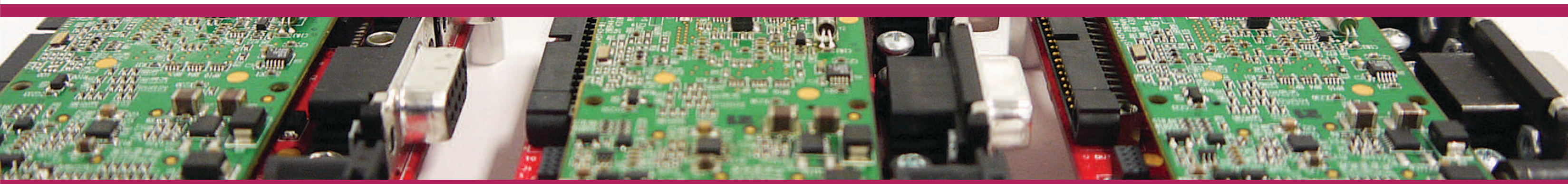
# MicroPilot®

World Leader in Professional UAS Autopilots

100% NON-ITAR PRODUCTS ITAR · ISO 9001 : 2015 QUASAR REGISTERED · Since 1994



# trueHWIL²

## True Hardware in the Loop Simulator

MicroPilot's True Hardware in the Loop (trueHWIL²) simulator offers UAV integrators and researchers the highest fidelity UAV autopilot simulation available on the market today.

Existing quasi-hardware-in-the-loop simulators approximate a UAV's flight by exchanging sensor and control surface position information with the autopilot over a serial port or CAN bus. This form of simulation introduces inaccuracies as an autopilot in-flight reads information from the Serial port or CAN bus instead of directly from its sensors. MicroPilot's trueHWIL² offers a dramatic improvement in simulator fidelity by electronically simulating all sensor outputs using digital to analog converters, signal conditioning, FPGAs and PWM interface boards. MicroPilot's trueHWIL² allows our customers to replicate the conditions their UAVs experience in flight; offering superior, on the ground validation of autopilot set-up and integration.

- Includes all required MATLAB® Libraries and Block sets for Fixed-Wing and Rotary-Wing airframes.
- Full Electrical simulation of all autopilot sensors including gyros, accelerometers, pressure sensors, magnetometer, and GPS messages.
- Includes a pre-compiled MATLAB® simulator that can be used right out of the box for users who choose not to purchase MATLAB®/Simulink®/Simulink Coder™.
- Simulator parameters can be monitored and updated from a remote PC, allowing customization of the pre-compiled simulator.

## MicroPilot

**The choice of over 1000 clients in 85 countries**

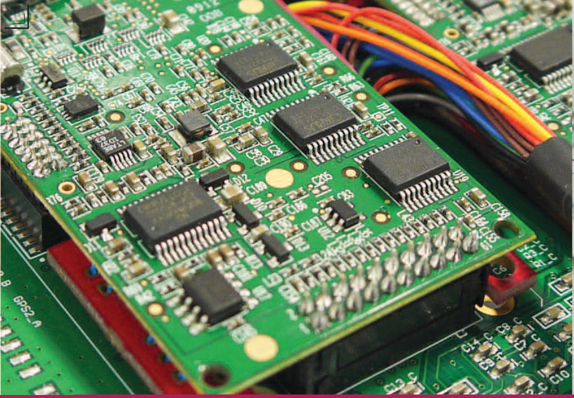

## FOR FIXED-WING AND ROTARY-WING SIMULATION

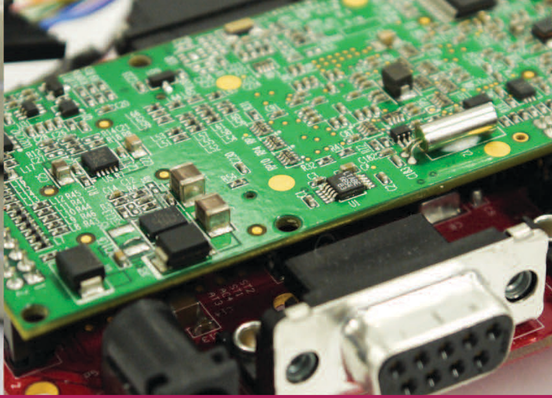
MATLAB®, Simulink® and Simulink Coder™
are registered trademarks of The MathWorks, Inc.

