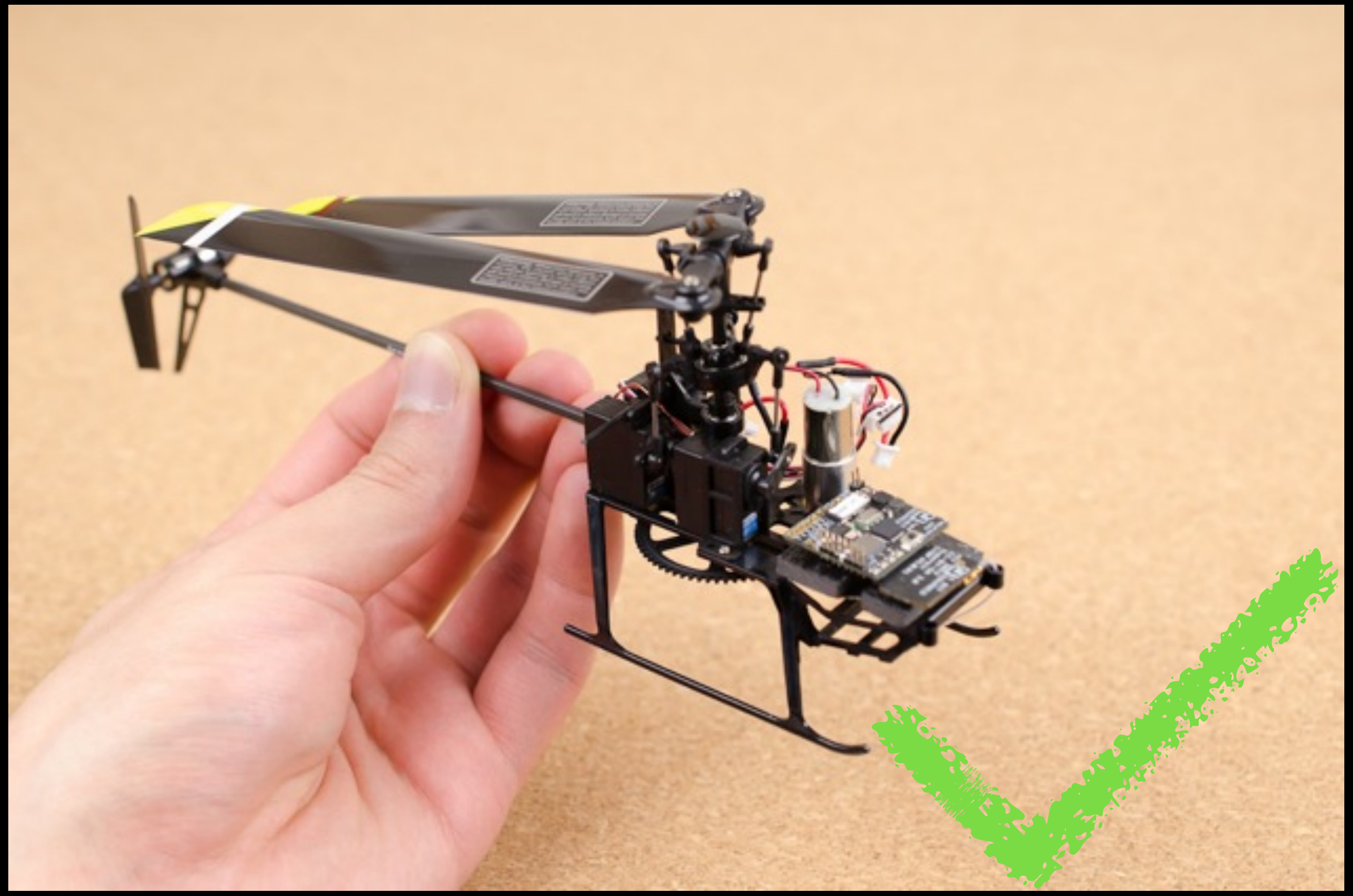
Drones

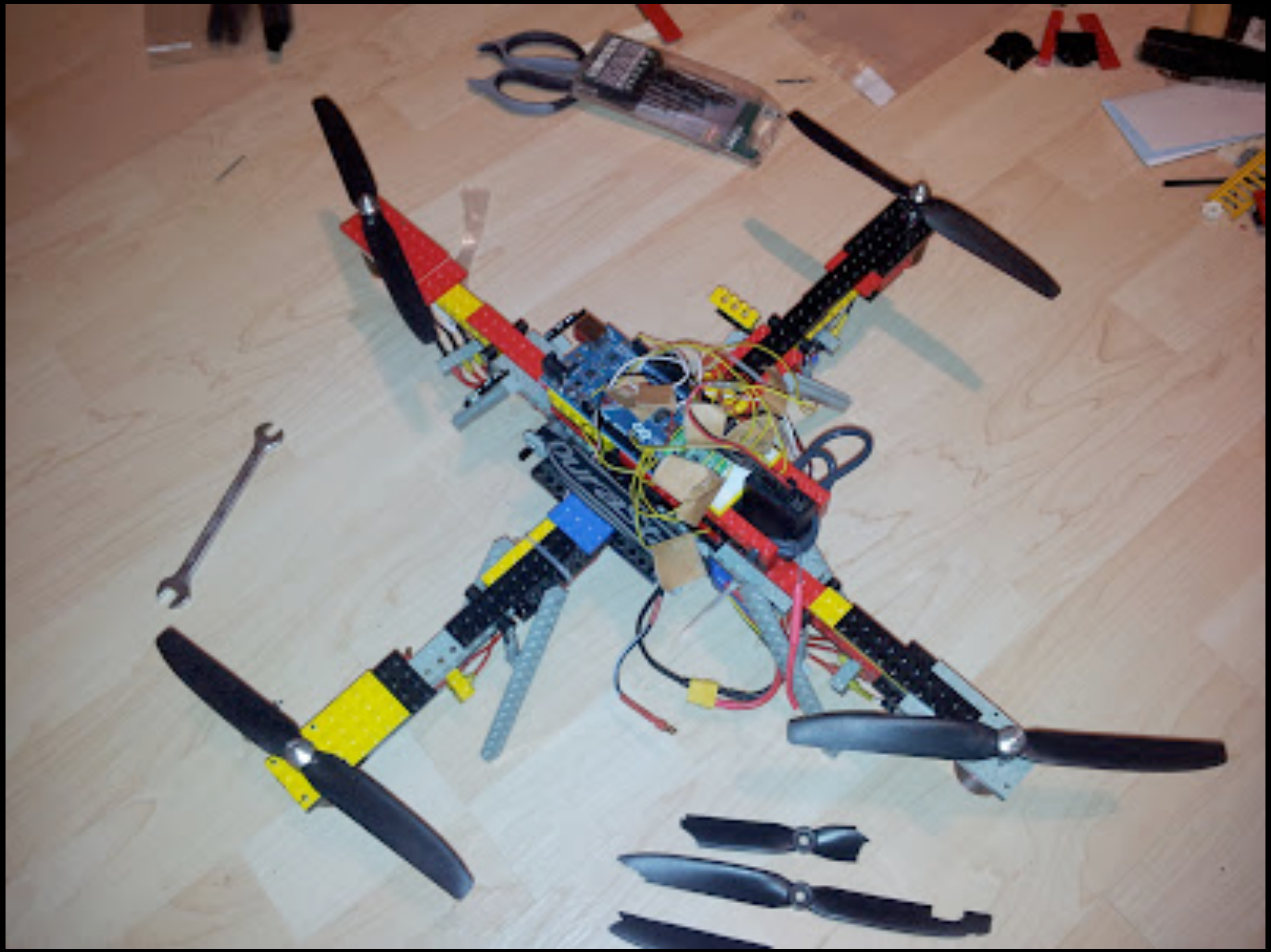
Autonomous flying vehicles, where are we now and where are we going?

