

World Leader in Professional UAS Autopilots





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.

FOR FIXED-WING AND ROTARY-WING SIMULATION

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



MicroPilot The choice of over 1000 clients in 85 countries



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

Ble Window Help												
TEST Project	Target 0	Dielog	0 Target 0 : Dialog 1	Target 0	Chalog 2							
- 🕼 Target 0 : Target_0	Alsorable Parameters											
Trept 0 Date	Model Parameters File:											
	D-DC/CLOPHENE:Source/SSC/ClinueHAB, center/Protect/NTarget_Ouev1.orm									-	Irones.	
											-	-
	Arcraft Foroneters File:								rcreft:	The second		
	provide the second seco									-	import.	
	Model Parameters											
			Parameter Name	Path	Parameter Description	#rows	acels.	Export Din	Din Parameter			1
	1	26	SAspect_Rate	Suboyster	Aspect_Ratio	1	1	-	Aspect Ratio	[1.000	0000]	
	2	61	Postive_Stal	Suboystor	Heative_Stall	1	1	-	Postve Stall	[0.005	1178]	
	2	58	INogative_Stall	Subsyster	Negative_Stal	1	1	-	Negative Stall	[0.004	1266]	
	4	- 80	Blax Aleron	Subsyster	Max_Alleron	1	1	-	Max Aleron	[0.006092]		
	5	53	Intex_Rudder	Subsyster	Max_Rudder	1 1 🖌 Max Rudder		Max Rudder	[0.00	(192]		
		51	Max Elevator	Subsyster Max_Elevator		1	4	-	Max Elevator	[0.00	139]	
	7	40	HAN	Subsyster ILos		1	4	•	tox	[0.691	M26]	
		.91	III yy	Subsyster	Anyster Ilyy 1 1 I		Igy	[1.101	1944.)			
	2	42	ILER	Subsyster	Iter	1	- 1	•	La	11.221	842]	
	10	52	Max_Flaps	Subsyster Max_Flaps		1	2.4	•	Max Rape	[0.000	(000	
	11	34	#lap_Lift	Subsyster IFlap_Lift		1	. 1	•	Flap Lift	[1.000	1000	
	12	33	IPLIED_Dried	Subsysteri	Map_Drag	1	1	•	Place Evag	10.250	(000	
	13	76	filing_Area	Subsyster	IN/NO_Area	1	-1		Wing Area	10.425	1496]	
	14	77	Ning_Helf_Span	Subsyster Telling_Half_Span		-1	4		wind Half Spin	[0.76]	1000	
	15	27	achore .	Subsyster ICherd		4	. 1		Chord	[0.200	H36]	
	16	37	Recourding_Point_X	Subayatar	Grounding_Point_X	1	4		Grounding Point X	[0.000	8000]	
	17	38	Knounding_Point_Y	Subayatar	Grounding_Point_Y	4	1		Grounding Point Y	[0.10	K00]	
	10	29	Kreunding_Point_Z	Subayatari	Grounding Point_2	1	4	-	Grounding Paint 2	[0.108	680]	1
	8										2	1
	Editing Validation					sPC Target				Tie		
			and I server	and an a state of the second s			-				-	
	4.3	Paran	Edit Pera	Reseive Conflict		udad P	Save	rie AL.				
	Dele	te Para	weter			Read R	stameters From	Sa	e Fie	1		

Full electrical simulation of all sensors



A valuable tool for UAV **Certification & Validation** trueHWIL²



MicroPilot's trueHWIL² simulators exchange sensor and control surface position data electrically unlike guasi hardware-in-the-loop simulators that exchange this data via CAN bus or serial port. MicroPilot's trueHWIL² allows your autopilot to execute code on the ground exactly as it wold in a real flight.

)0





trueHWIL² Interface (Analog)



trueHWIL² Interface (Digital)

L



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

- MP2128^{HELI2} Sensorless Autopilot
 - or -
- MP2128^{LRC2} Sensorless Autopilot
- or -• MP2128^{3X} 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)







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 HORIZON^{™P}. 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.

trueHWIL Block Diagram



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).