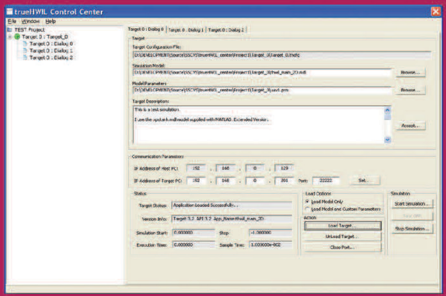
# HIGHEST FIDELITY

## UAV autopilot simulation available on the market today..

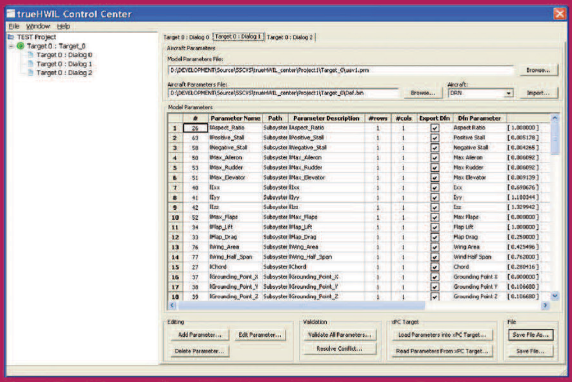
www.micropilot.com
info@micropilot.com | +1(204) 818-0598
MicroPilot is a registered trademark.