by
Piotr Esden-Tempski

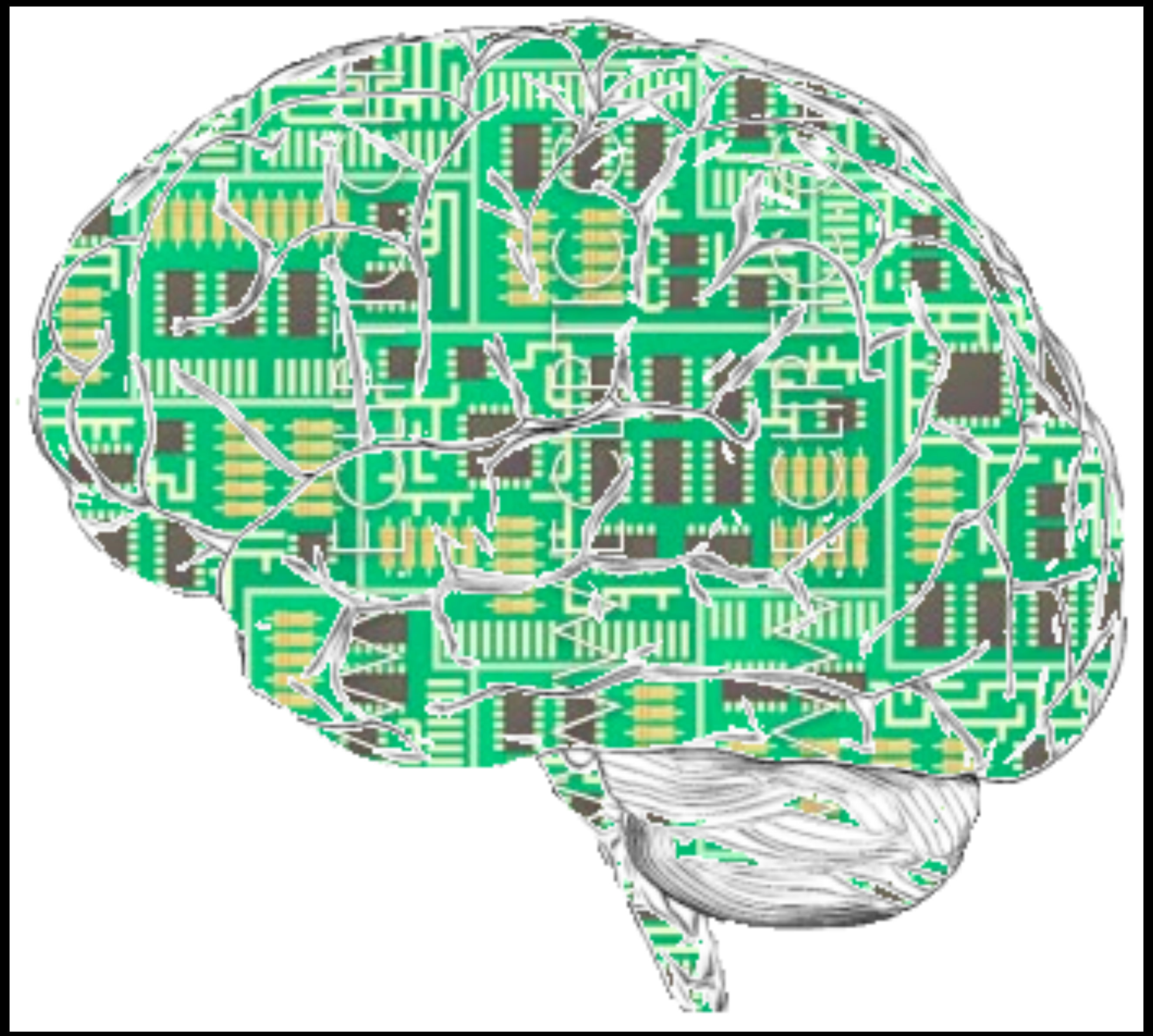
Paparazzi UAV

1 BIT SQUARED

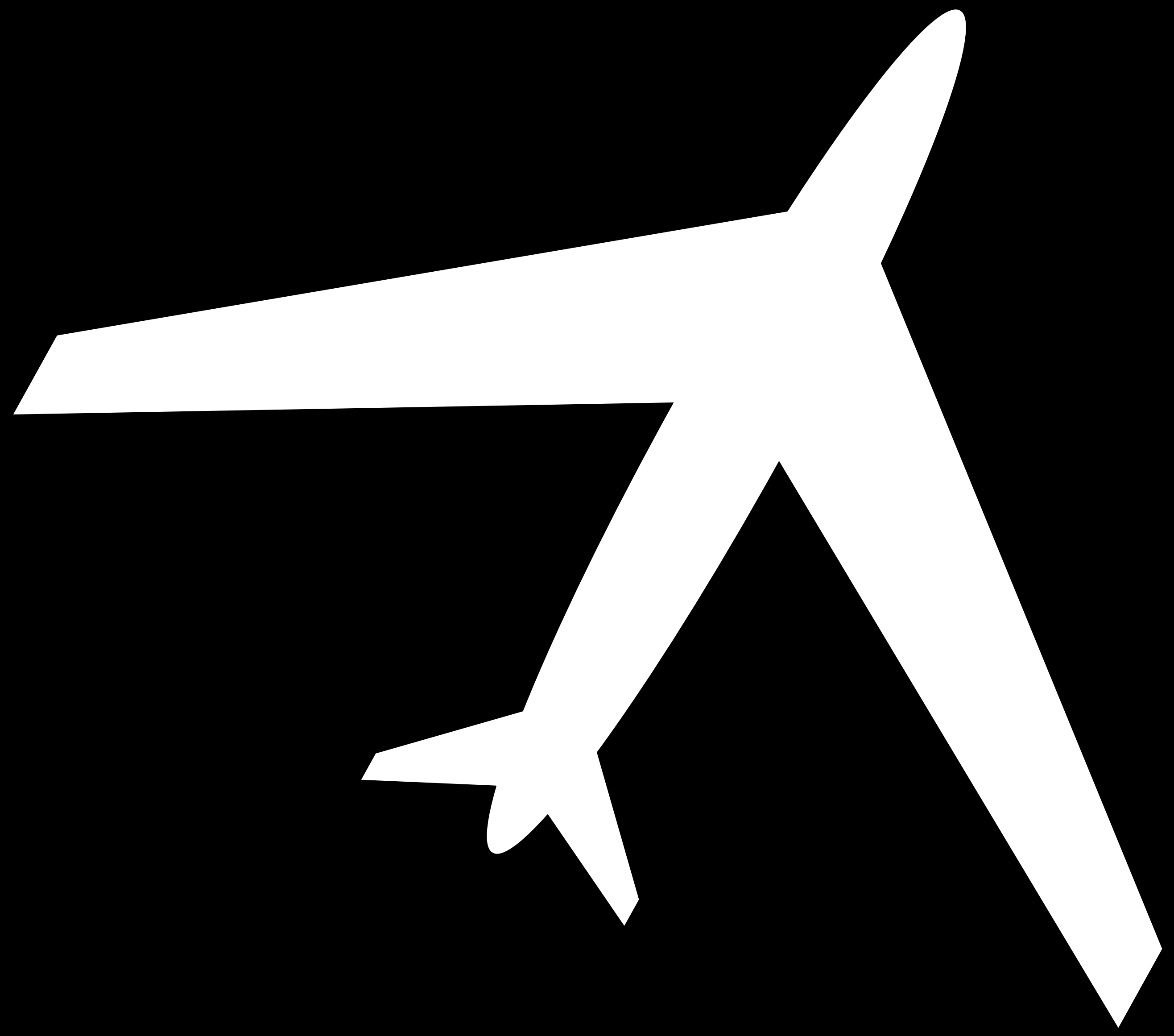





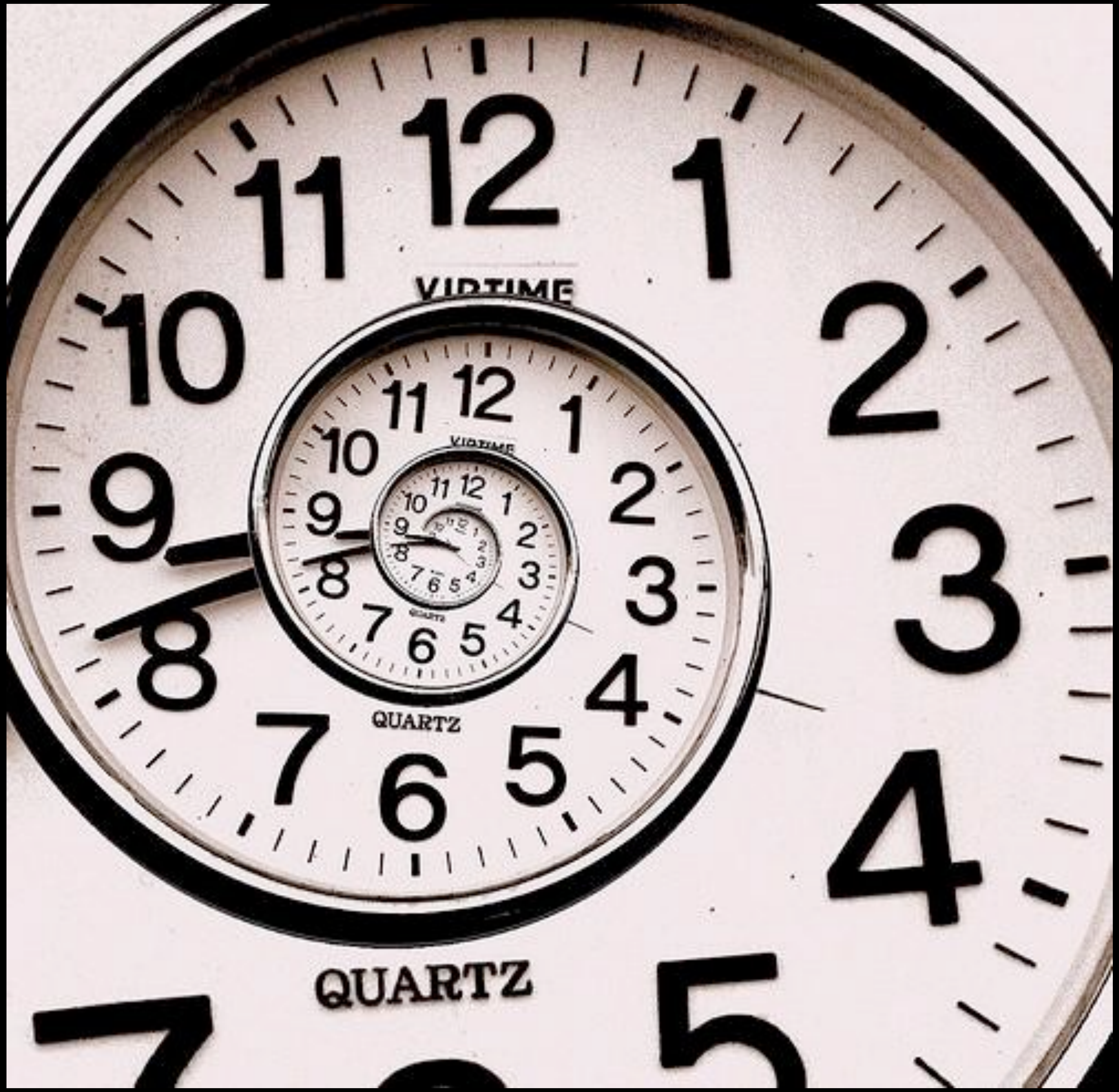
DIY



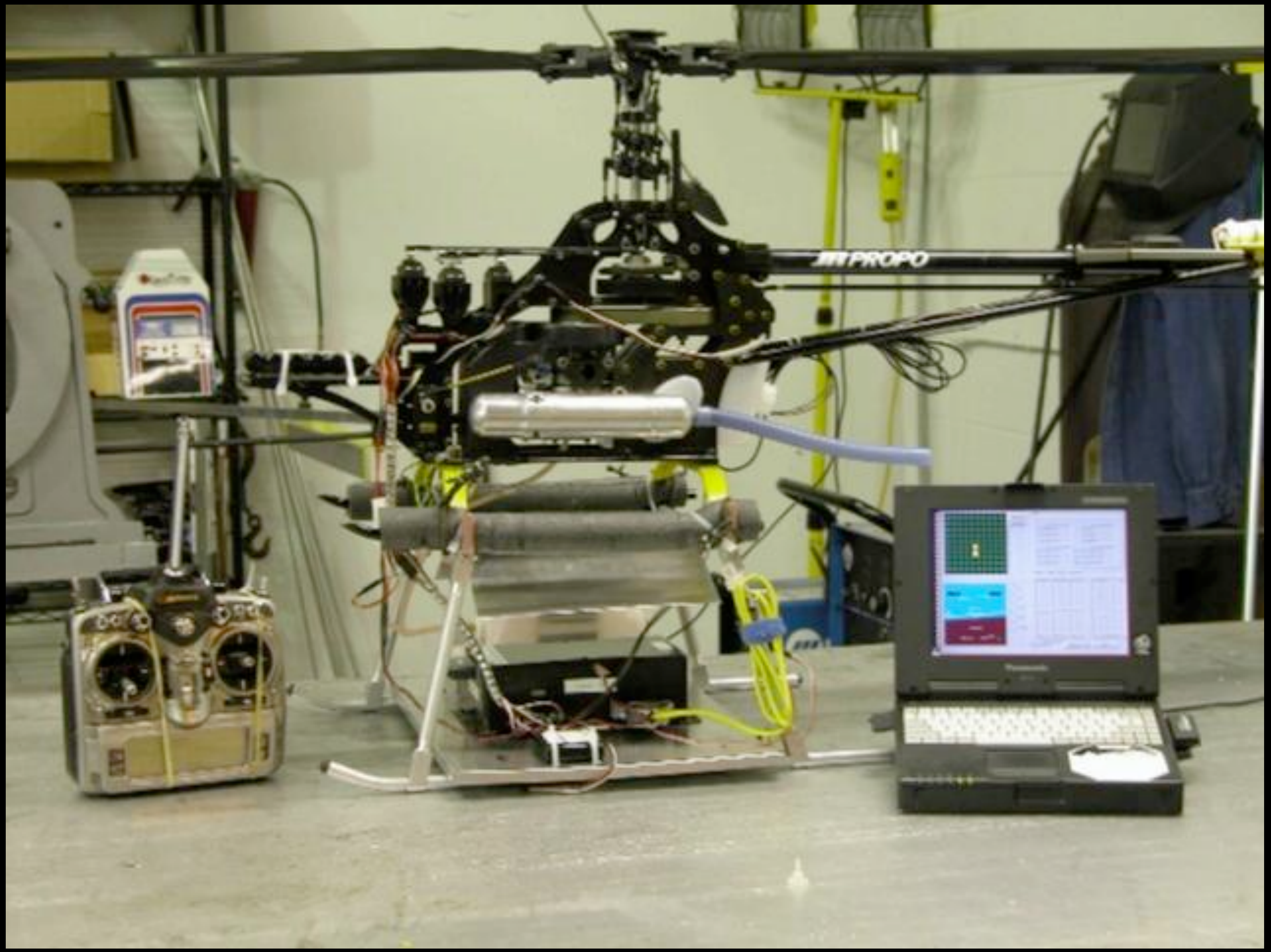
+



Autonomous



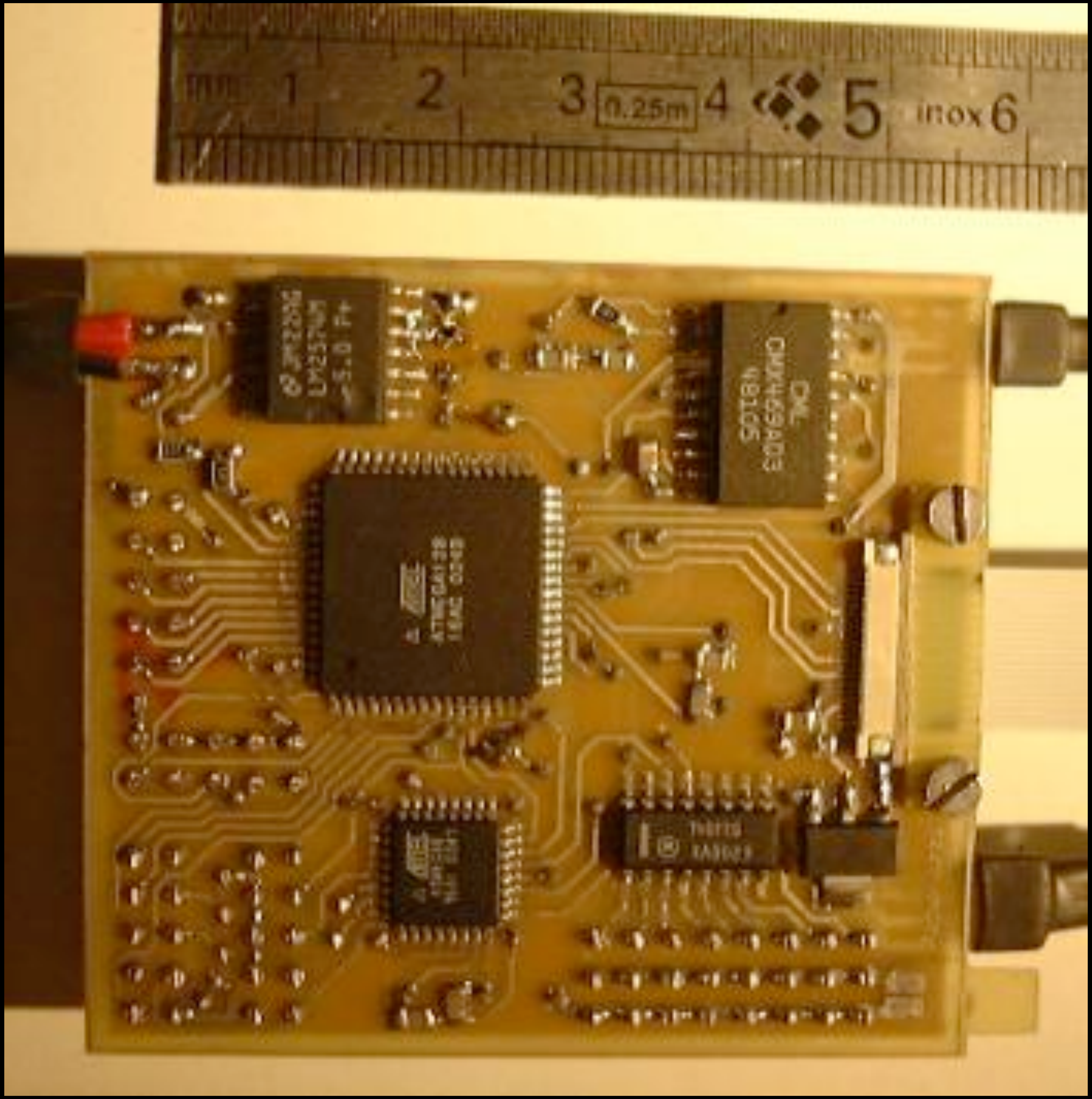
History



autopilot.sourceforge.net

September 2001

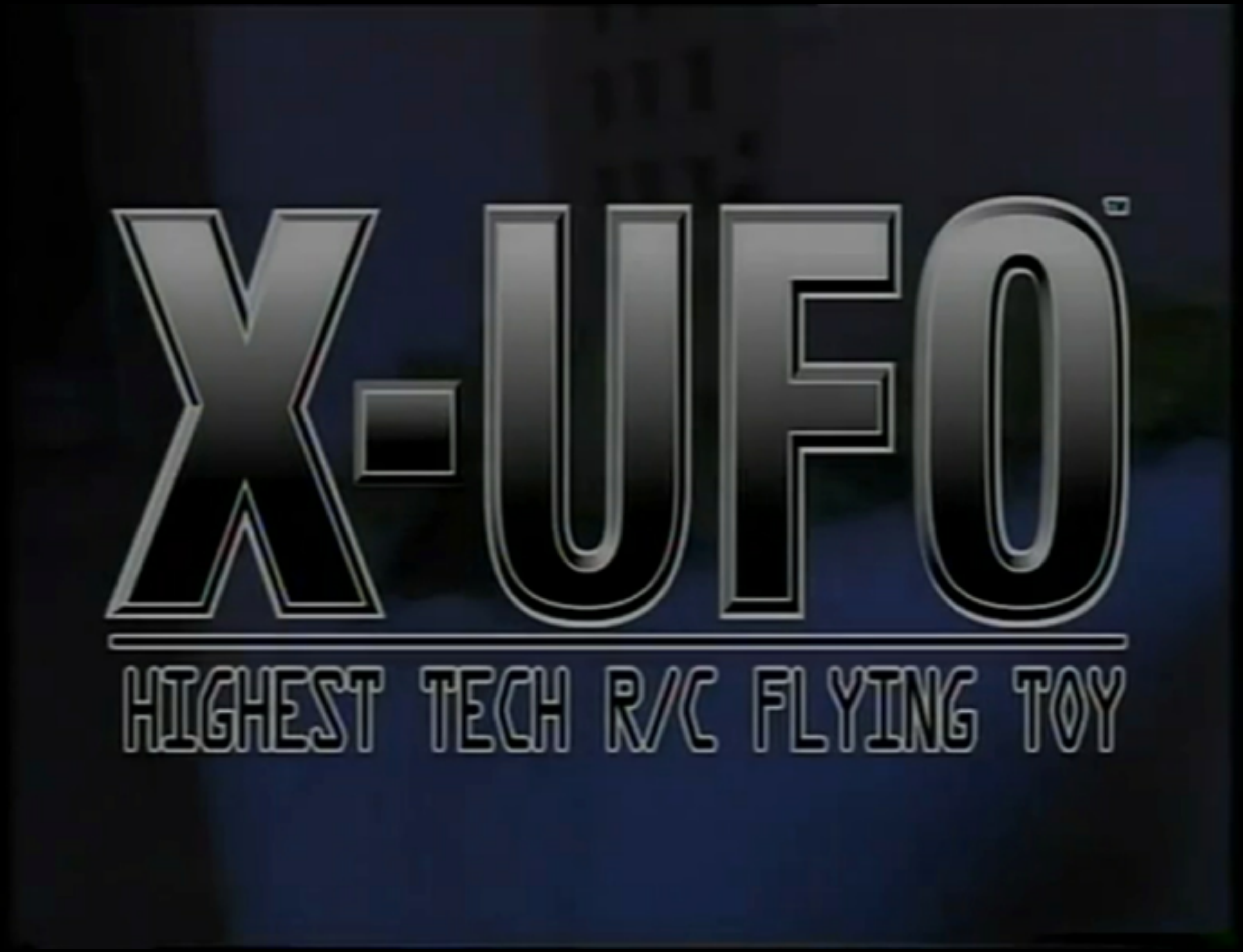
Paparazzi UAV
August 2003

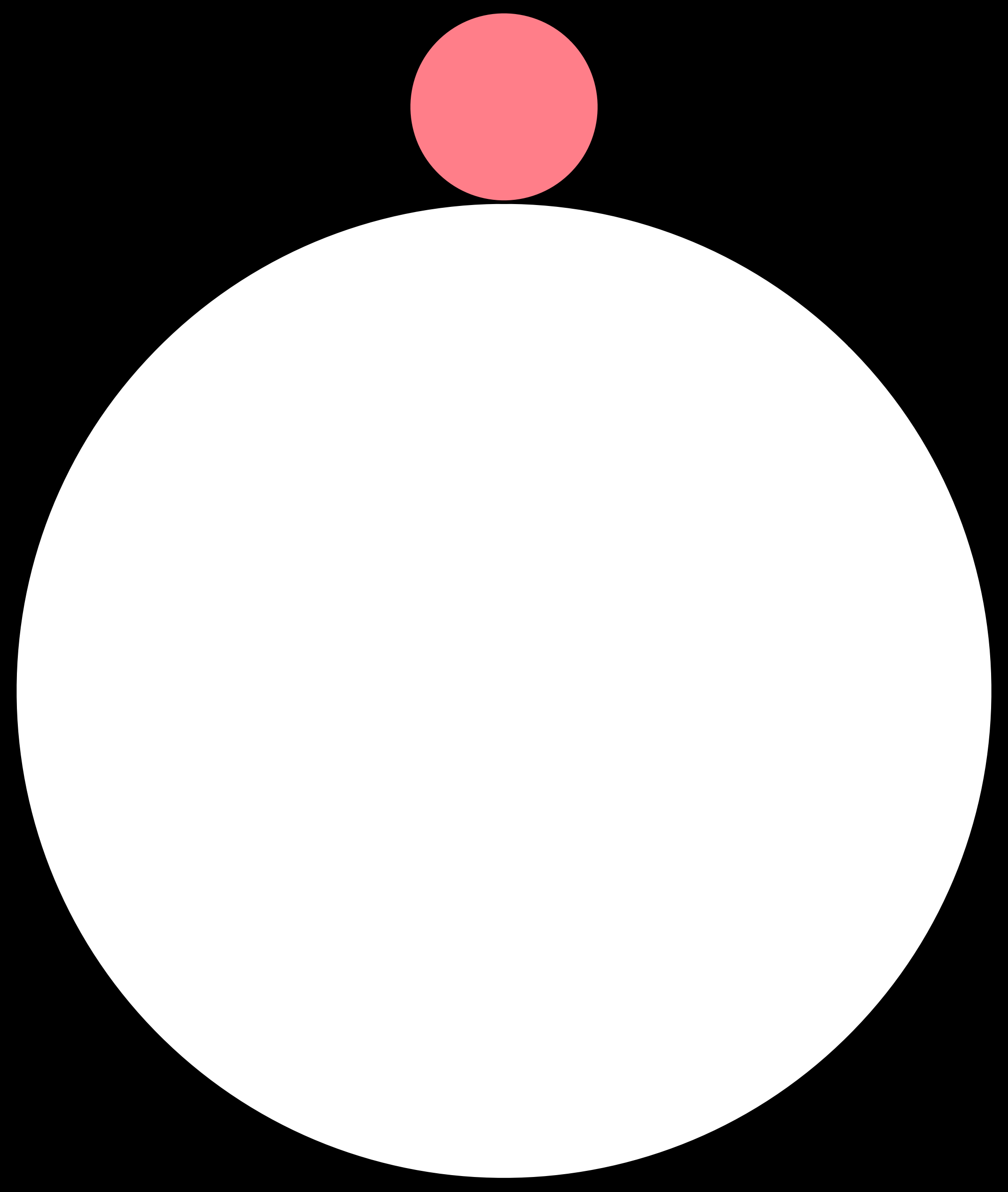

mm 1 2 3 0.25m 4 5 inox 6

2003 Jugend Forscht

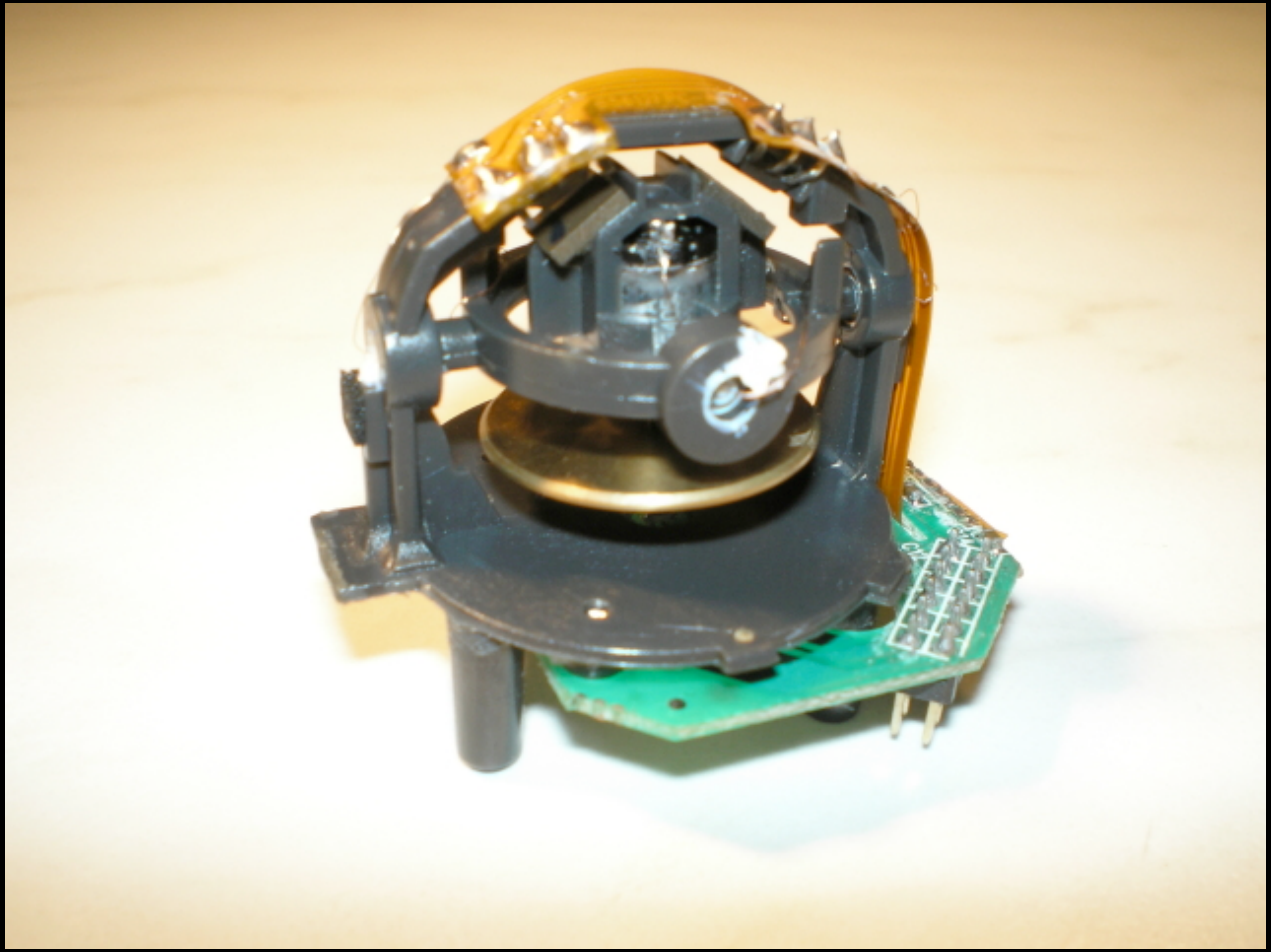
Daniel Gurdan & Klaus Michael Doth

Silverlit®





Stability

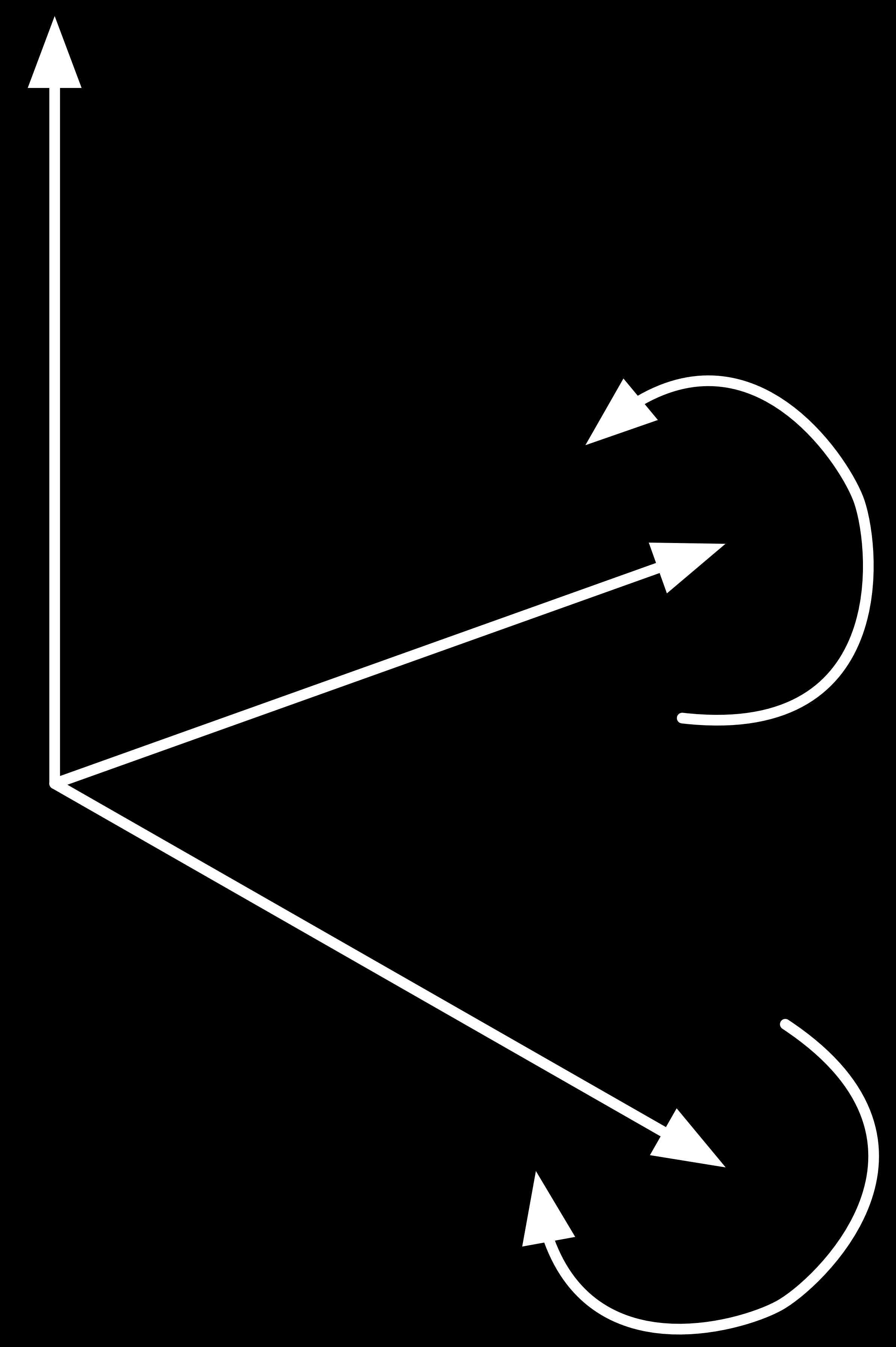


X-UFO mechanical gyroscope

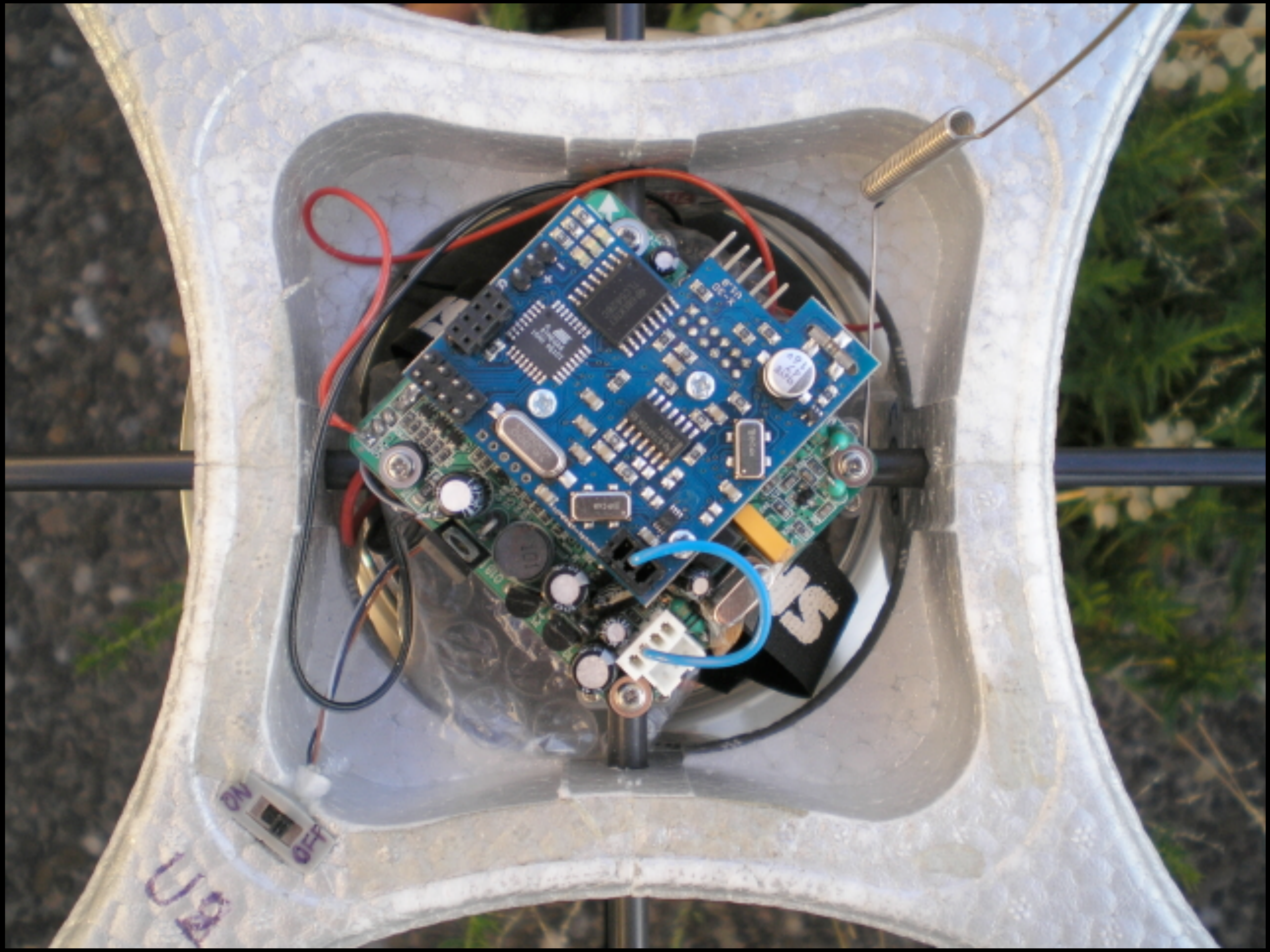

Registrieren
Einloggen, um PNs zu lesen
Login
forum.x-3d.de
das erste deutsche Quadrocopter-Forum
Board-FAQ | Suchen | Chat | in English
x-3d-shop
Wir ziehen um! Bitte ändert Eure Bookmarks von forum.xufo.net auf forum.x-3d.de!
Aktuelles Datum und Uhrzeit: 2013-11-15 (Fr), 20:54
FORUM.X-3D.DE Foren-Übersicht
Unbeantwortete Beiträge anzeigen
CLOSED
Forum
Themen
Beiträge
Letzter Beitrag
Knowledge Base
FAQs und Anleitungen
Das X-UFO Nachschlagewerk (im Aufbau)
29
58
2010-02-06 (Sa), 23:48
ICH
Multicopter-Technik
Ich wollt nur ganz kurz...
Fragen stellen ohne vorherige Registrierung (wegen Spamwelle vorübergehend geschlossen)
1130
11212
2013-05-10 (Fr), 17:43
BaerBalu
Das Silverlit X-UFO
Der Klassiker von 2005; Themen zu Reparaturen, kleineren Mods und Basteleien
883
10283
2013-10-28 (Mo), 10:54
BaerBalu
X3D-BL
Diskussion zu Upgrades für das X-UFO und zum kompletten X-BL (X-3D, X-Base, X-3D Funpilot etc.)
1926
36012
2013-11-07 (Do), 20:36
Spookymike
TT-Copter
TT-Copter - ICH wollte eigentlich nur fliegen...
538
8921
2013-05-05 (So), 21:04
ICH
Andere Multicopter-Projekte und Eigenbau
Für Selbermacher: Hier haben Projekte wie UAVP, Mikrokopter, Quadrocontrol und Armokopter ihren Anfang gemacht...
852
22487
2013-11-08 (Fr), 19:28
Jaro
Intelligente Nutzlast
Projekte, um das UFO zu mehr als zum "Spielen" zu nutzen
156
2122
2013-09-20 (Fr), 14:00
S3NS3
Flugmodellbau allgemein

