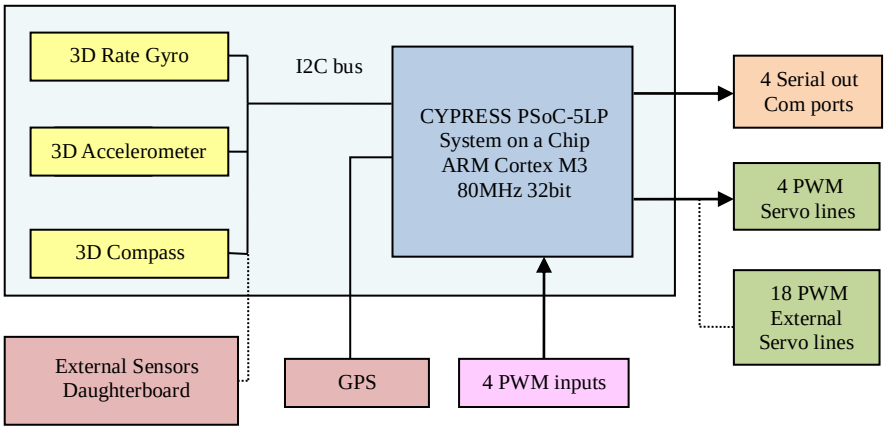
miniAHRS/GPS/FCS

GPS assisted Attitude & Heading Reference System combined with Flight Control System

The *miniAHRS* system is a high quality, low cost, GPS assisted, Attitude and Heading Reference System, based on commercial grade MEMS sensors. It is intended to provide attitude, heading and position data with the option to perform flight control logics and issue real time servo commands. The measurements are low noise, low latency, reliable and stable in any flight scenario. The system can be used as vertical gyro and magnetic heading reference for fixed and rotating wings UAVs.

The *miniAHRS* incorporates state of the art 3D digital MEMS rate gyros, accelerometers and magnetometers to provide pitch, roll and heading measurements. The system uses propriety complementary filter to merge all available information for providing the best attainable estimation without any long term drift or instability. If GPS signal is available, attitude accuracy data is further improved by eliminating the influence of constant accelerations on the mathematical erection of the virtual vertical gyro. The GPS provided position and velocity data are being combined with accelerometer measurements for improving high speed position dynamics and reducing inherent GPS latency. External devices like static or dynamic pressure sensors can be added through the exposed I2C bus terminals. The system can log the measured data to a miniature external microSD drive and thus serve as an autonomous flight data recorder (black box).

The FCS module performs fast flight control close loop logics referring to external commands and local immediate measurements. The system issues 4 channel servo PWM signals at a 5ms interval with minimal latency. Additional servo channels can be provided through a daughterboard.



miniAHRS/GPS/FCS Block Diagram

The *miniAHRS* is based on the revolutionary Cypress PSoC5LP® MCU containing 32 bit Cortex® M3 CPU and FPGA programmable analog and digital building blocks (including A2D, D2A, digital signal filters and a mini DSP). This opens up a host of possibilities for incorporating additional complex functionalities into a small, low cost, reliable and easily programmable unit.

NewByte Flight Dynamics Ltd, miniAHRS/GPS/FCS (NBP00003 V1.7 200Hz)

Actual Size

Product Specification

Acceleration	
Measurement range for X/Y/Z axes……	± 16g
Bias error for X/Y/Z (mg)……....	<± 30mg
Bandwidth……	100Hz
Angular rate:	
Measurement range for roll/ pitch/yaw rates…..	± 2000 deg/s
Bias error for roll/pitch/yaw rates……	<± 0.05 deg/s
Bandwidth……	100Hz
Attitude:	
Measurement range for roll and pitch……..	Pitch ±90deg, Roll ±180deg (Quaternion continuous operation)
Accuracy with GPS (rms) ……	< ±1.5deg static, 3deg dynamic
Accuracy without GPS (rms) ……..	< ±2.0deg static, 10deg dynamic
Magnetic Heading:	
Measurement range……..	0-360deg
Accuracy (rms)……	<±1.5deg static, 5deg dynamic
Bandwidth……	120Hz
Position/Velocity with 20Hz GPS:	
X, Y, Z velocity accuracy (rms) ……..	0.1m/s
Position accuracy (rms) ……	2.5m
Drift	
Long term drift…….	None (g erection for pitch and roll, magnetic stabilization for heading)
Flight control	
Update rate……	200Hz
PWM input channels……	4
Direct PWM channels output……...	4
External PWM channels output……	18
External sensors extension bus……..	I2C, 3.3V @ 1MHz
External static and dynamic pressure sensors…..	Barometric Altitude and Calibrated Airspeed.
Additional GPIO pins……	18 (Optional CAN bus, SPI, USB, UART, MDIO, A2D, D2A, ABZ, SSI encoders).
Micro Controller	
CPU device…….	Cypress PSoC5LP with 80MHz ARM Cortex M3 32bit processor
Programmable ROM……..	256KB
Runtime RAM…….……	64KB
NVM EEPROM……..	2KB
Communication	
Output Rate…….	200Hz
Serial port……..……..	460800 bps, 8N1, 3.3V TTL
Start Up Time……	500ms
Power requirements	
Supply Voltage……..…….	4.5-10V
Average Supply Current……	60mA
Physical properties	
Length x Width x Height……	22x39x6 mm
Weight……	4 g
Environment	
Temperature……	-30 to 75C
Relative Humidity……...	5-95% Non-condensing