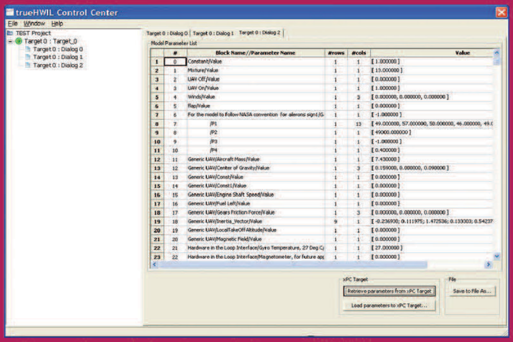





**Test in your lab and save the time, expense, and weather delays associated with flight testing**

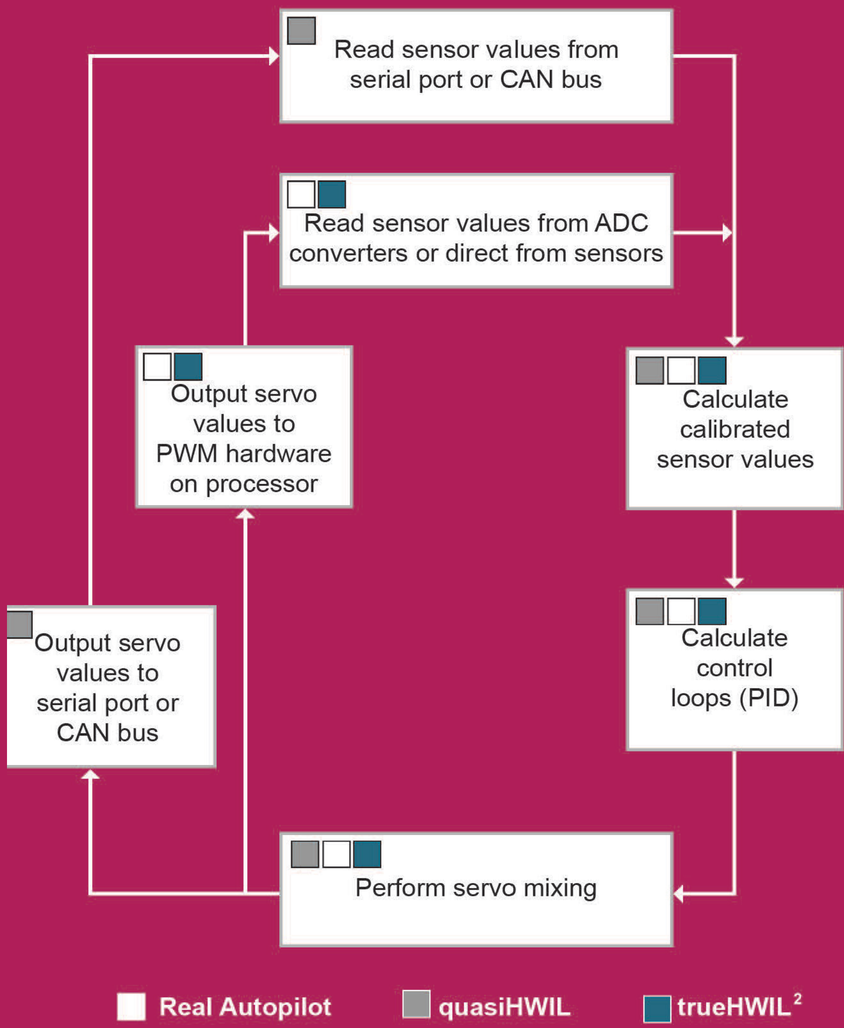


**Full electrical simulation of all sensors**



**A valuable tool for UAV Certification & Validation**

# trueHWIL$^2$



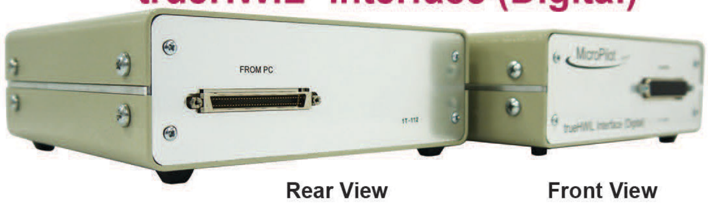

MicroPilot's trueHWIL$^2$ simulators exchange sensor and control surface position data electrically unlike quasi hardware-in-the-loop simulators that exchange this data via CAN bus or serial port. MicroPilot's trueHWIL$^2$ allows your autopilot to execute code on the ground exactly as it wold in a real flight.