X-UFO forum

X-UFO Plottermeier gyroscope mod

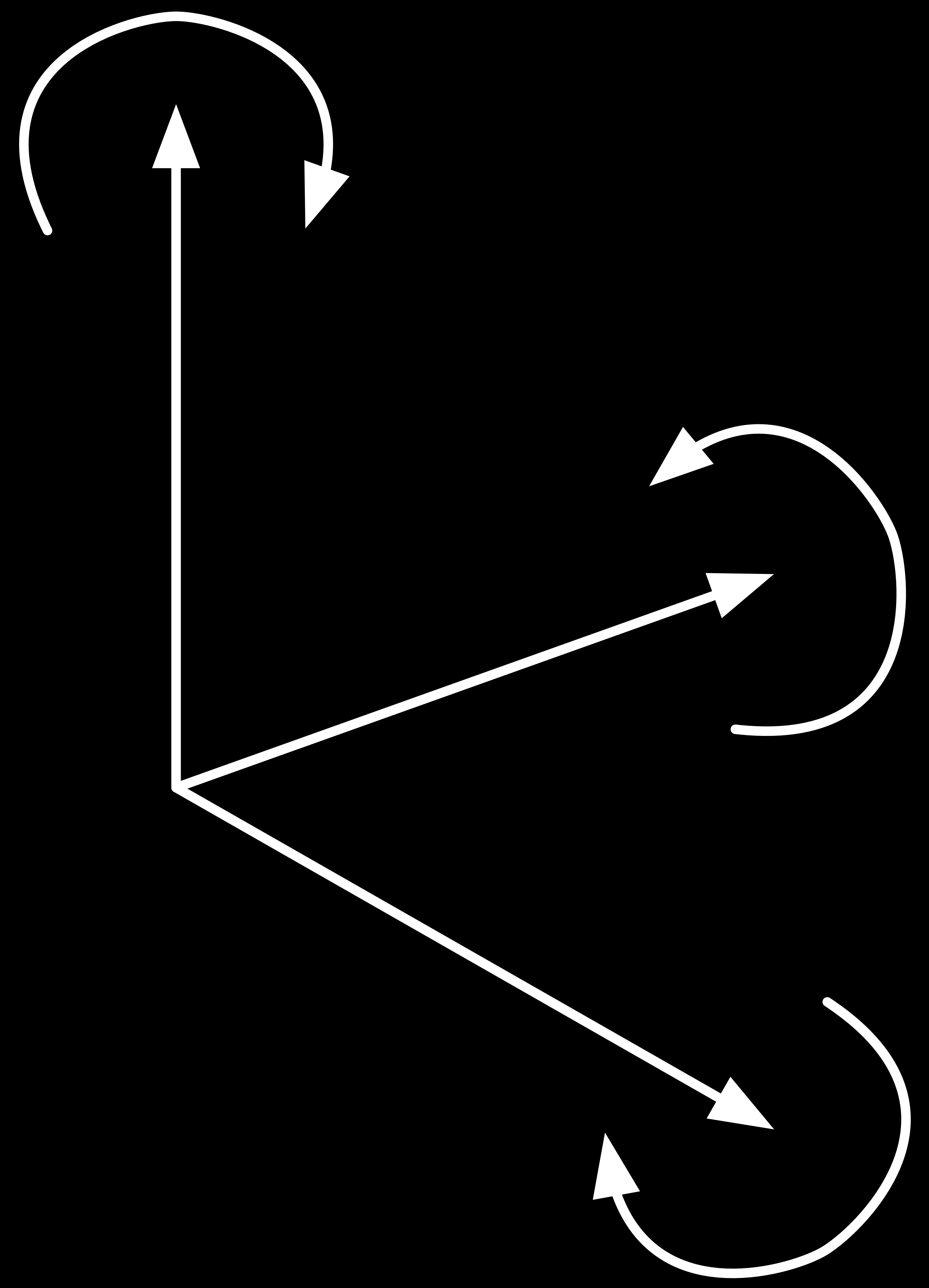


2 DOM
(Degrees Of Measurement)

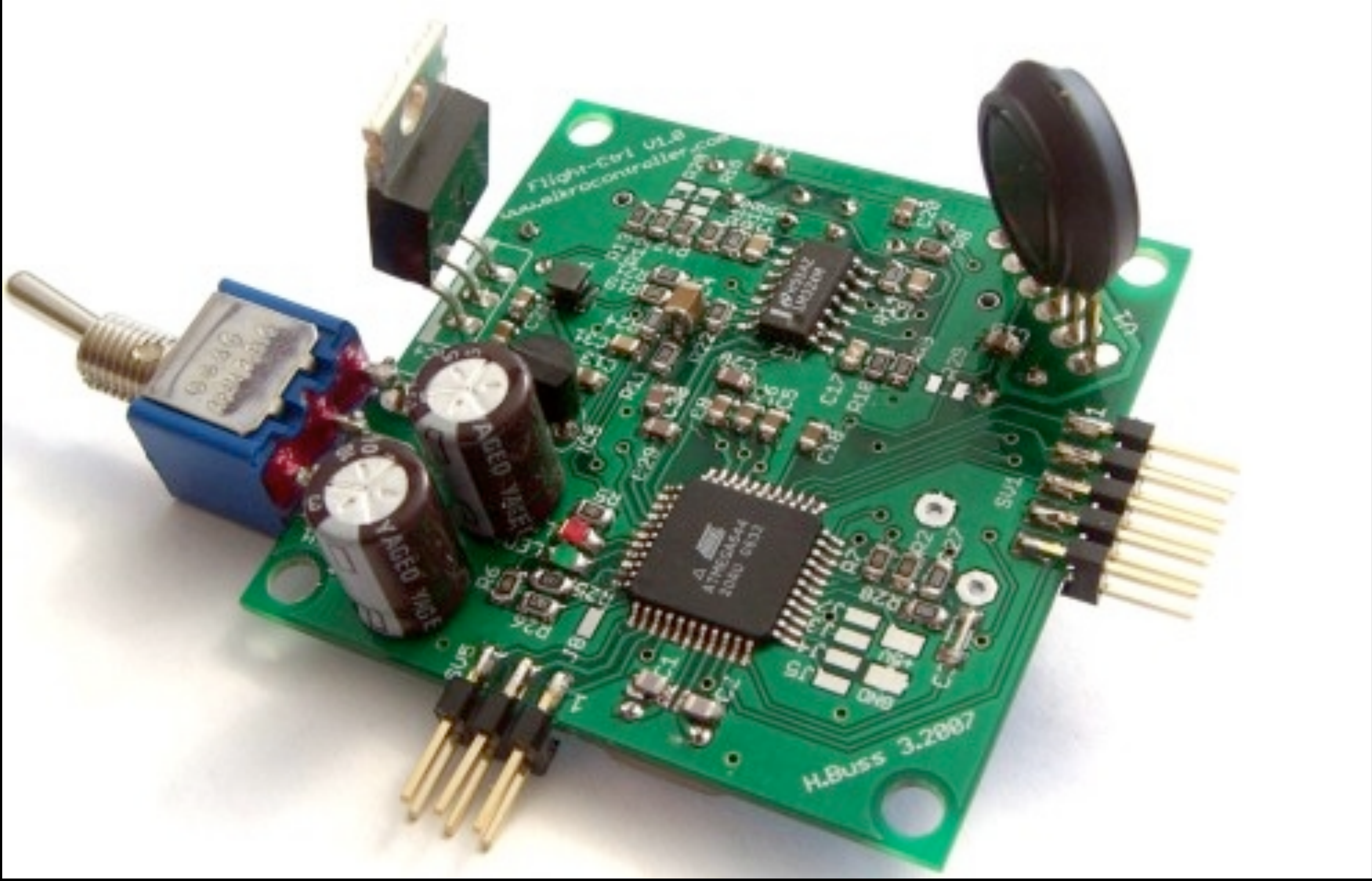


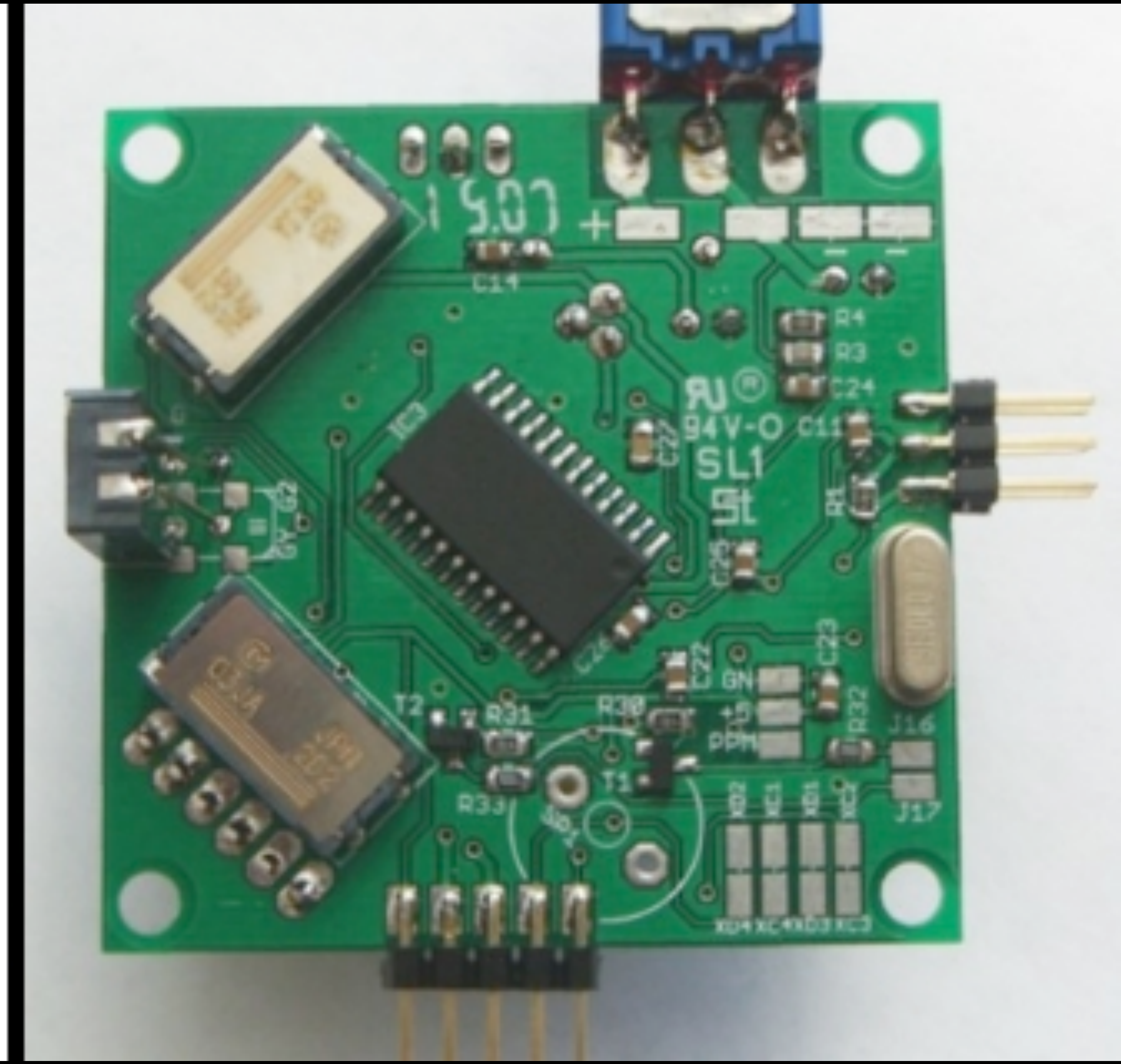
X-UFO AscTec

X-3D

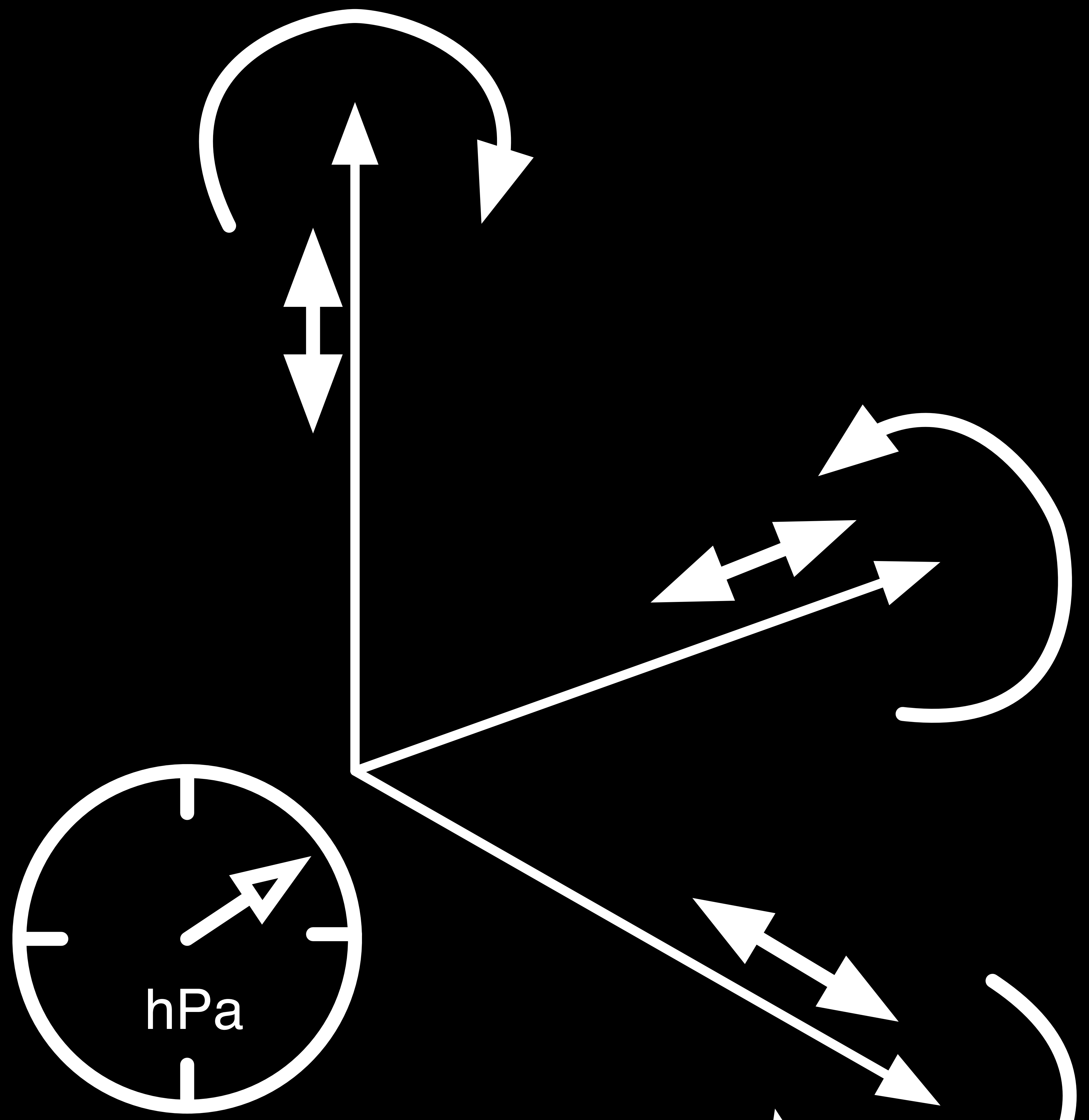


3 DOM
(Degrees Of Measurement)



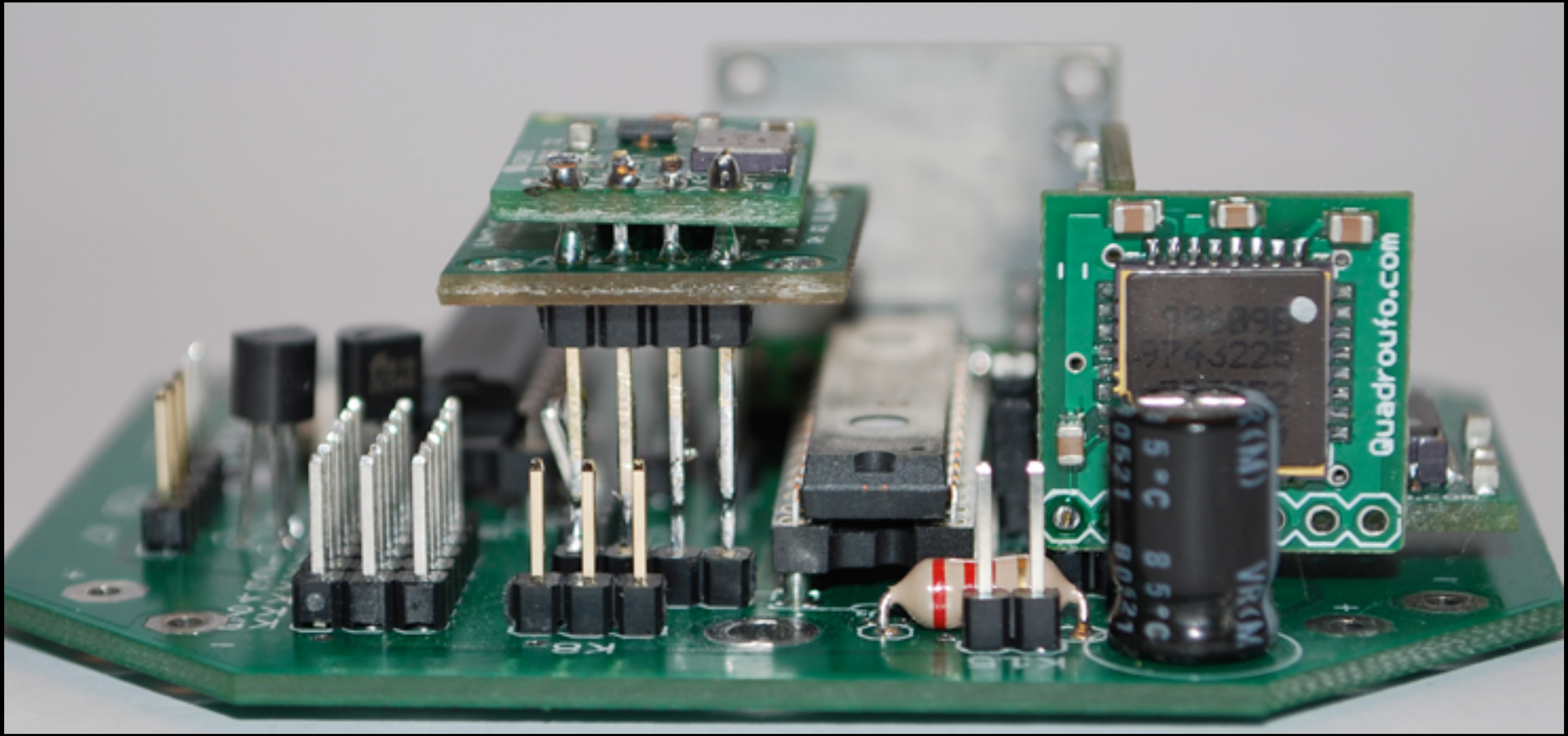


Mikrokopter
Flight-CTRL

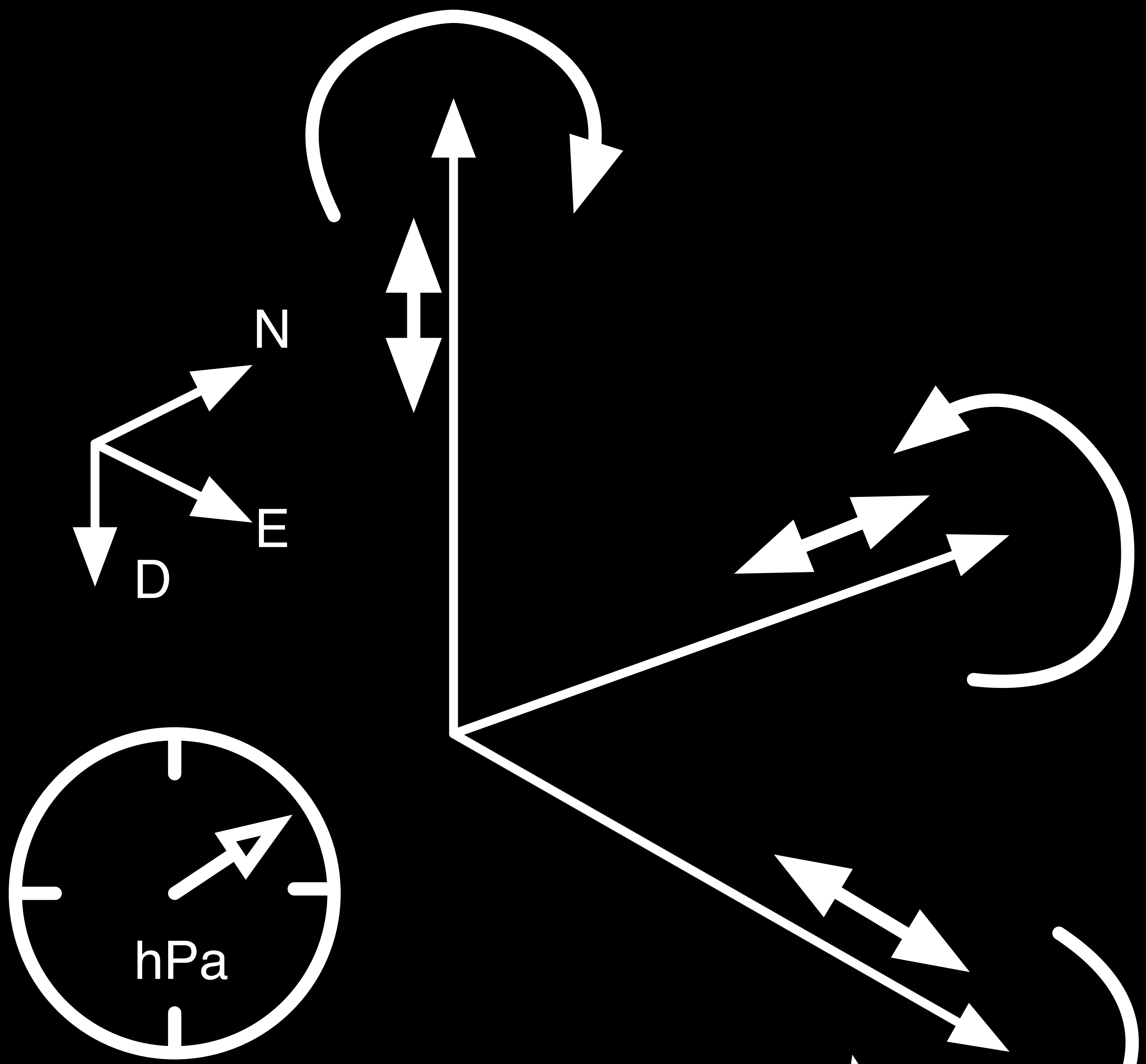


7 DOM

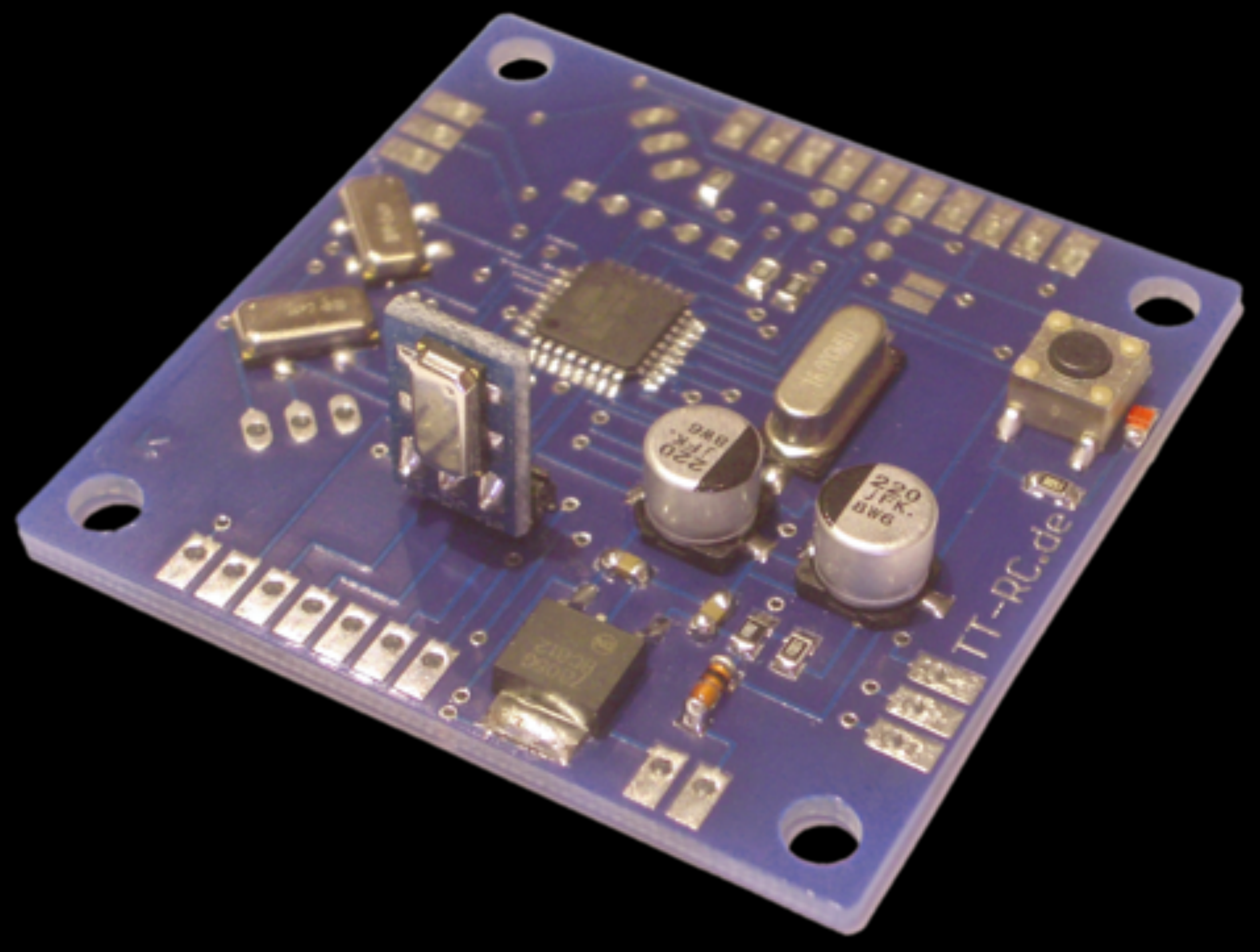
(Degrees Of Measurement)

