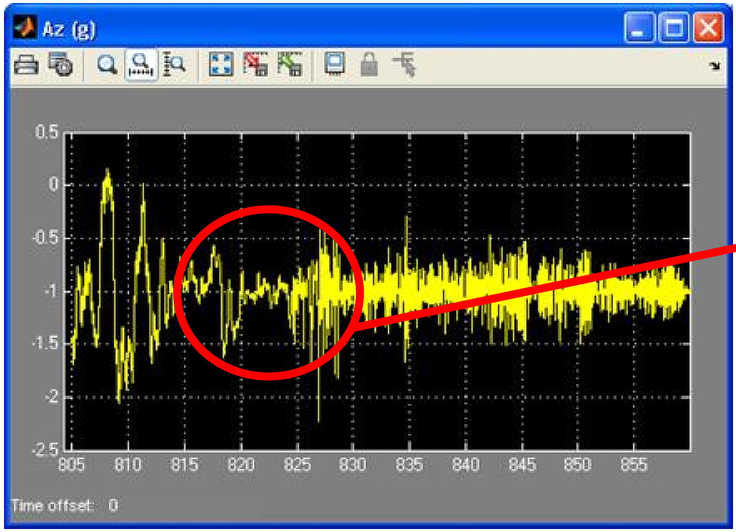
Preliminary Flight Data





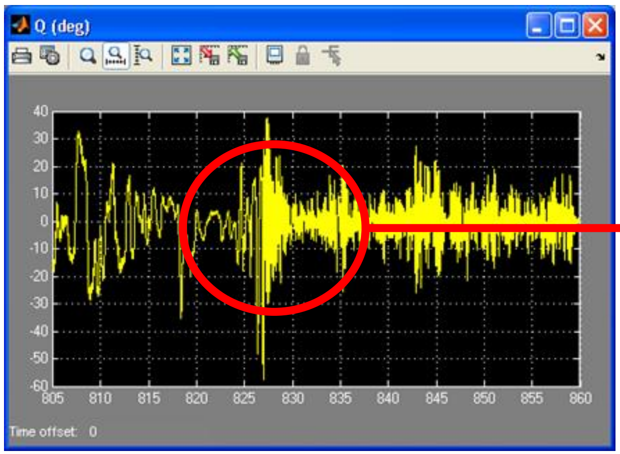


Touchdown

Touchdown
- High Frequency signal after touch down

Preliminary Flight Data

Flight State On-boar signal



Touchdown
- High Frequency signal after touch down

Activate brakes control and heading control

Questions

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