**MicroPilot®**
World Leader in Professional UAS Autopilots

## trueHWIL² Interface (Analog)

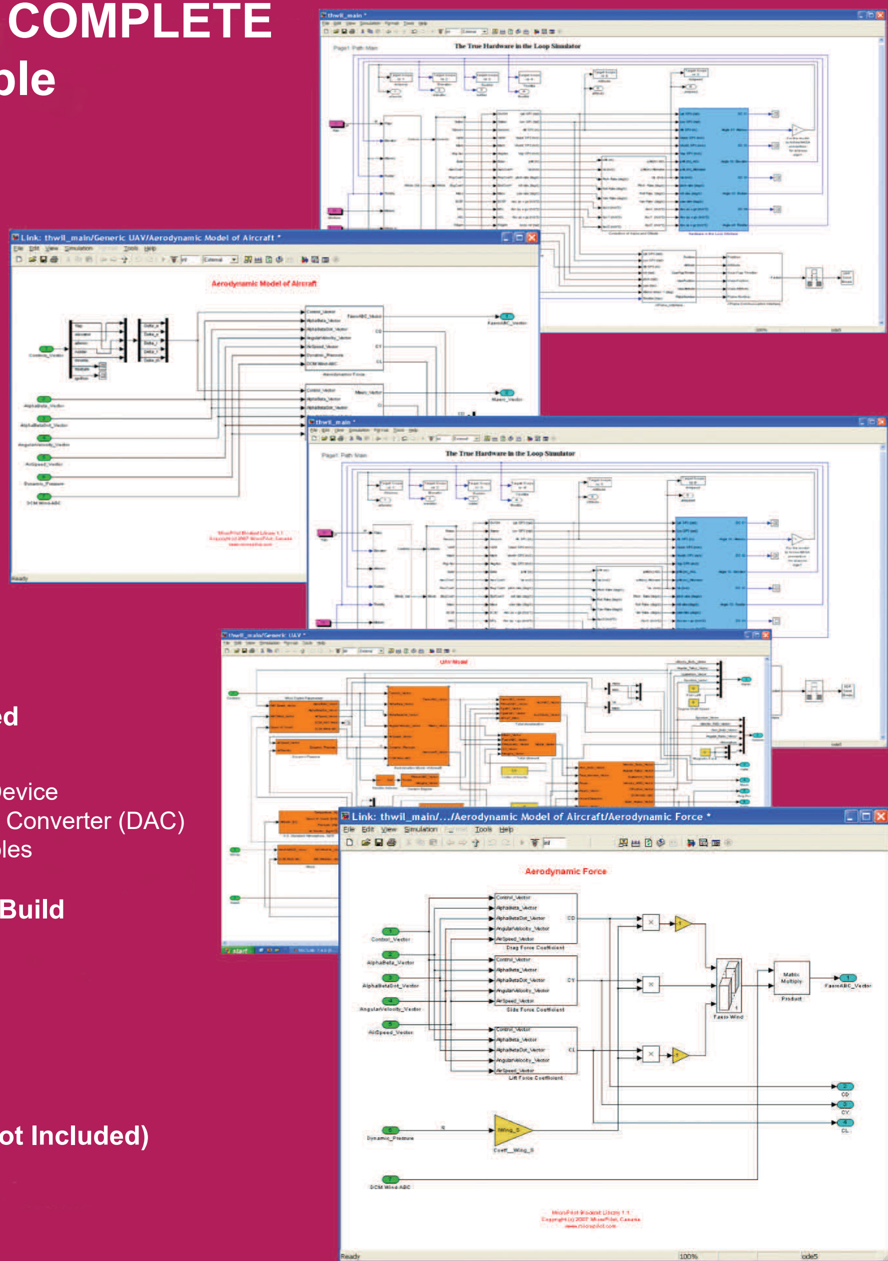

Rear View　　Front View

## trueHWIL² Interface (Digital)




Rear View　　Front View

# The most ACCURATE and COMPLETE UAV validation tool available




### MicroPilot Interface Hardware (Included)

- MicroPilot trueHWIL² Interface Box (Analog Option)
- MicroPilot trueHWIL² Interface Box (Digital Option)
- MicroPilot trueHWIL² SPI Interface Board
- MicroPilot Analog Acquisition Board

### MicroPilot Sensorless Autopilot

- MP2128HELI2 Sensorless Autopilot

  - or -
- MP2128LRC2 Sensorless Autopilot

  - or -
- MP2128³ˣ Sensorless Autopilot

### MicroPilot Software (Included)

- MATLAB® Reference simulator
- Pre-compiled xPC UAV simulator
- trueHWIL² control center
- MicroPilot MATLAB® simulation block set

### Customer Supplied Interface Hardware Required for trueHWIL² (Not Included)

- National InstrumentsTM NI PCI-6602 Counter/Timer Device
- National InstrumentsTM NI PCI-6703 Digital to Analog Converter (DAC)
- National InstrumentsTM NI SH68-68-D1 Shielded Cables

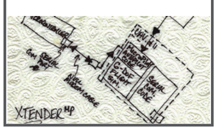
### Customer Supplied Software Only Required to Build Custom UAV Models (Not Included)

- MATLAB® release 2010b
- Simulink Coder®
- xPC TargetTM
- Microsoft Visual C++, Standard Edition

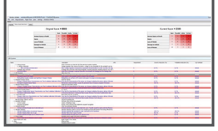
### Other Optional Customer Supplied Software (Not Included)

- Laminar Research X-Plane (Used for Visualization)