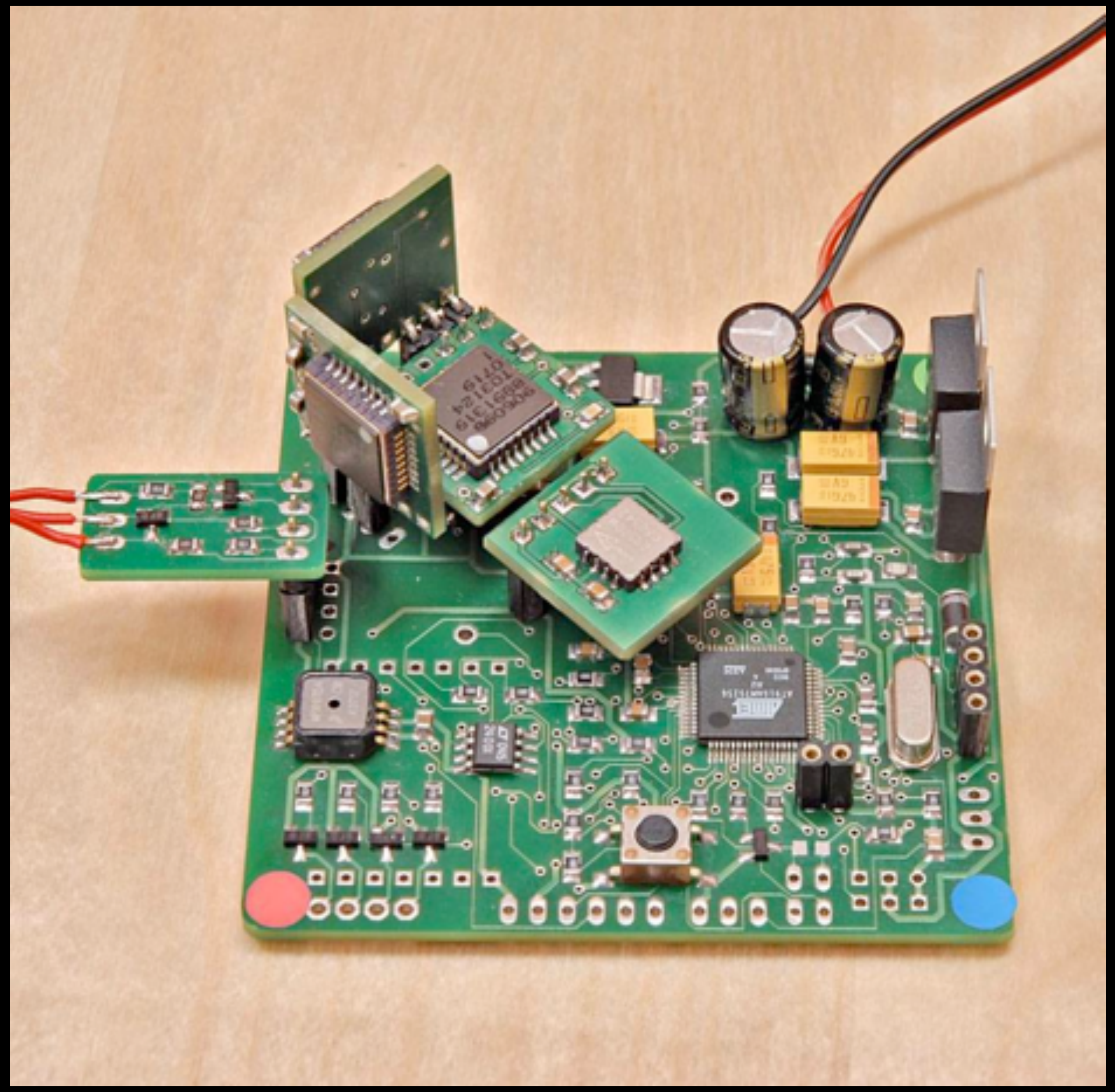


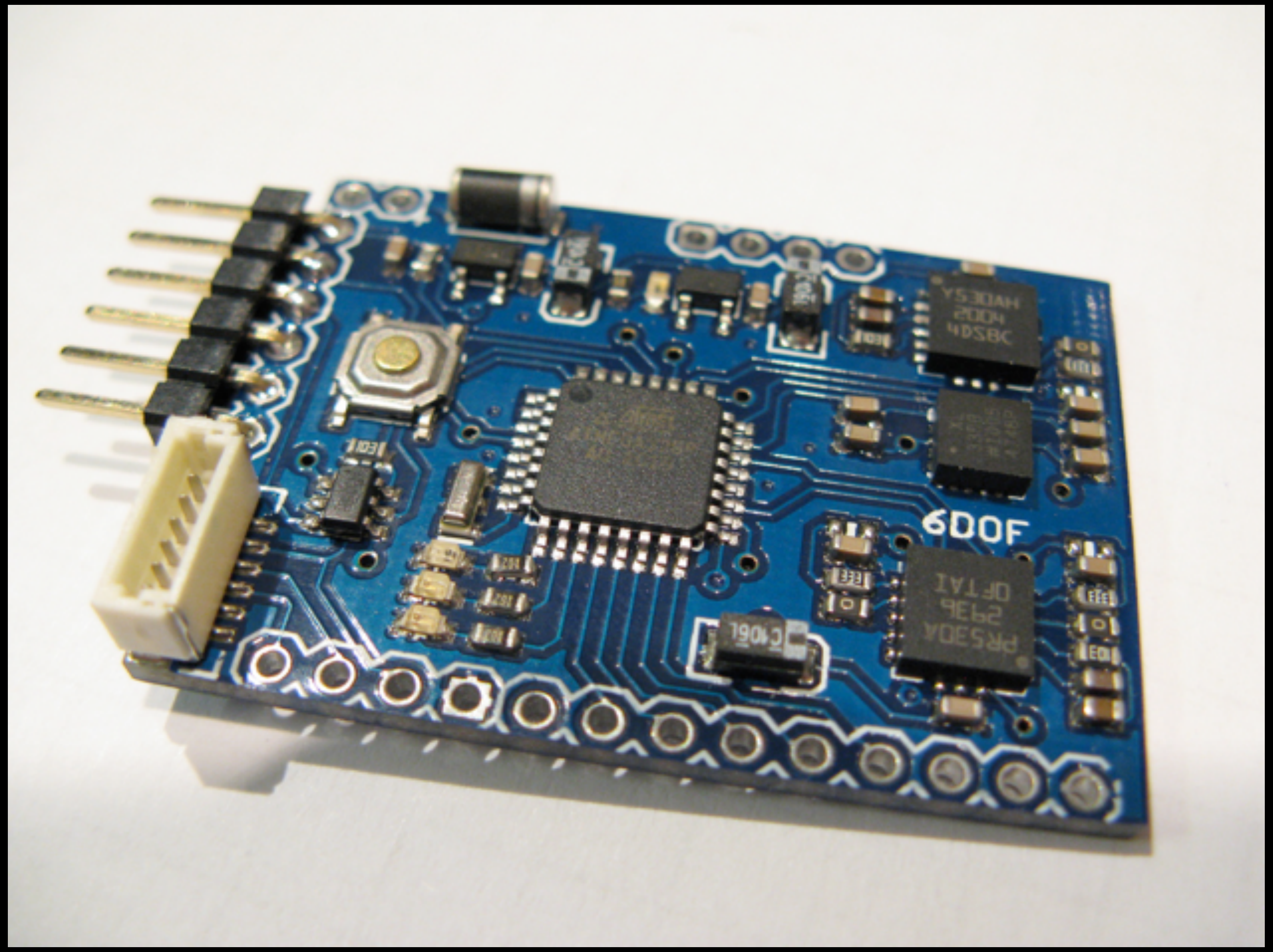
UAVP
aka. wolferl



10 DOM
(Degrees Of Measurement)



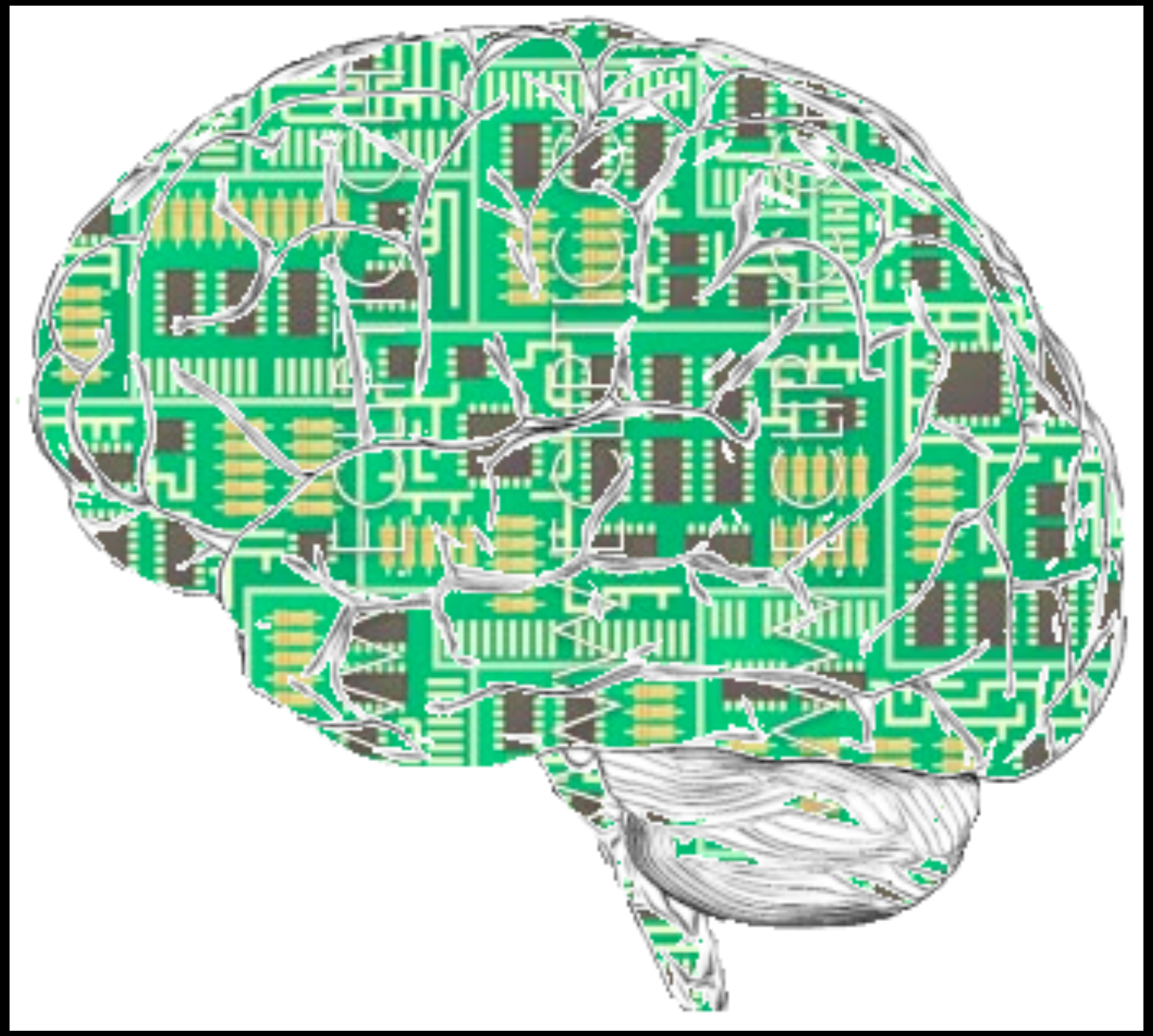




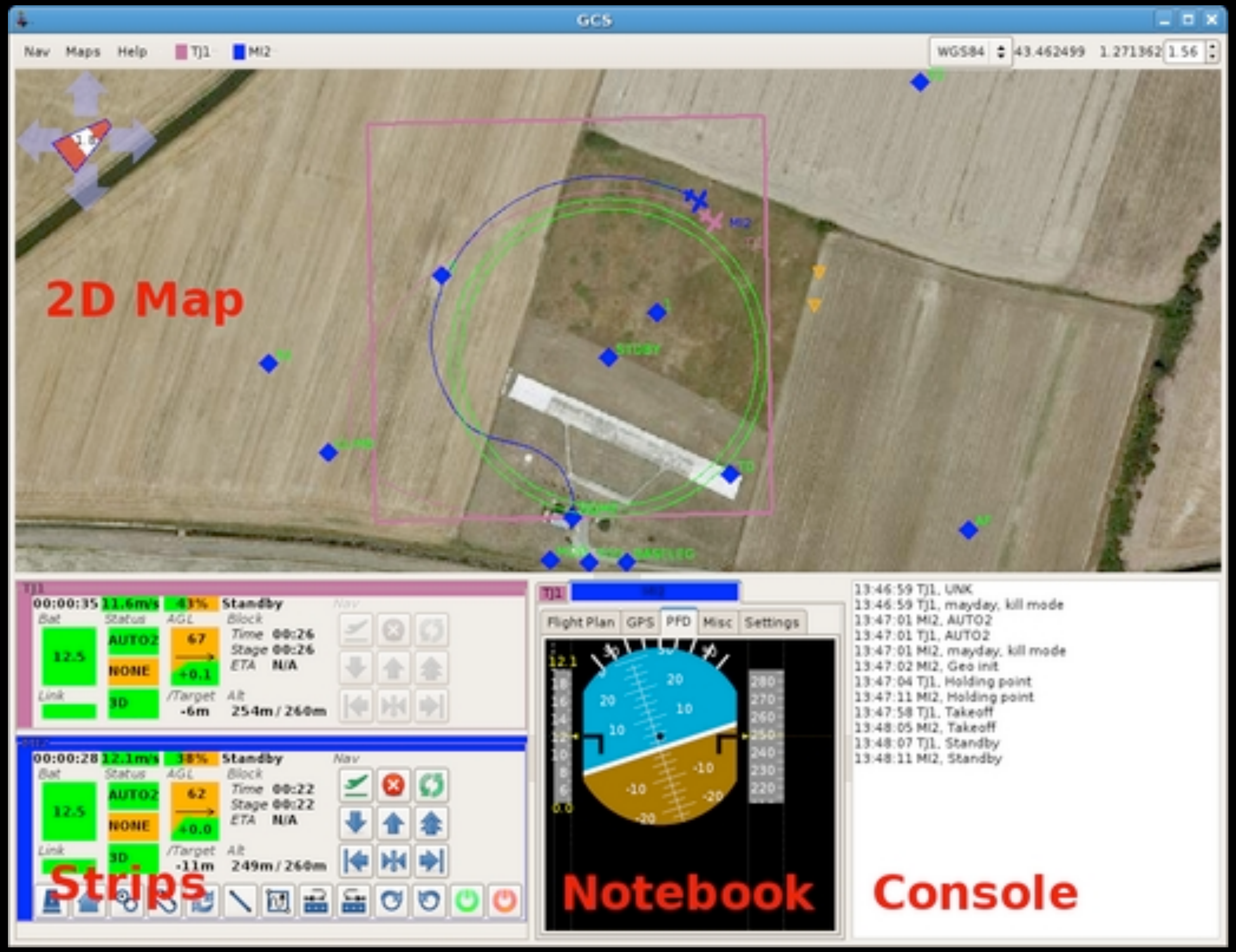
TT-Copter

Arm-O-Kopter

ArduImu



Autonomity



Booz + IMU + GPS
ARM CPU

Paparazzi
GCS

THE UNIVERSITY of ADELAIDE

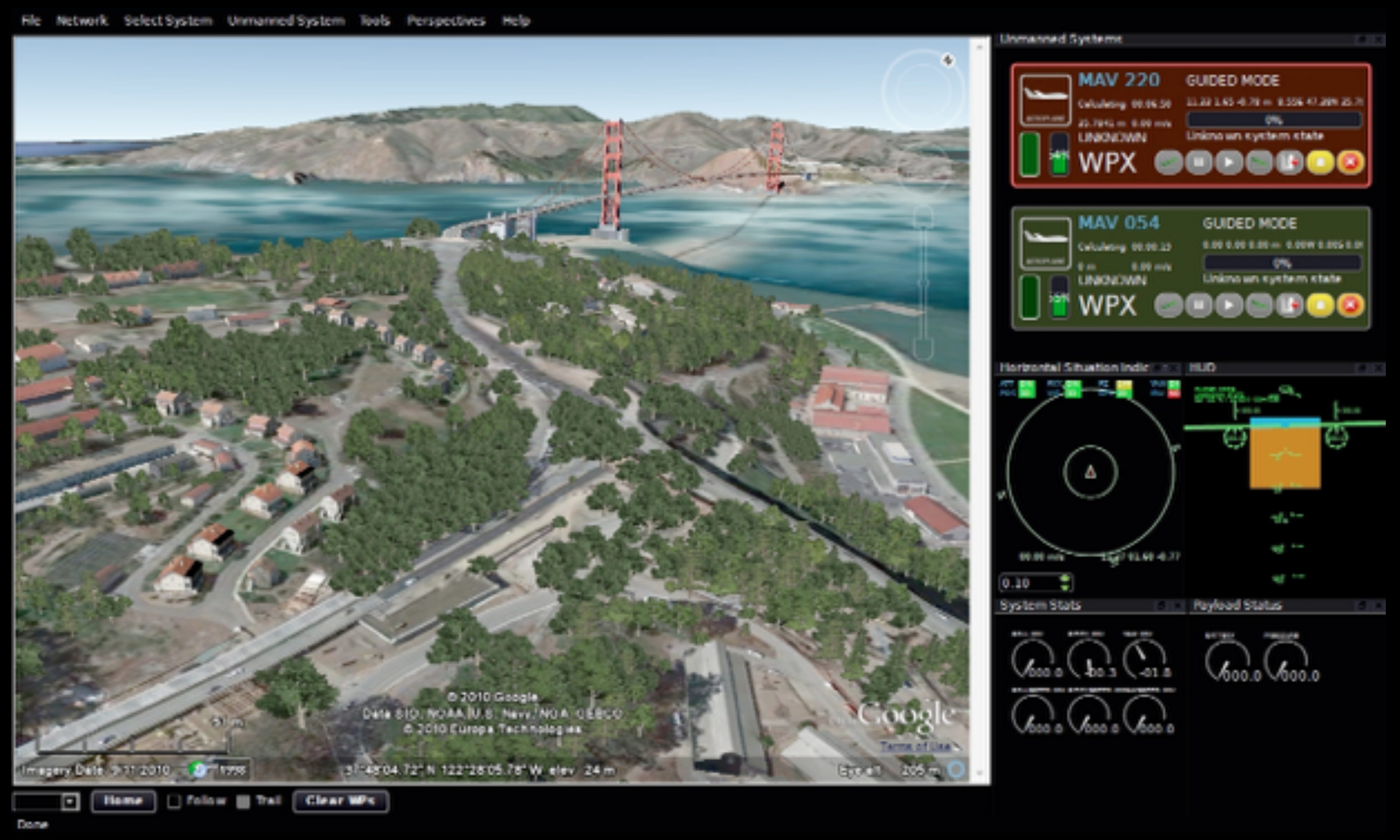
THE UNIVERSITY OF ARIZONA

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

TU Delft
Delft University of Technology

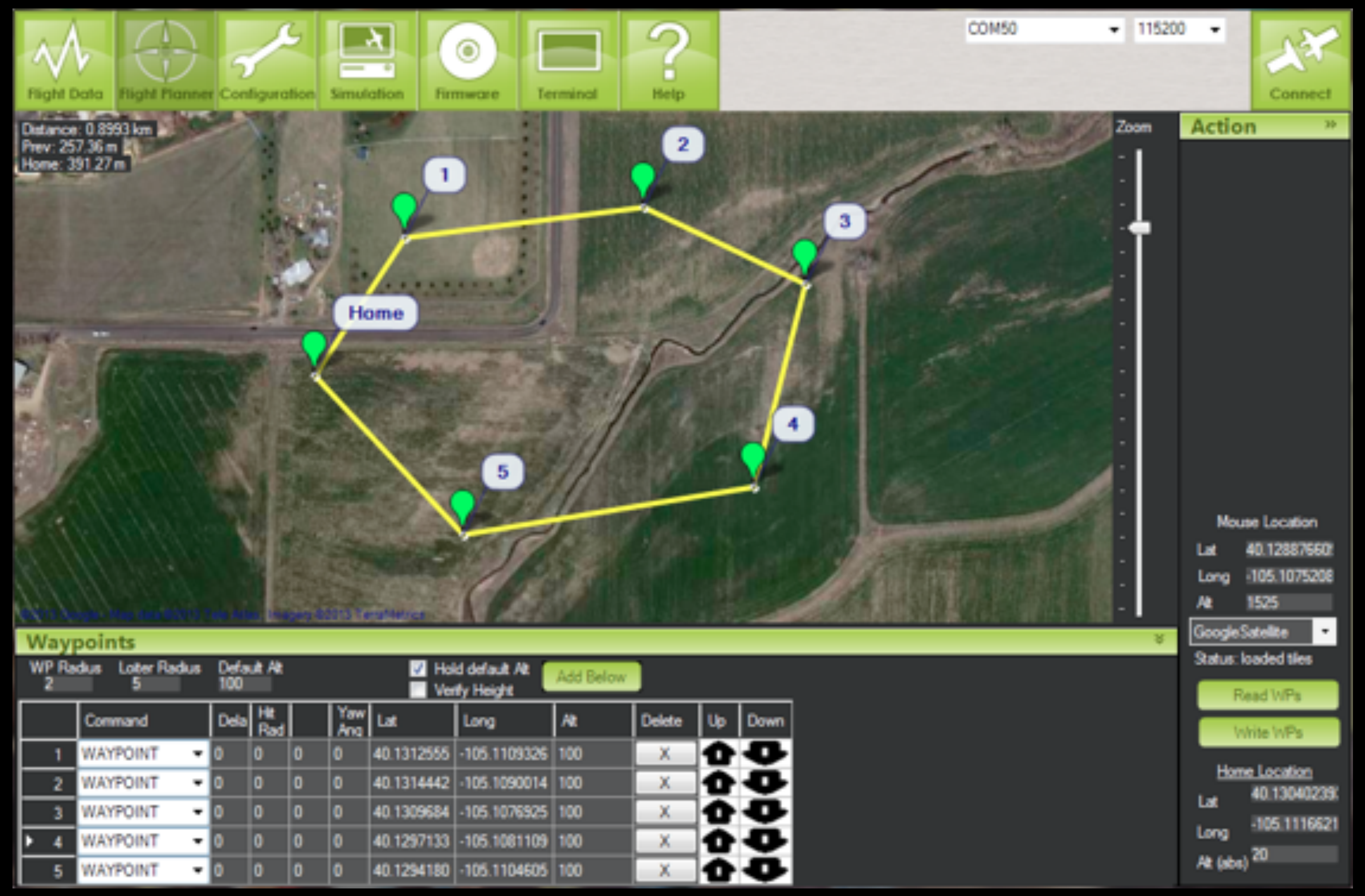
ENAC

UNIVERSITÉ DE SHERBROOKE



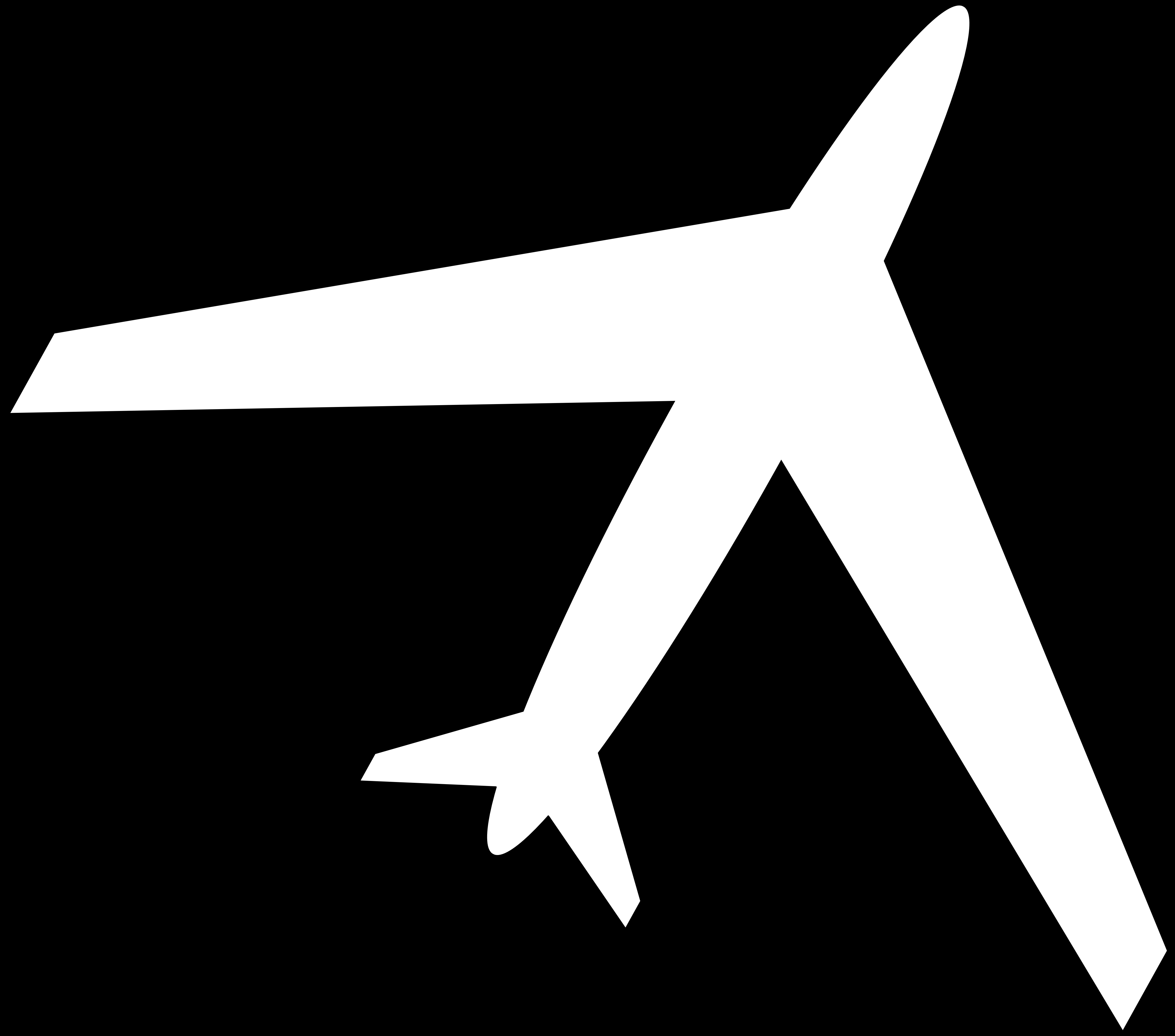
QGroundControl

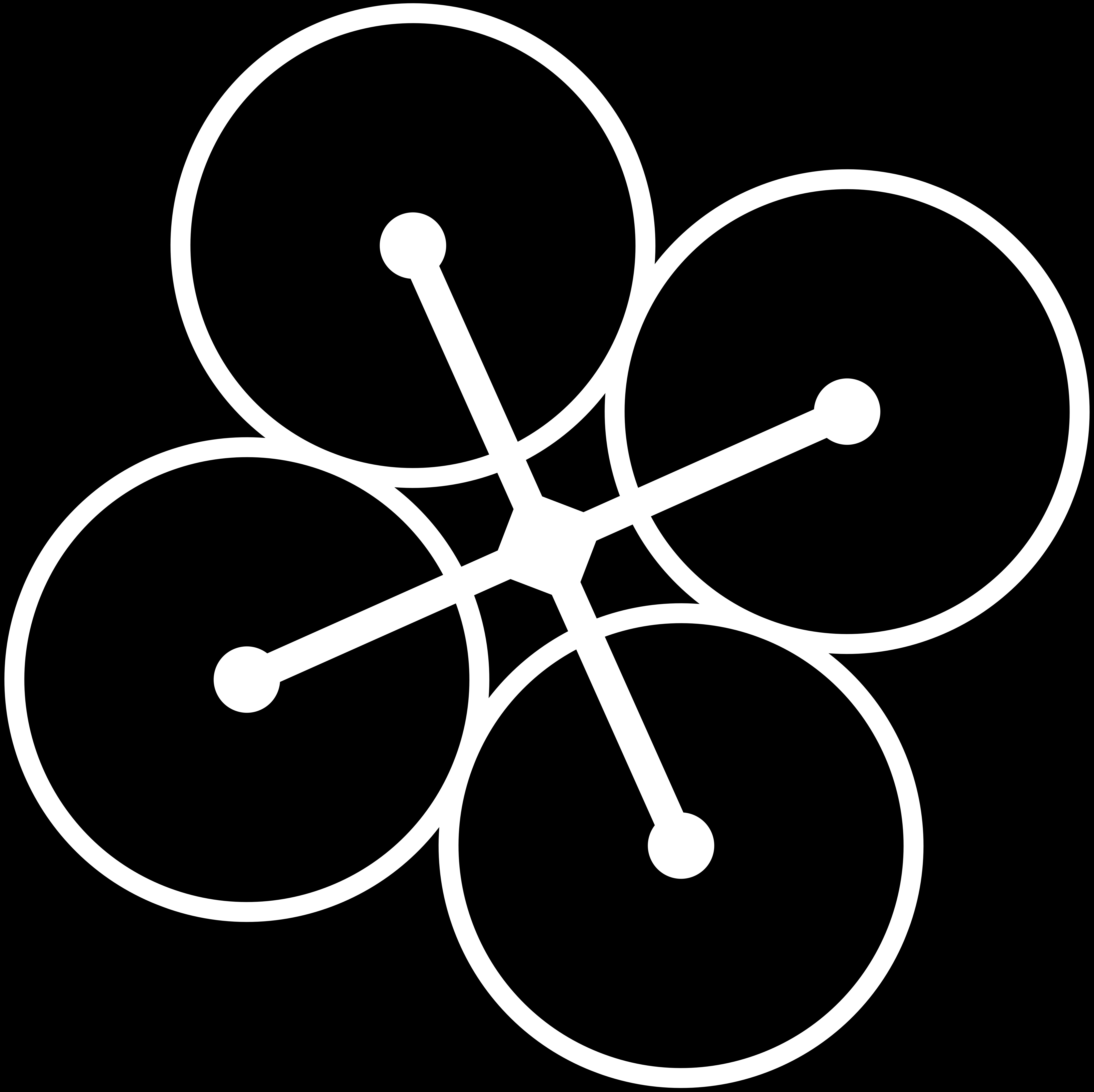
OpenPilot GCS

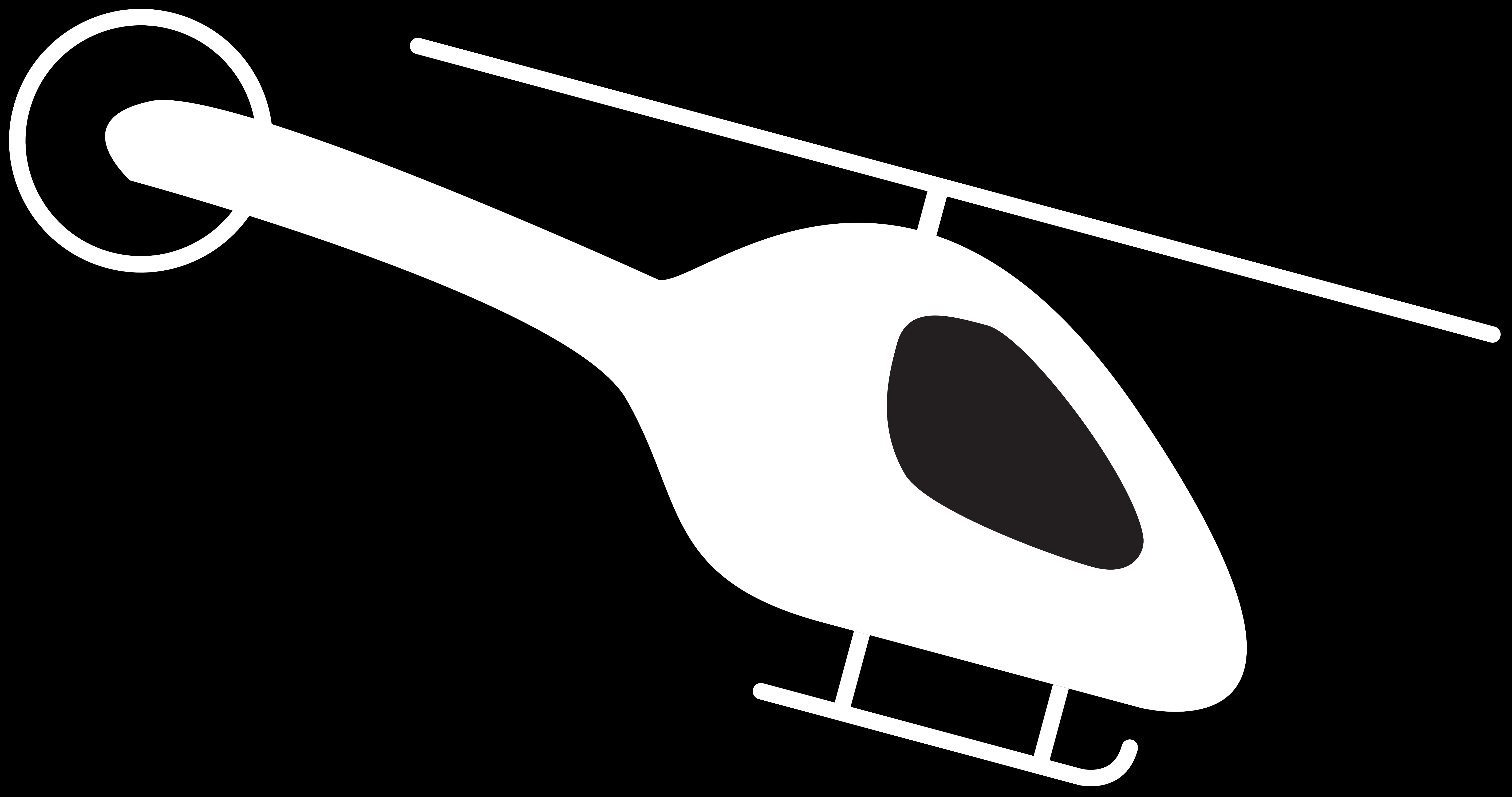


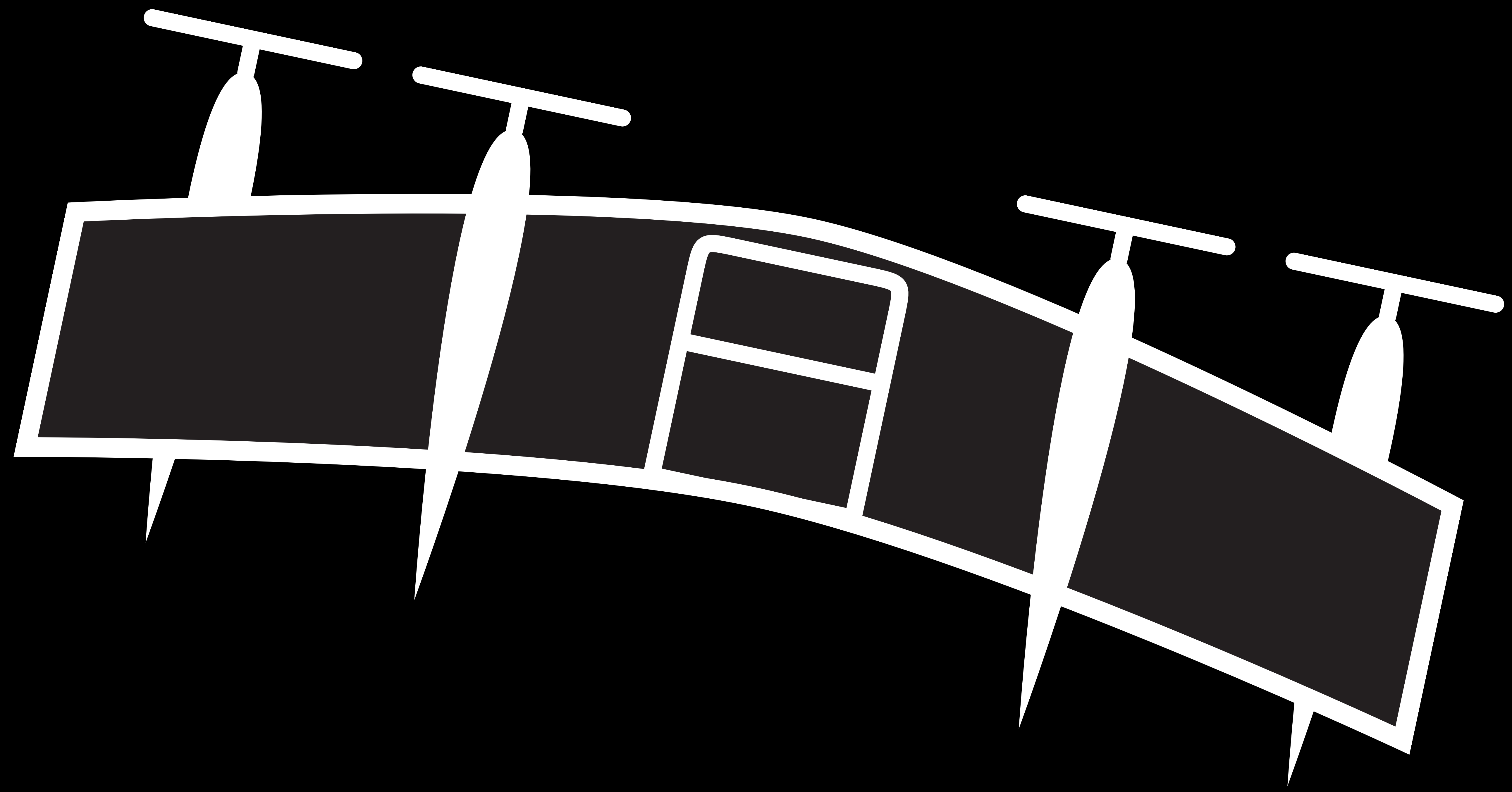
Mission Planner

Today





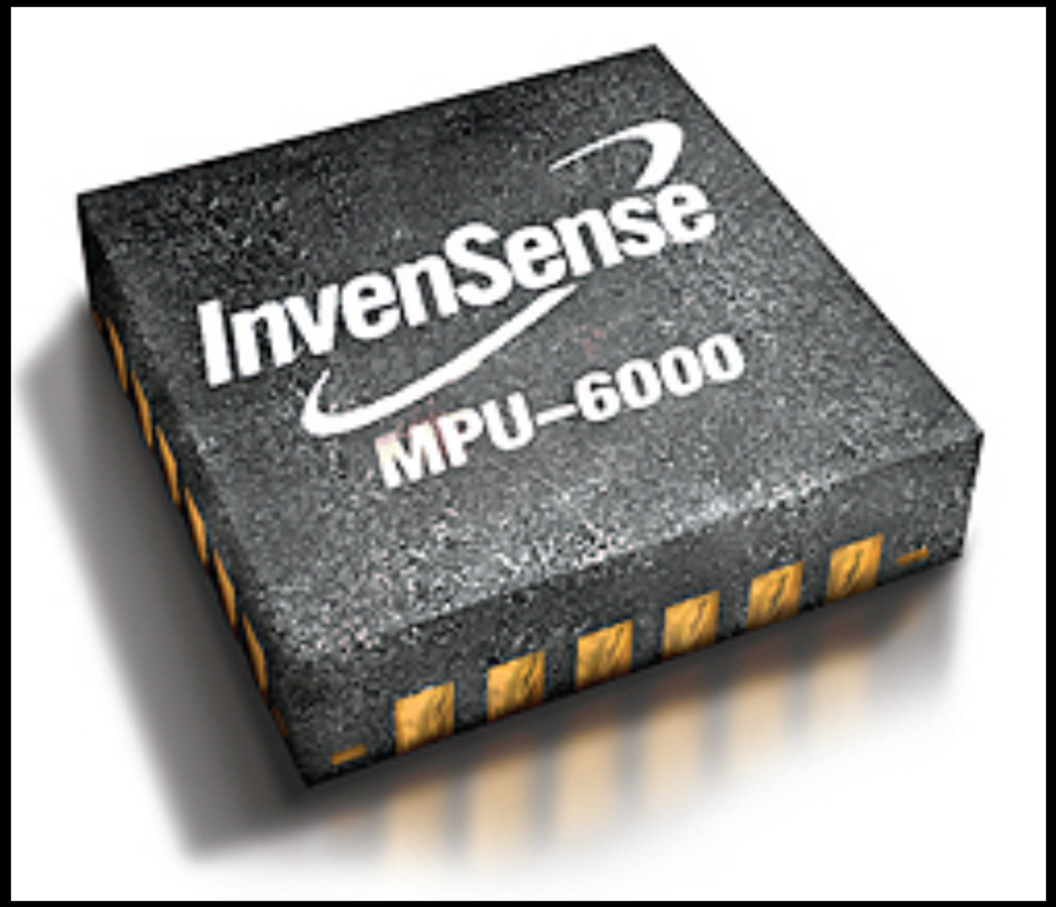




ARM

32-Bit

64MHz+

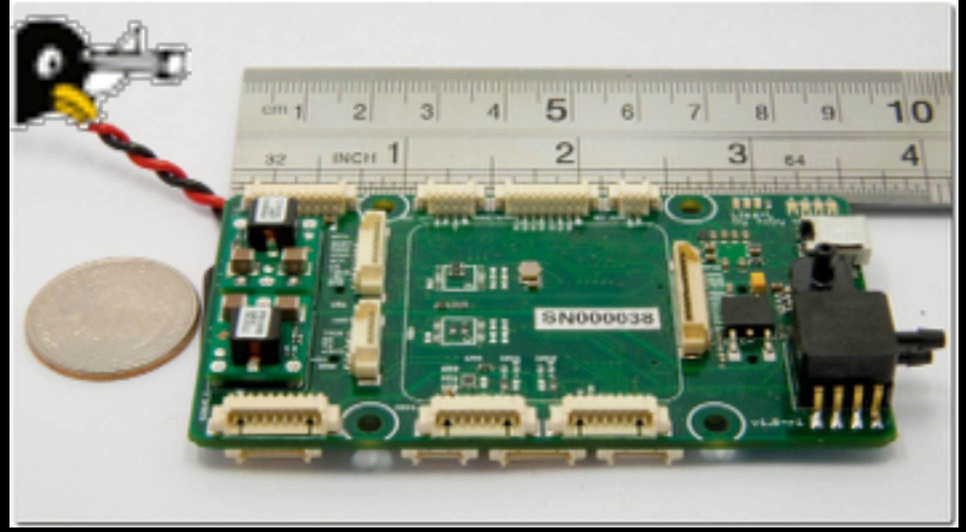


InvenSense

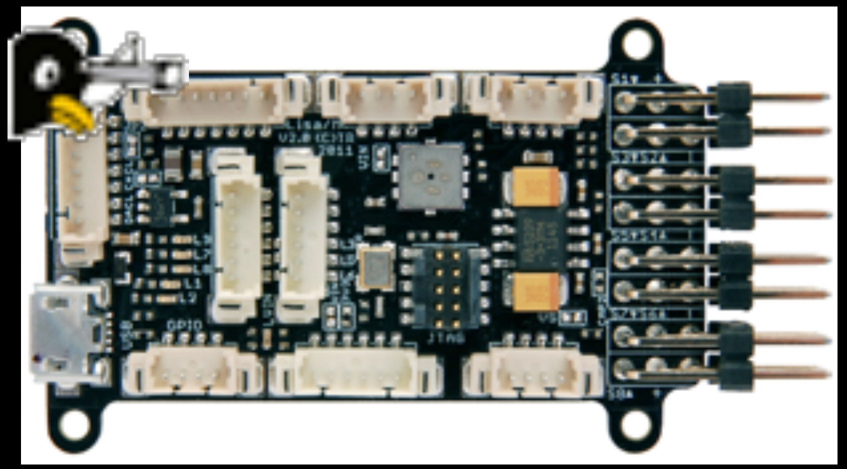
3 x Gyro

MEMS

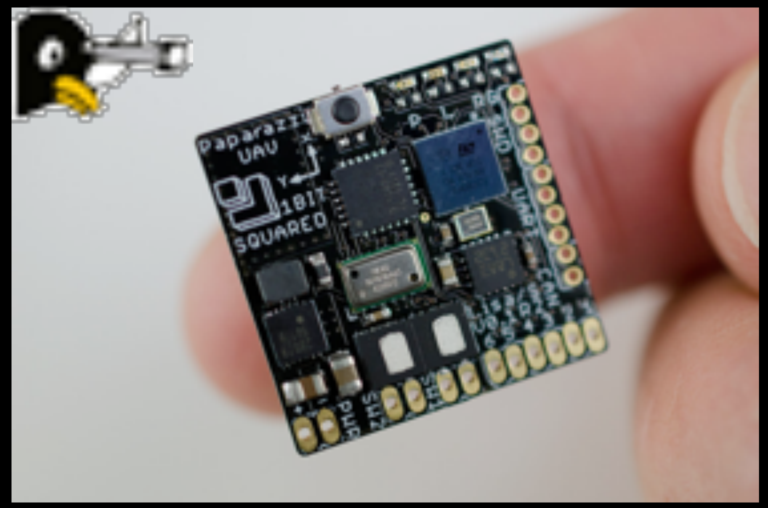
3 x Accel



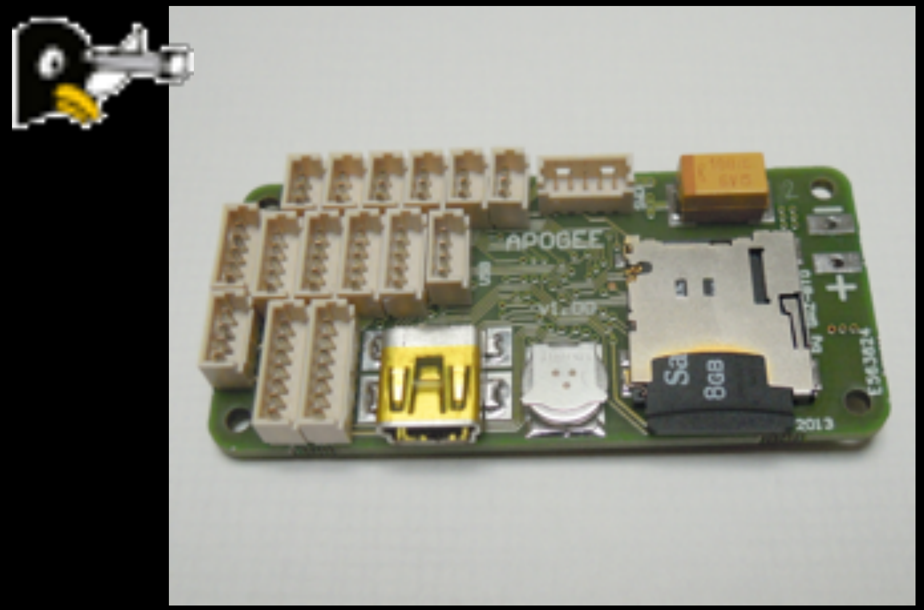
Lisa/L



Lisa/M

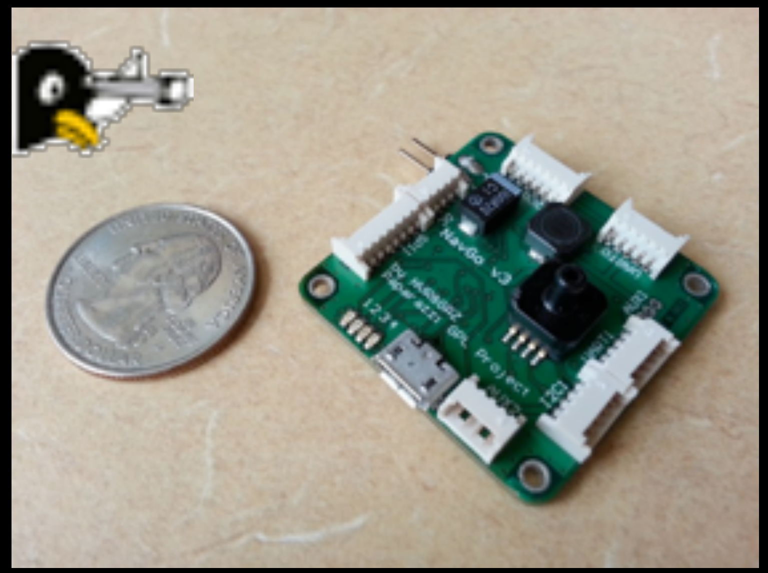


Lisa/S

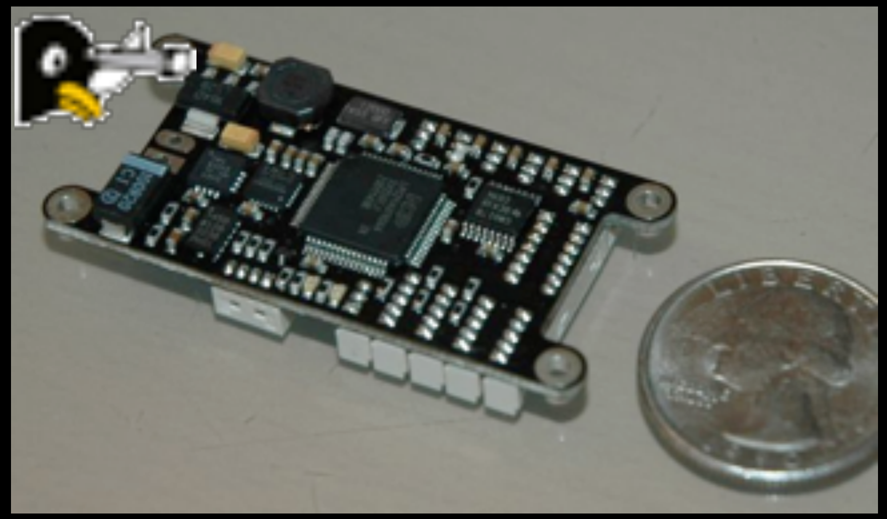


Apogee

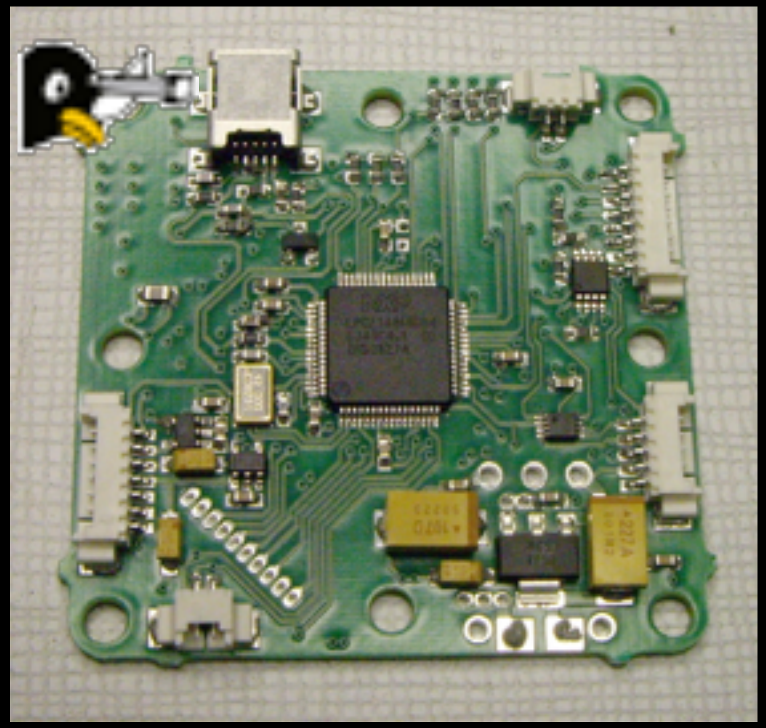
Krooz



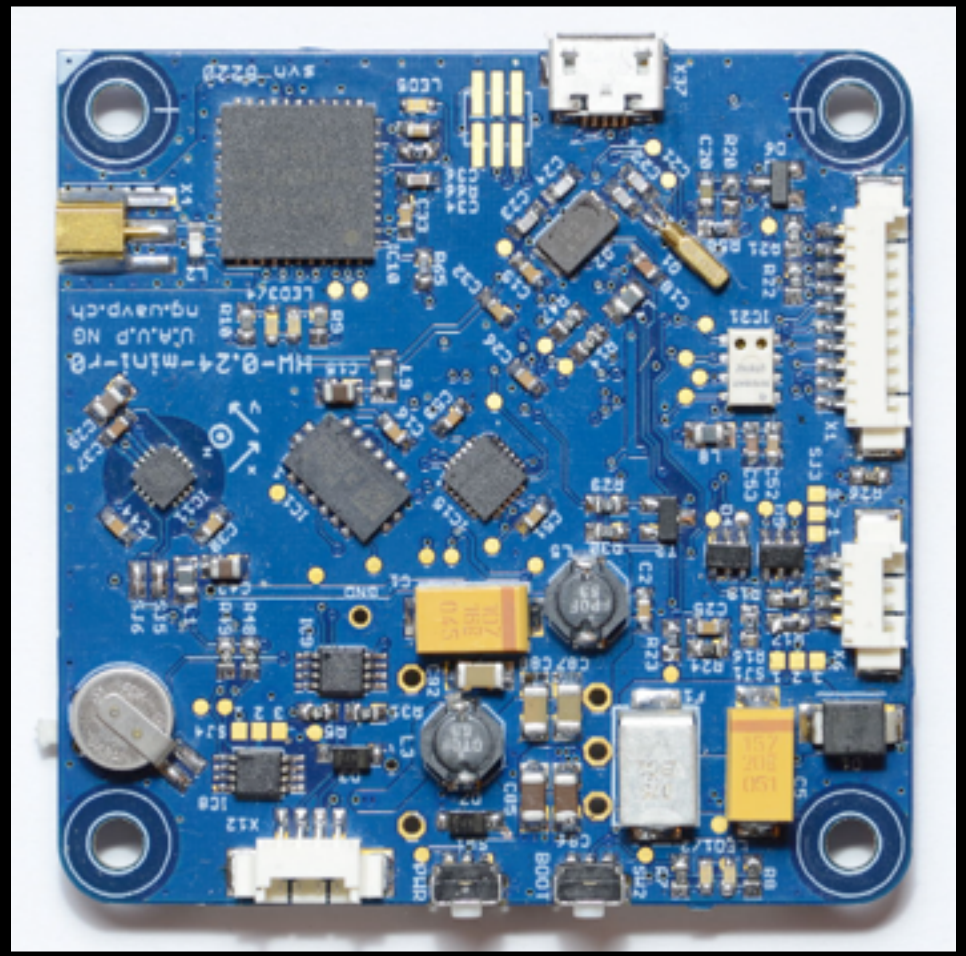
NavGo



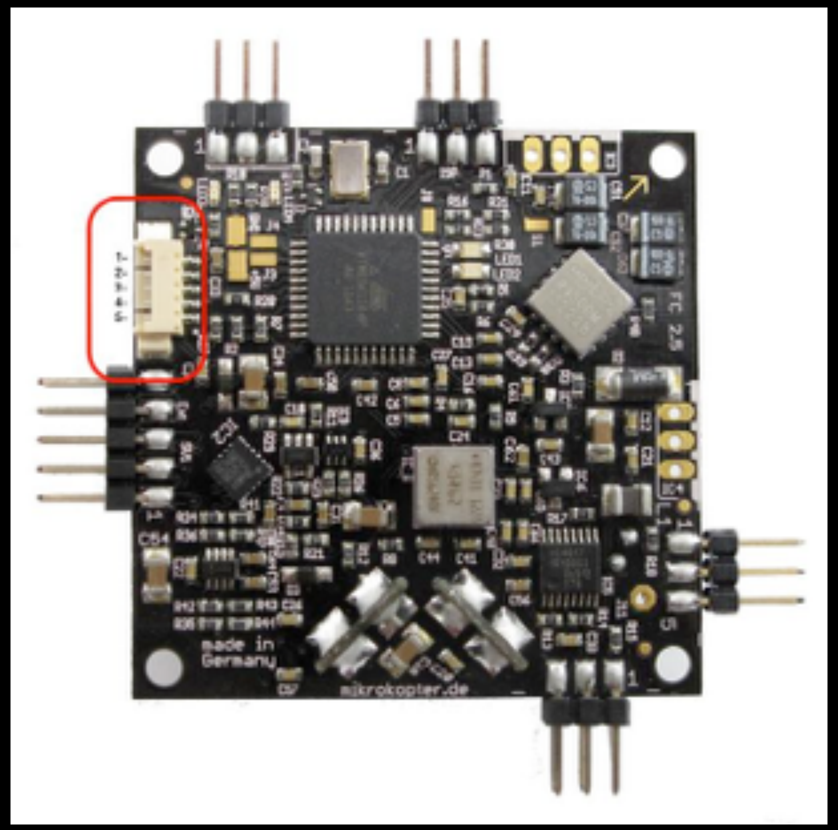
Umarim



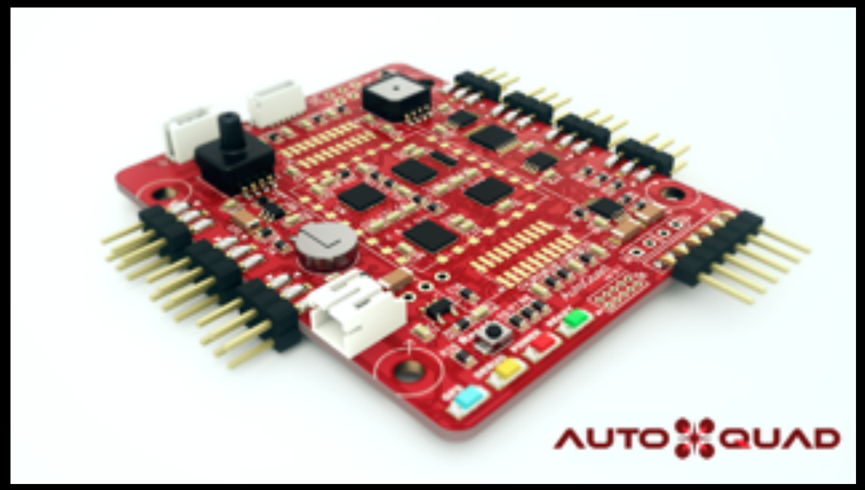
Booz



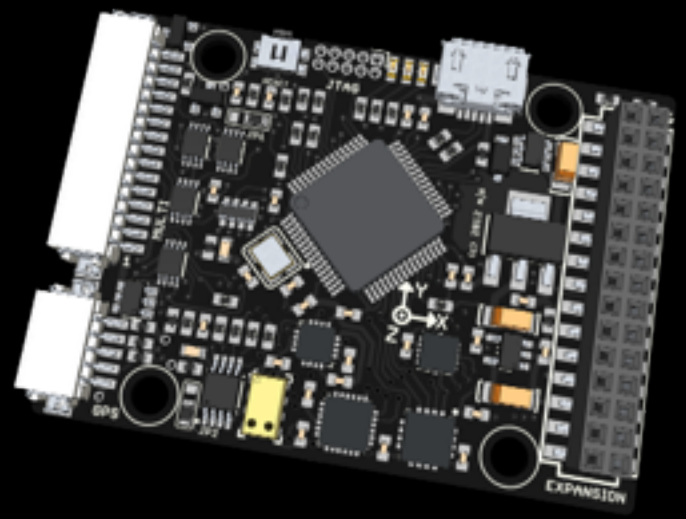
UAVP-NG



MK FlightCtrl

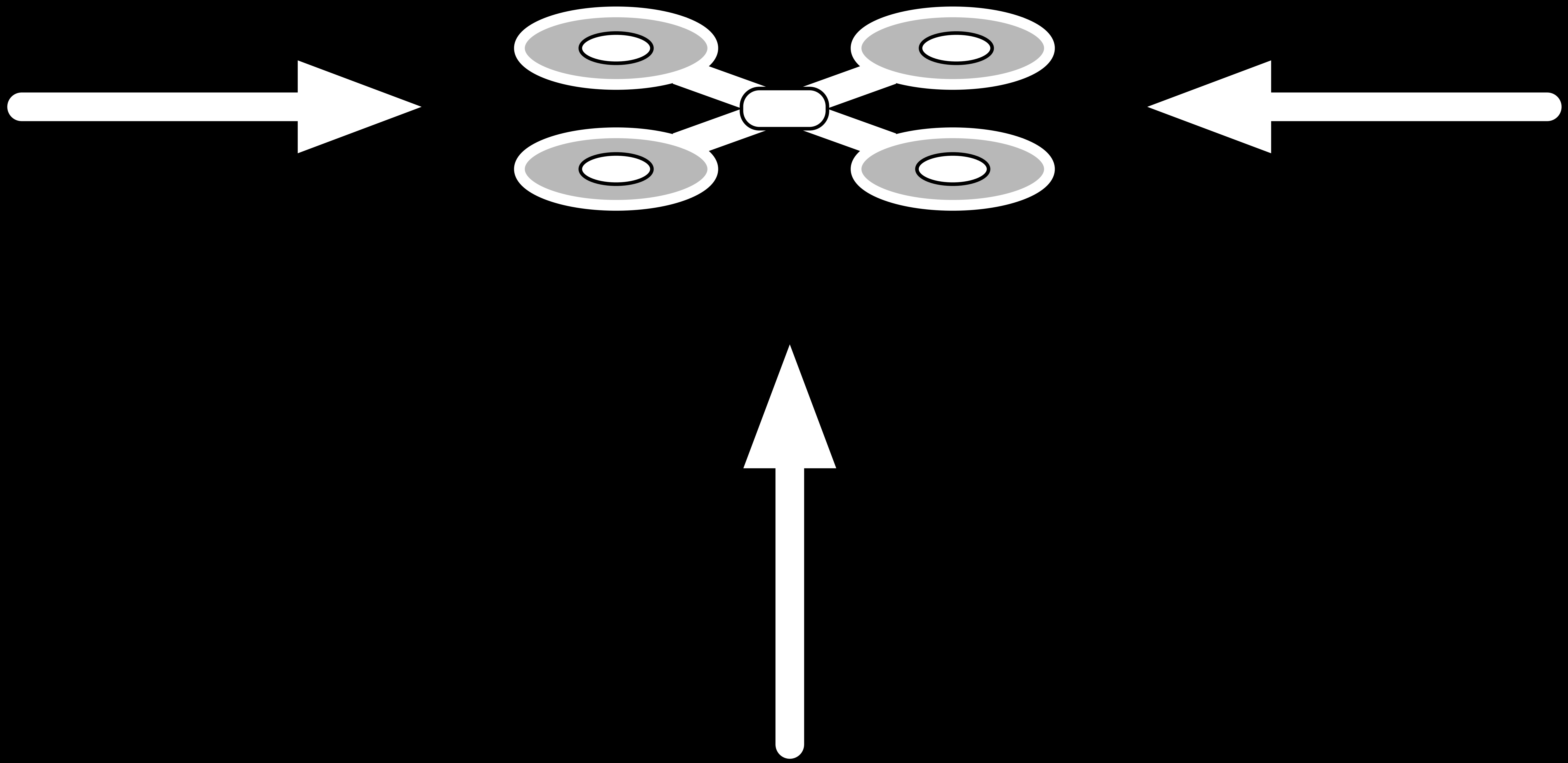


Autoquad

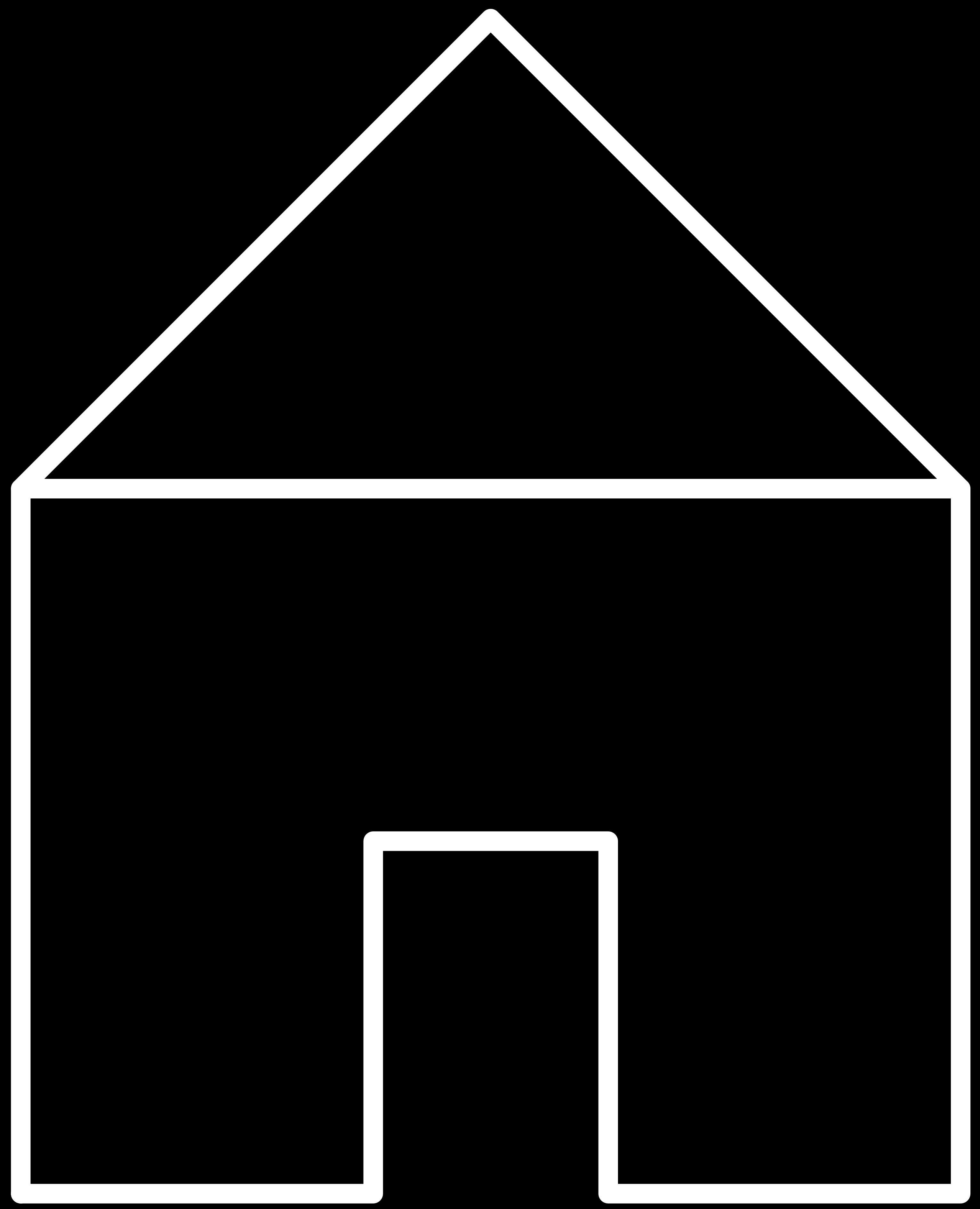


PX4

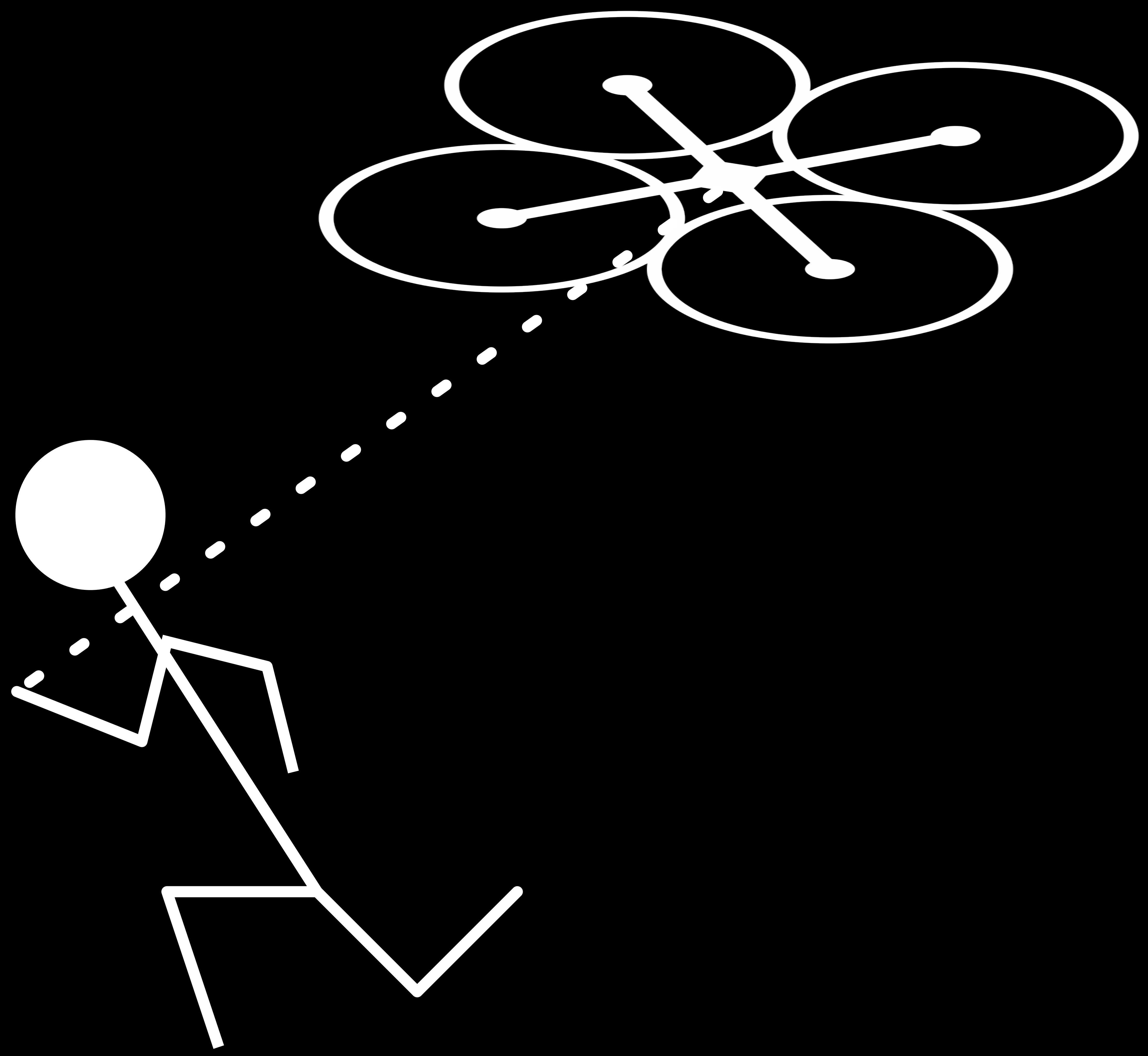
Feature	Lisa/L v1.1	Lisa/M v2.0	Lisa/S	KroozSD	Apogee v1.00	Umarim v1.0	Umarim Lite v2	NavGo v3	Tiny v2.11	TWOG v1.0	YAPA v2.0
	MCU										
Part	STM32F103RE	STM32F105RCT6	STM32F103REY6	STM32F405RGT6	STM32F405RGT6	LPC2148	LPC2148	LPC2148	LPC2148	LPC2148	LPC2148
Clock	72MHz	72MHz	72MHz	168MHz	168MHz	60MHz	60MHz	60MHz	60MHz	60MHz	60MHz
Flash	512kB	256kB	512kB	1024kB	1024kB	512kB	512kB	512kB	512kB	512kB	512kB
RAM[2]	64kB	64kB	64kB	128 & 64kB	128 & 64kB	32kB & 8kB	32kB & 8kB	32kB & 8kB	32kB & 8kB	32kB & 8kB	32kB & 8kB
	Onboard Sensors[3]										
MEMS IMU	no	aspirin	yes	krooz/ext	yes	yes	yes	yes	no	no	no
Magnetometer			yes	yes	yes	no	no	yes	no	no	no
Barometer	yes	yes	yes	yes	yes	yes	no	yes	no	no	no
Diff Pressure	yes	no	no	no	no	no	no	no	no	no	no
GPS	no	no	yes	no	no	no	no	no	yes	no	no
	Input/Output[4] **& Communication Interfaces**										
UART	3 & 1RX	2 & 2RX	1 & 1RX	3	3 & 1Rx	2	2	2	1	2	2
I2C	2	1 + 1[5]	1[8]	2	2	2	1	2	1	1	1
SPI	2	1	0	1	1	1	1	1	1	1	1
ADC	3 (12bit)	3 + 2 (12bit)[5]	0	4 + 1 (12bit)[5]	0 + 3 (12bit)	0 + 4 (10bit)	8[6]	0 + 4 (10bit)[6]	0 + 1 (10bit)[6]	8 (10bit)	6 (10bit)
PWM	6	6 + 2[5]	6	10 + 1[5]	6 + 1	6	6	0 + 1[5]	8	8	10
PPM Output	no	no	no	no	no	no	no	no	1	1	no
PPM Capture	1	0 + 1[5]	1	1	1	1 + 1[5]	1 + 1[5]	1 + 1[5]	1	1	1
R/C serial		2	1		1 (standard & S.BUS)						
GPIO[7]	?	1	0	2 + 1[5]	0 + 4	0 + 4[6]	0 + 4[6]	0 + 2[6]	2	2	1
Onboard LEDs	8	5	4	3	4	2	2	4	3	3	3
USB Peripheral	Onboard USB JTAG +	bootloader	no	bootloader	DFU bootloader + USB	bootloader	bootloader	bootloader	bootloader	bootloader	bootloader
CAN	1	1	1	no	no	no	no	no	no	no	no