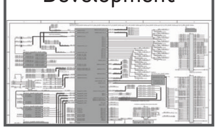
XTENDERmp



XTENDERvalidate



Custom Hardware/Software Development



Training & Integration Service

100% NON-ITAR PRODUCTS　ISO 9001 : 2015 QUASAR REGISTERED　Since 1994

## PROGRAMMING ENVIRONMENT

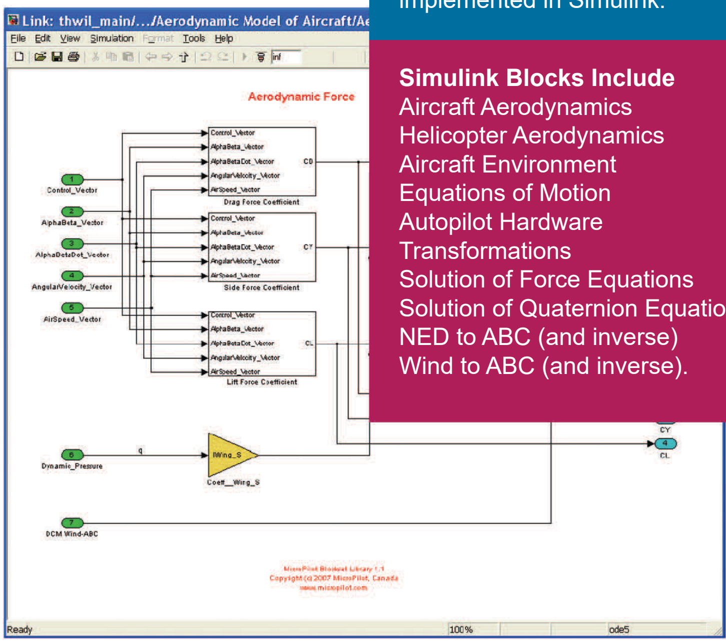
The trueHWIL² uses MathWork's MATLAB® as a simulation and programming environment.* The model is built using Simulink and MATLAB® high-level language programming. The model is then compiled and sent to the xPC Target™ computer with installed dedicated input/output hardware. This acquisition hardware is connected to the autopilot and reads its outputs and stimulates its inputs. Connection can also be made to other hardware components of the UAV to provide extended functionality of the simulator. The UAV flight can be controlled and monitored by HORIZONmp. The trueHWIL² also provides 3D visualization of flights using third party products, such as X-Plane.

*MATLAB® is optional. You do not need it to simulate your UAV. The trueHWIL² includes a full pre-compiled MATLAB® UAV simulation that allows our customers to access the power of the trueHWIL without the expense of purchasing MATLAB®. The structure of the simulator is fixed but parameters can be changed using the trueHWIL² control center on their PC.

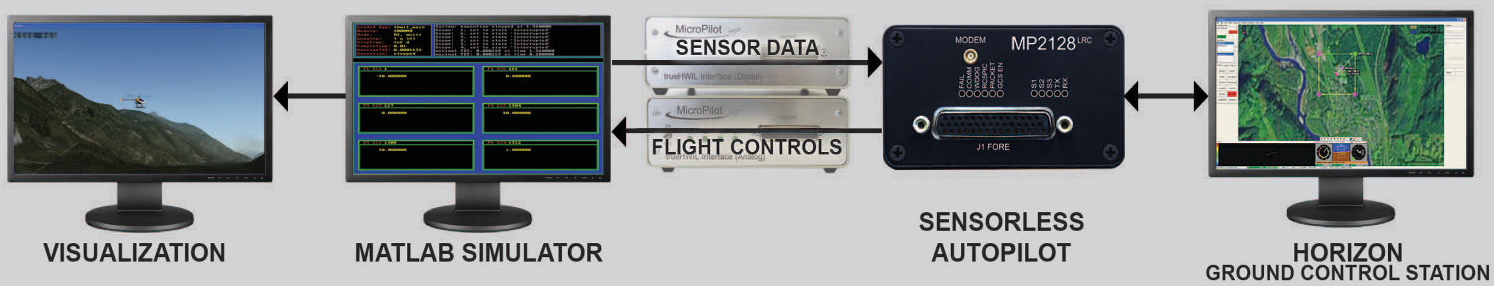
For those who want full flexibility in their simulation or for those who already have MATLAB®, MicroPilot provides a full MATLAB-based 6-dof flight simulator for use as a basis of simulation.

Includes full fixed-wing and rotary-wing simulators implemented in Simulink.

**Simulink Blocks Include**
Aircraft Aerodynamics
Helicopter Aerodynamics
Aircraft Environment
Equations of Motion
Autopilot Hardware
Transformations
Solution of Force Equations
Solution of Quaternion Equations
NED to ABC (and inverse)
Wind to ABC (and inverse).




### trueHWIL Block Diagram





# trueHWIL$^{3X}$

Contact MicroPilot for more information

MicroPilot®
World Leader in Professional UAS Autopilots