MODEM connector				Xbee	no	no	no	no	no	no	Xbee
	Onboard Peripherals										
SD card/interface				yes/SPI	yes/SDIO + USB storage	no	no	no	no	no	
RTC					yes + backup cap.	no	no	no	no	no	
Others	Overo w/ I/O incl. USB	Aspirin footprint, JTAG		On-board micro-USB B	On-board mini-USB B		On-board mini-USB B				RS232 options
	Program & Debug Interface										
	USB (luftboot)+ JTAG +	USB (luftboot)+ JTAG +	SWD + UART		USB(DFU) + SWD	USB (pprz bootloader)	USB (pprz bootloader)	USB (pprz bootloader)	USB (pprz bootloader)	USB (pprz bootloader)	USB (pprz bootloader)
	Power Management										
Supply Input	6.1V - 18V	5V - 16V	2.3V - 5.5V	7V - 32V	5.5V - 17V	5.5V - 17V	5.5V - 17V	5.5V - 16V	6.1V - 18V	6.1V - 18V	6.1V - 18V
Supply Output	2.25@5V, 2.25A@3.3V,	500mA@3.3V,	1A@3.3V	1.5A@3.3V, 5A@5V	1A@3.3V, 1.5A@5V	1A@3.3V, 1.5A@5V	1A@3.3V, 1.5A@5V	1A@3.3V, 1.5A@5V	1A@3.3V, 2.25A@5V	1A@3.3V, 2.25A@5V	2x 1A@3.3V, 2.25A@5V
Software Switch	2	no	1	no	1 (5V)	no	no	no	1	1	1
	Mechanical										
Size	~100mm x ~50mm	34mm x 60mm x 10mm	20mm x 20mm x 5mm	50mm x 60mm x 10mm	53 x 25 x 9mm (shares the	56mm x 25mm	53mm x 25mm	35mm x 35mm	70.8mm x 40mm	40.2mm x 30.5mm	80.0mm x 40.0mm?
Weight	?	9.9g - 10.8g	2g	20g - 40g	10g	9g	8g	?	24g	8g	23g w/ XBee?
Connector Style	Picoblade	Picoblade & 0.1" Servo	0.05" header	Picoblade & 0.1" Servo	Picoblade	Picoblade	Picoblade	Picoblade	Picoblade	Picoblade	0.1" Headers
PCB Style	4-layer	4-layer	6-layer	2-layer	4-layer	4-layer	4-layer	4-layer	2-layer	2-layer	2-layer
Mounting Holes	4x M3	4x 2mm	no	4x M3	4x 2mm (shares the same	4x 2mm	4x 2mm	4x 2mm	no	no	4x M3



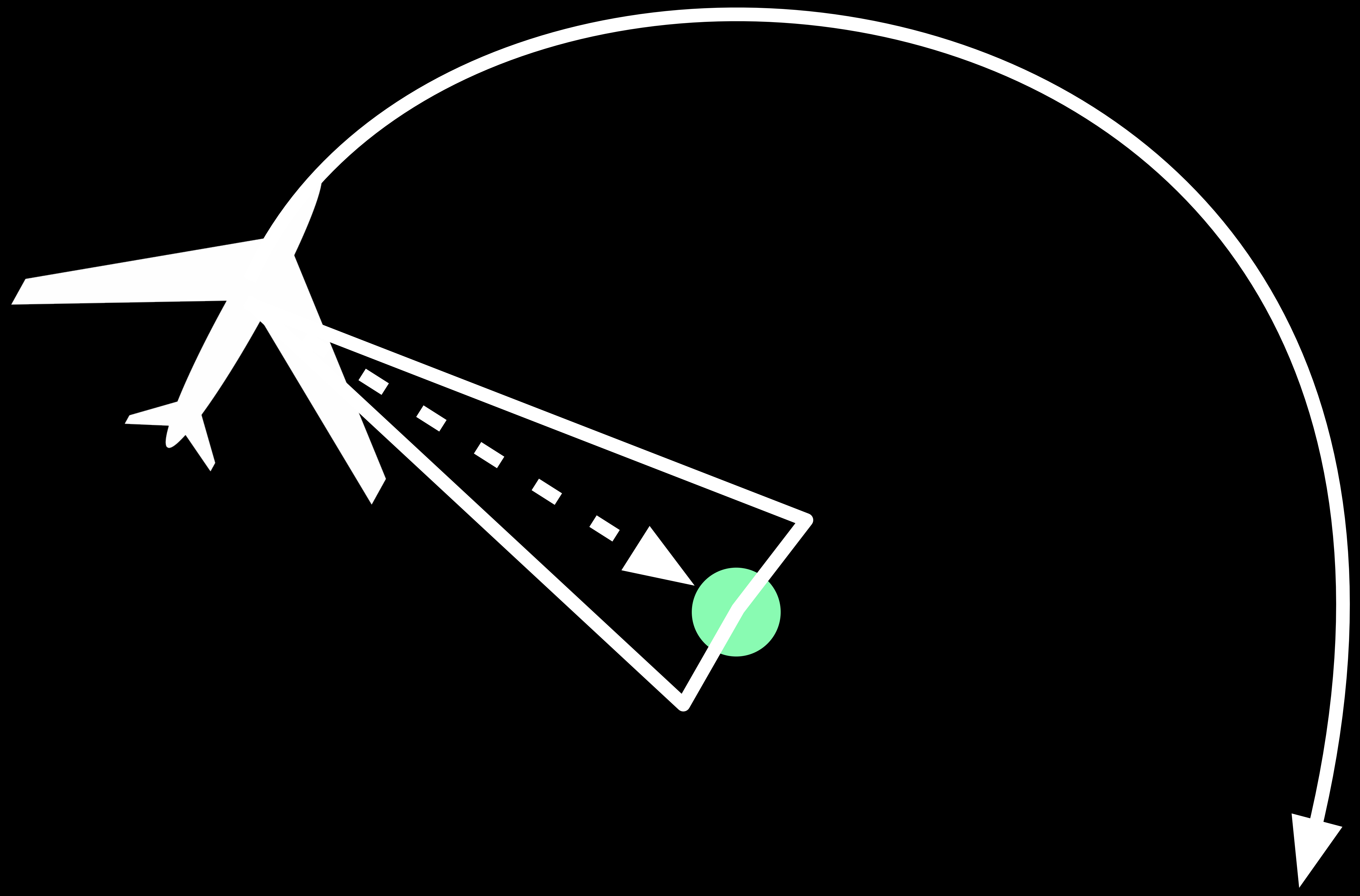
Position & Altitude
Hold



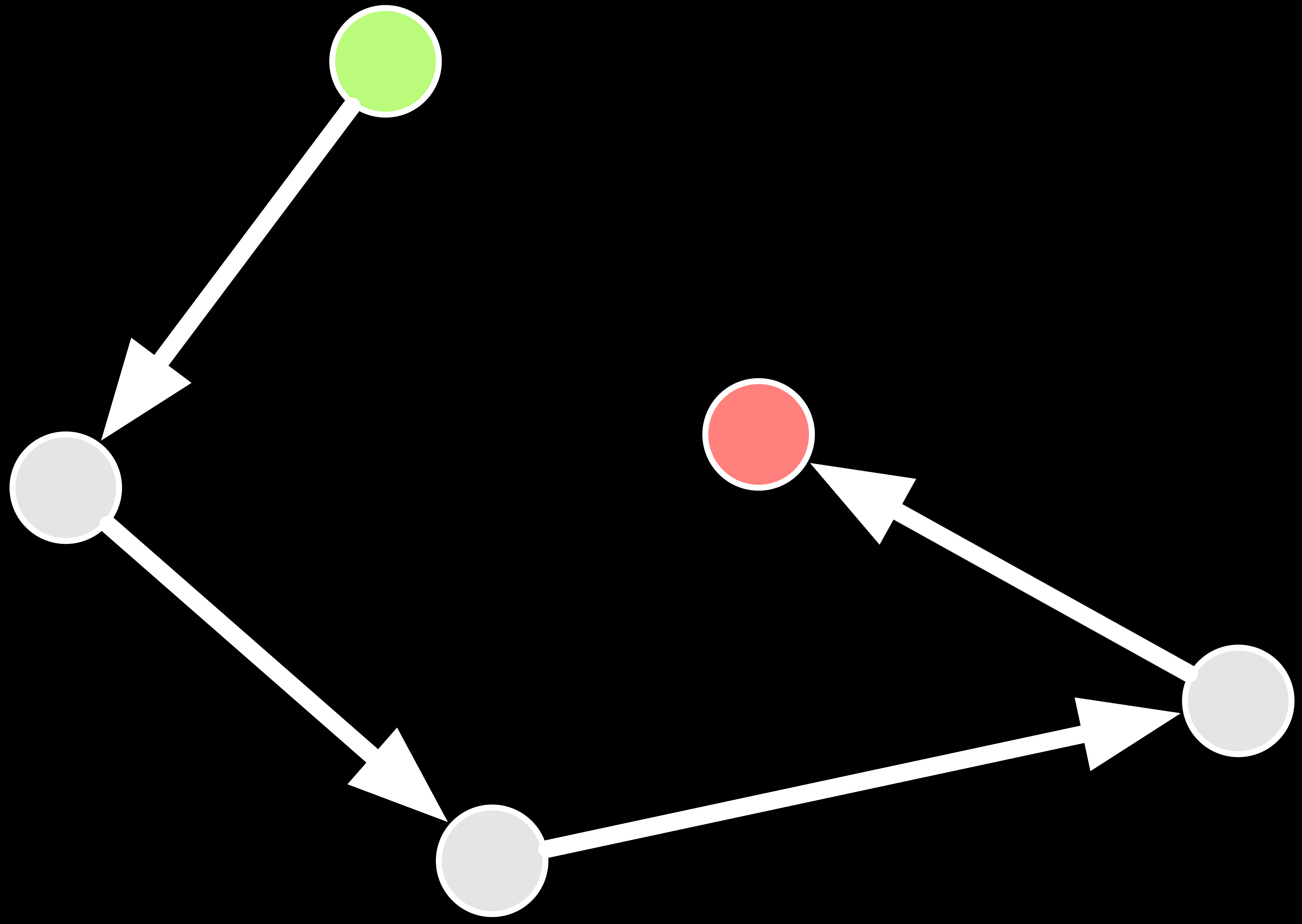
Homing



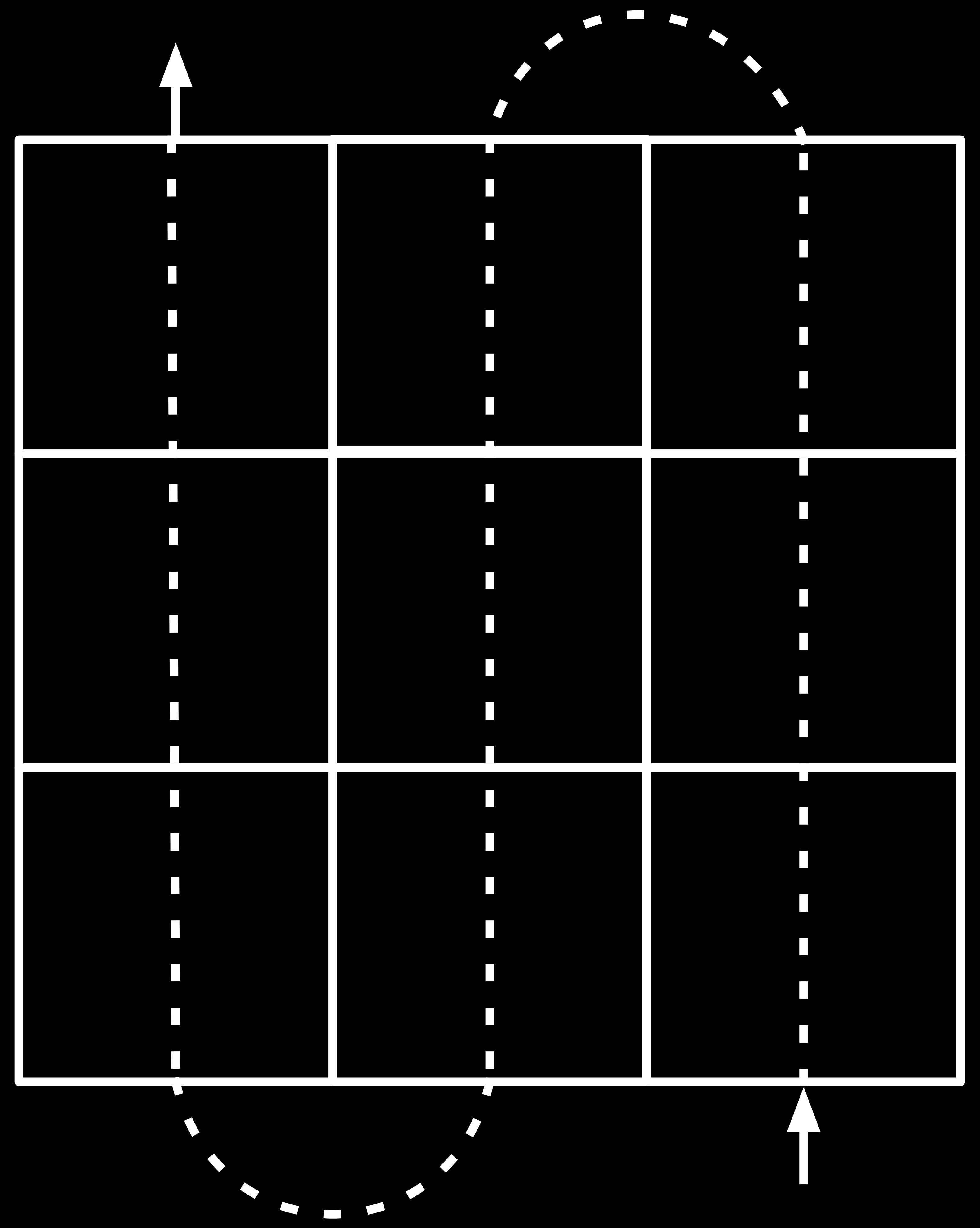
Follow Me



Camera Point Following

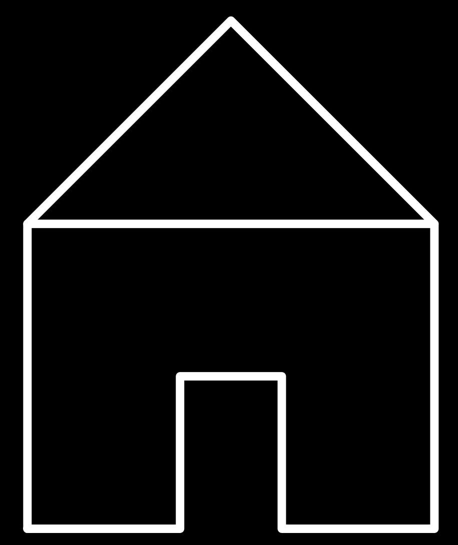


Waypoint Navigation

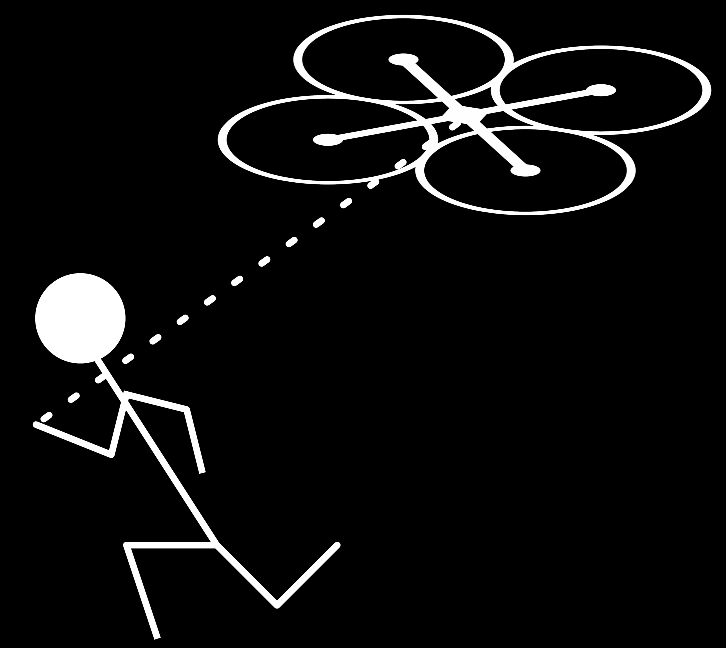


Survey pattern

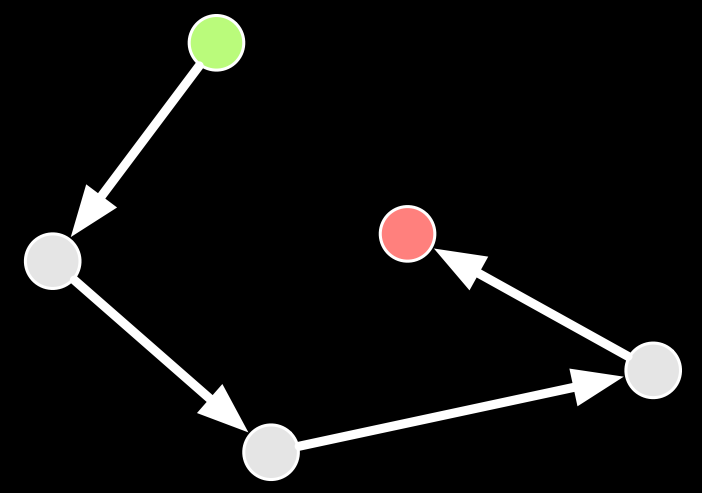
Geofencing



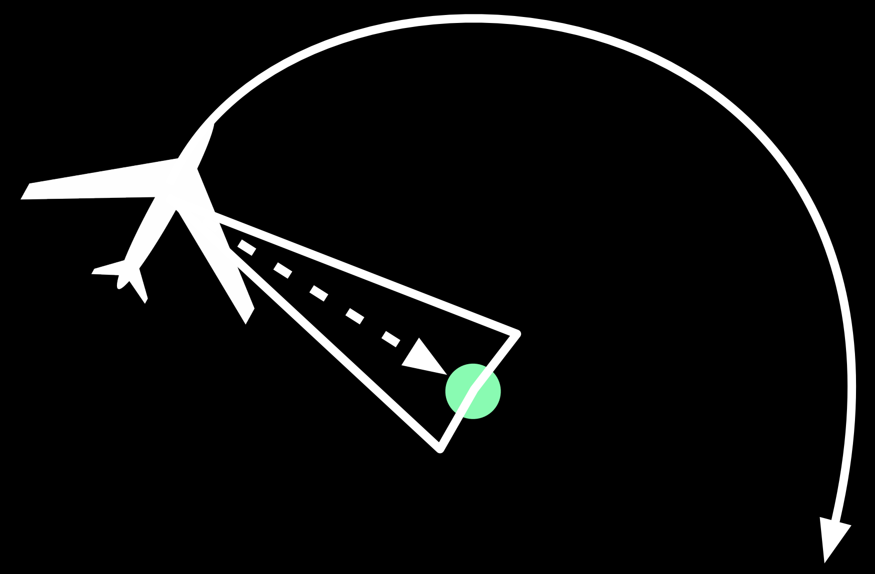
Homing



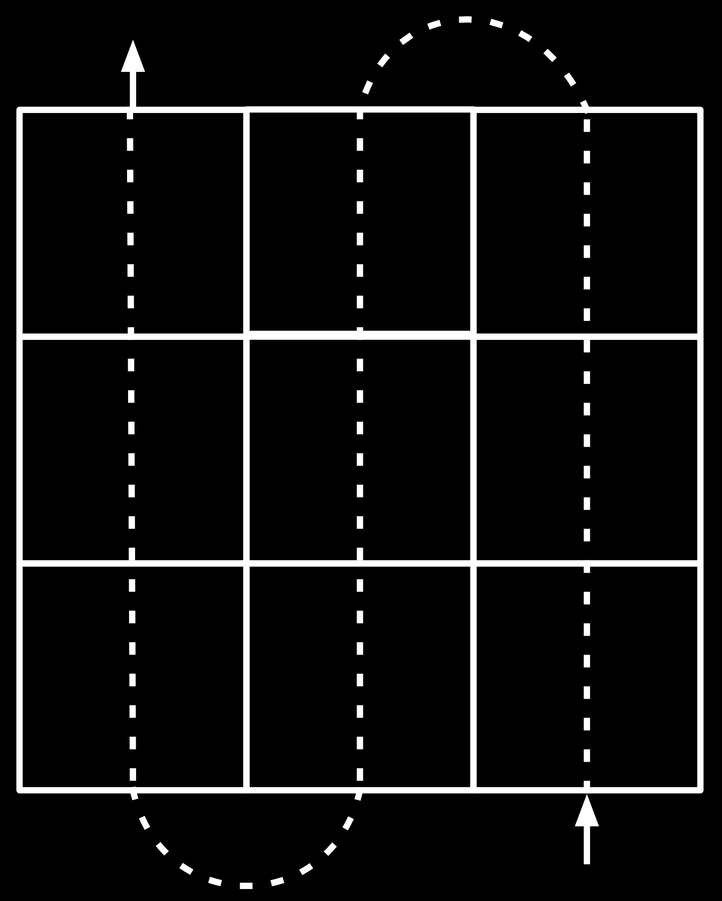
Follow Me



Waypoints

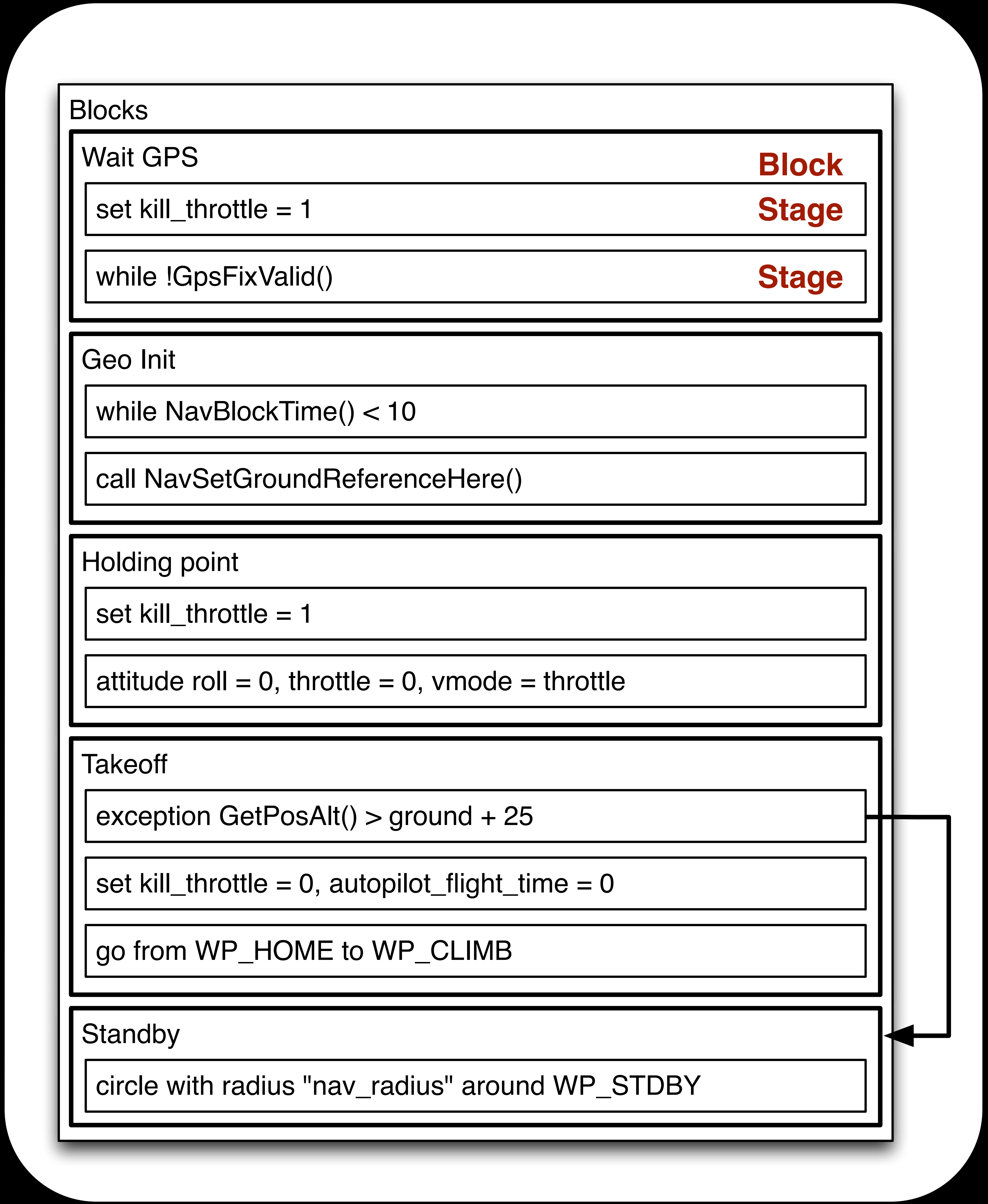


Point Camera



Pattern
Flights

Dynamic Flight Plans



Future

SUMO

Small Unmanned Meteorological Observer

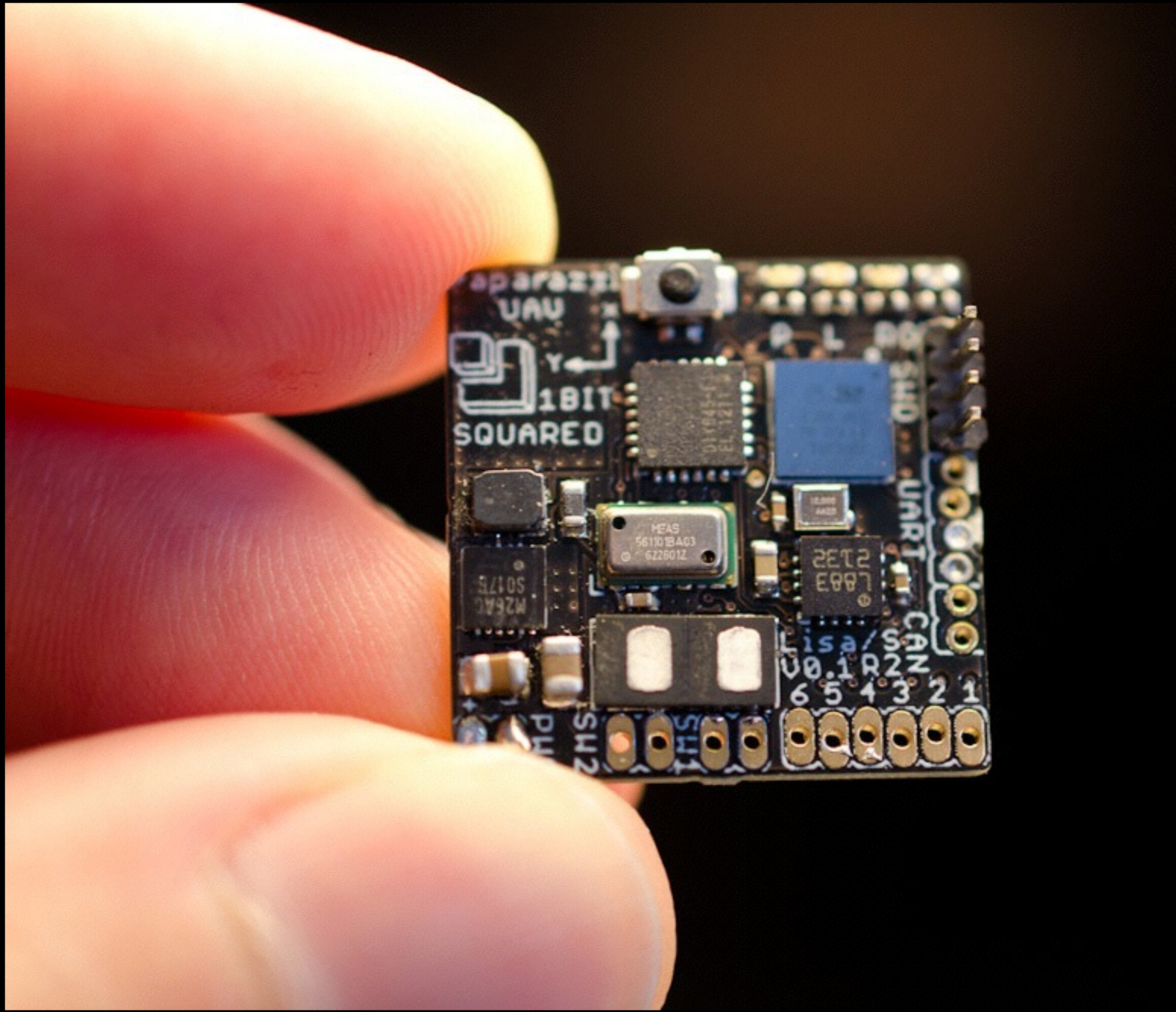
http://pfump.org

UAV CHALLENGE

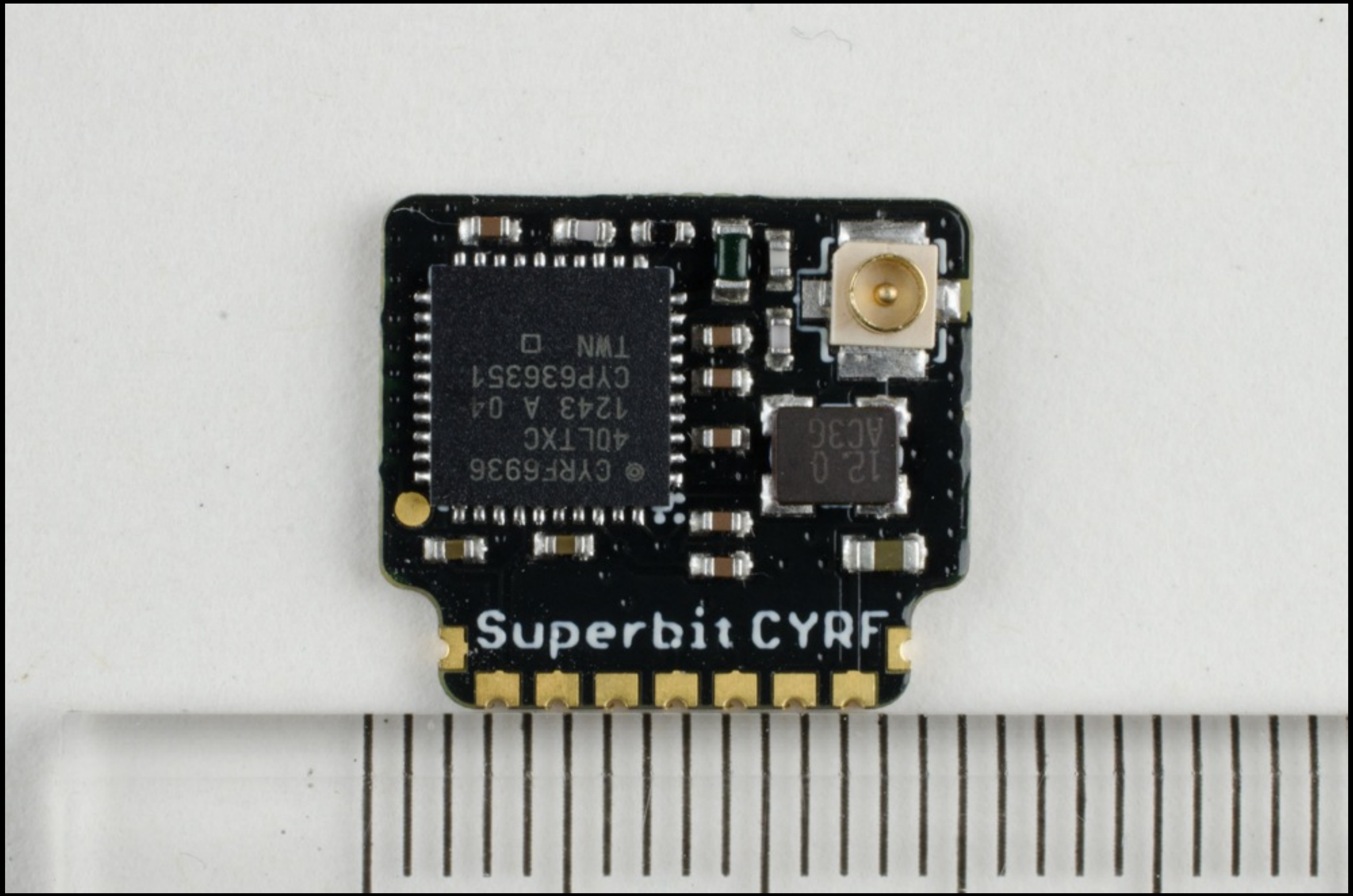
UAV Challenge
Outback Rescue

Miniaturization

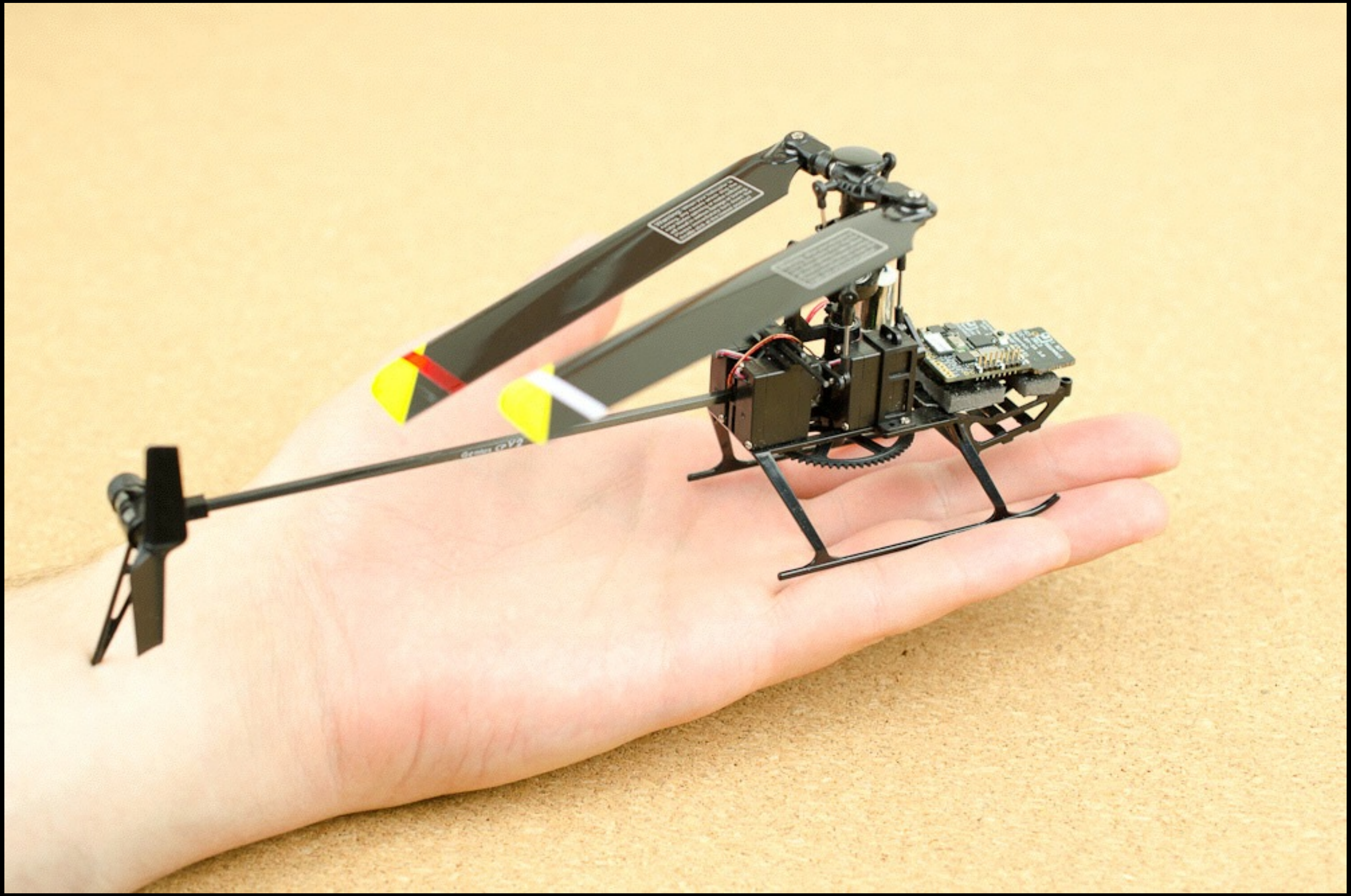
Crazyflie



Lisa/S



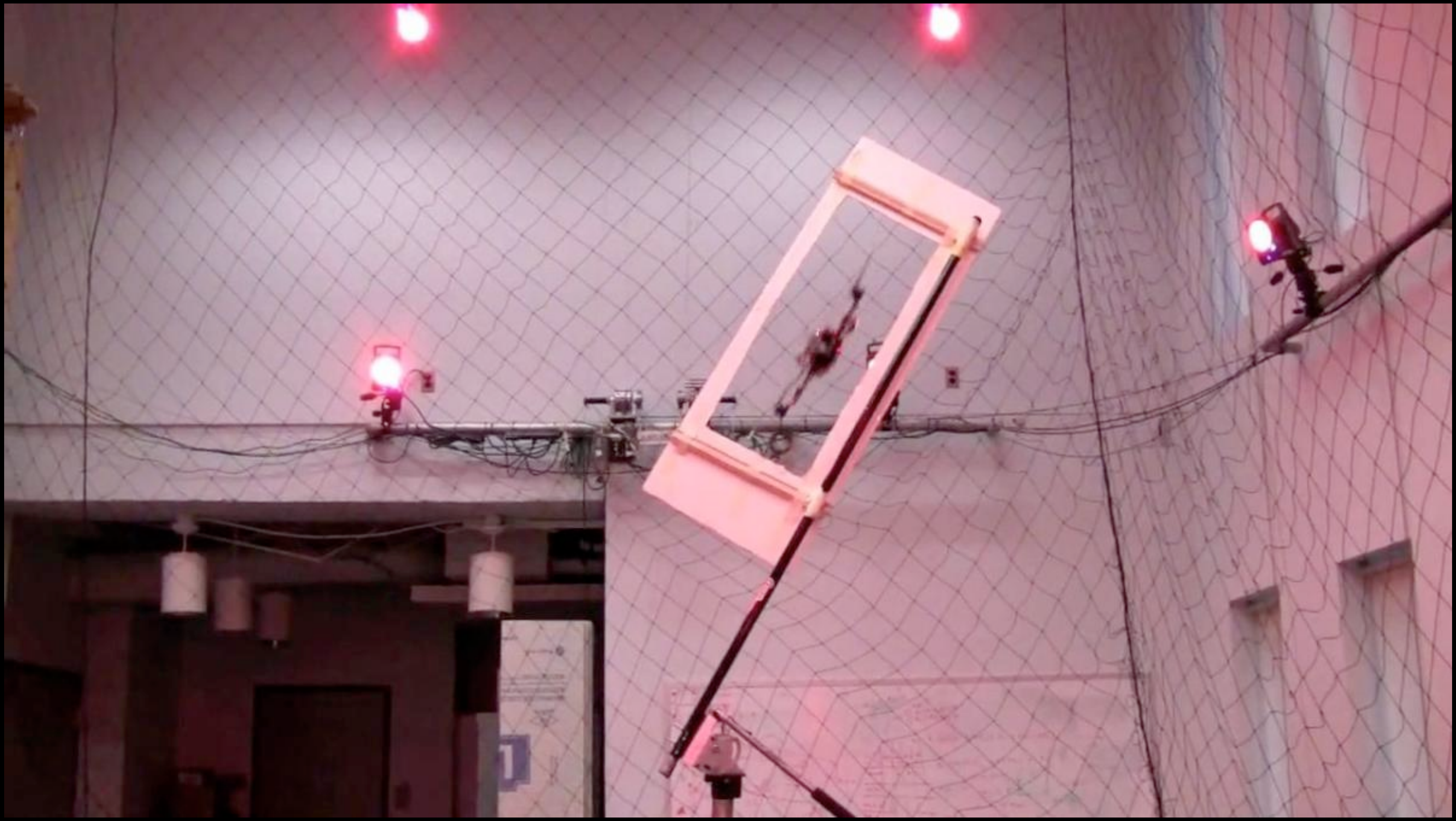
Superbit RF



Lisa/S on a 10cm Helicopter

GPS TECHNOLOGY

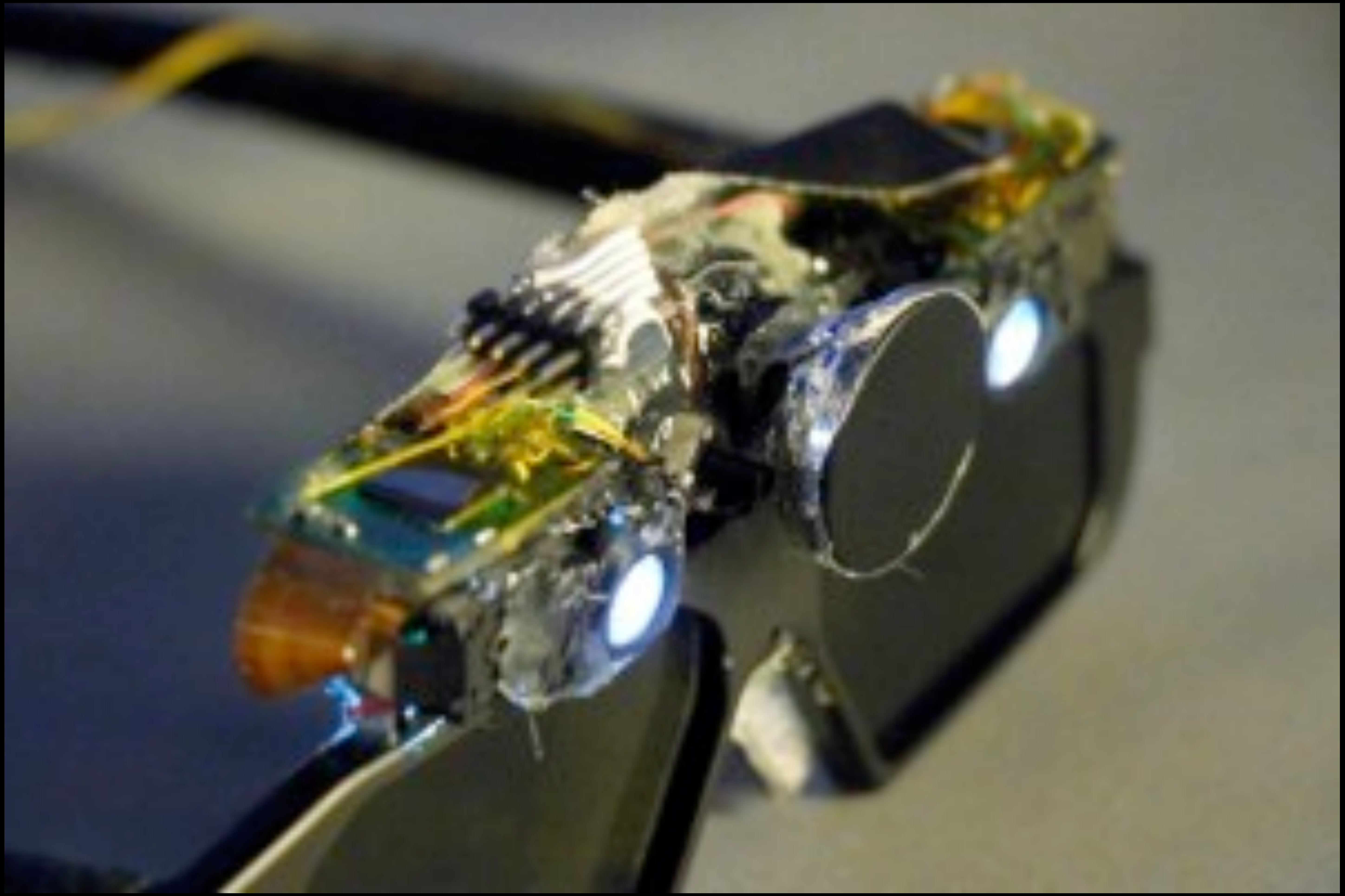
GPS



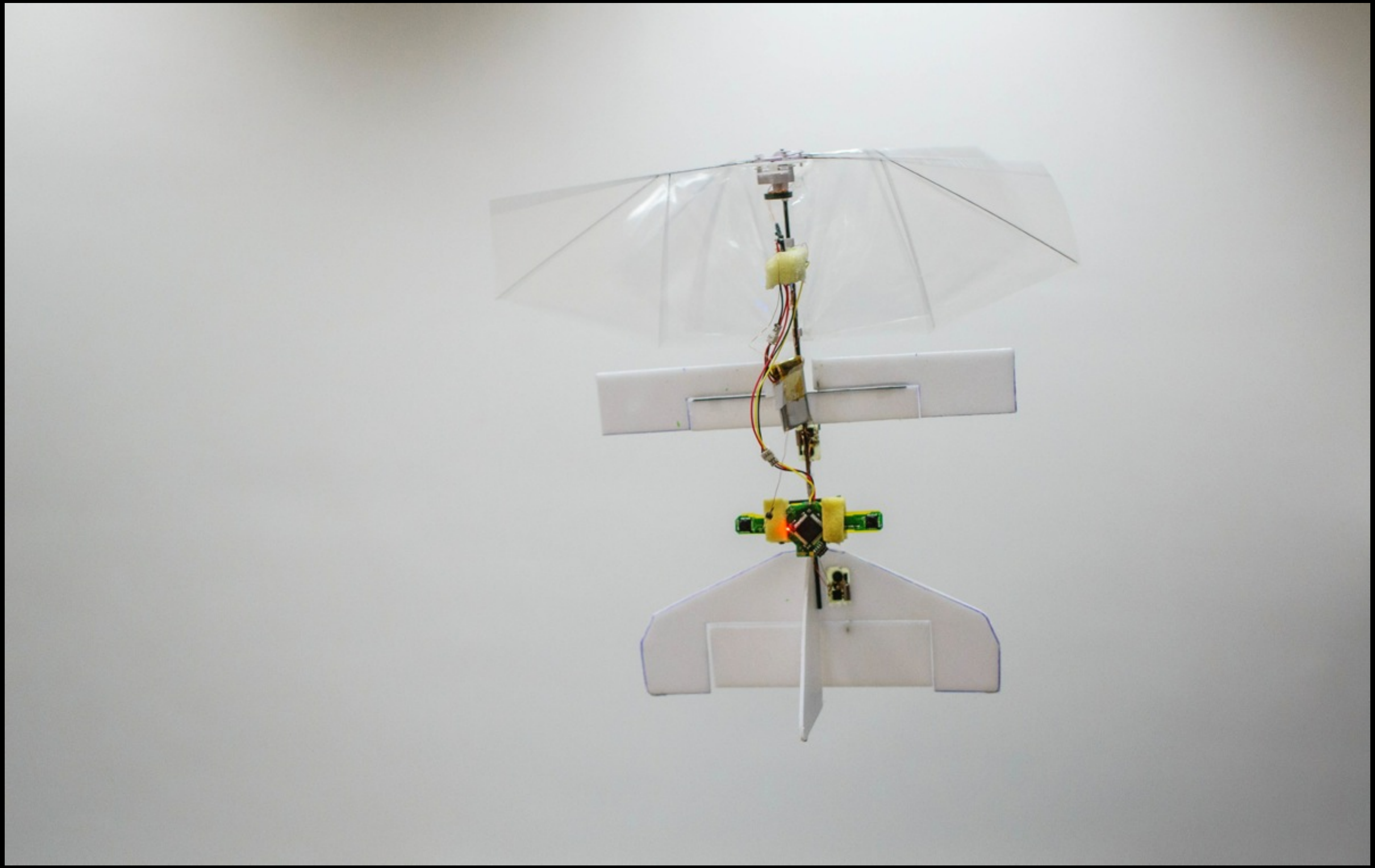
Vicon Tracking
GRASP Laboratory

“Indoor GPS” requirements

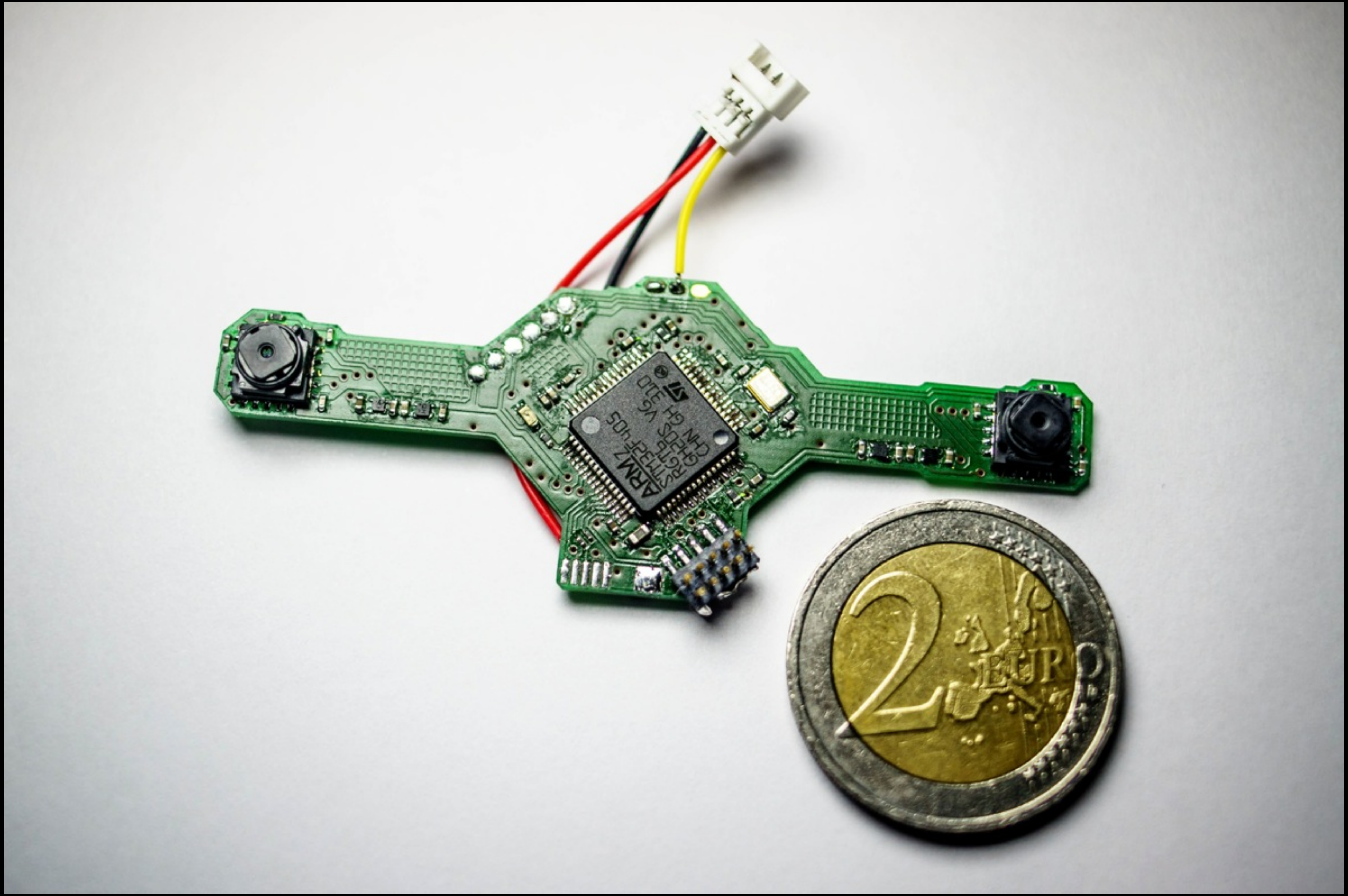
- High accuracy
- Relatively cheap
- No environment modification needed
- Light & Very small
- Low energy & computational requirements



Technical Illusions
Cast AR



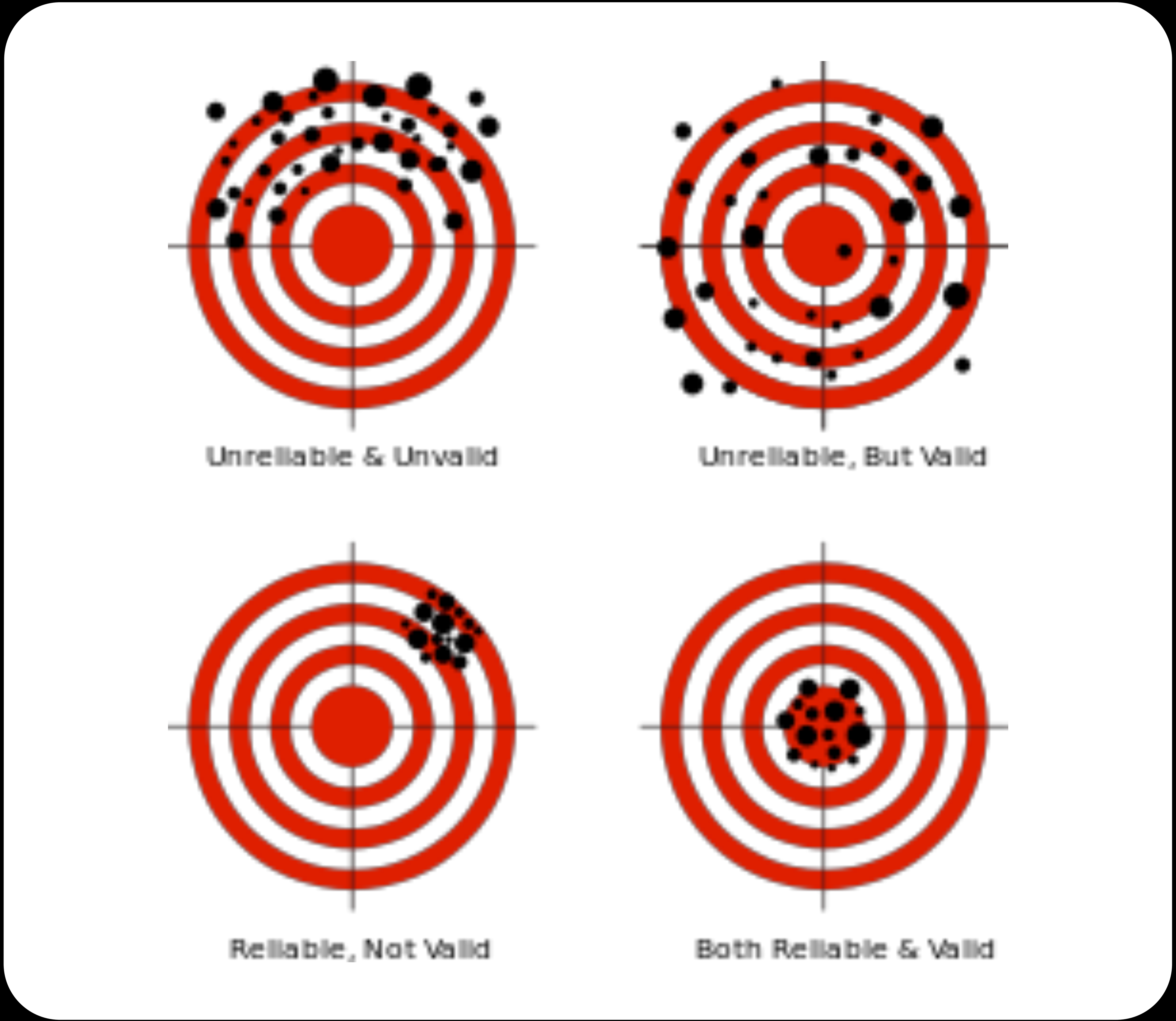
TU-Delft MavLab DelFly
Stereoscopic Vision



TU-Delft MavLab
4G Stereo Vision System

TU-Delft MavLab DelFly
Autonomous Indoor Flight

Reliability & Validity



Thank you very much!

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