

Native Flight Data

Flight data is logged on the aircraft and on the ground station in a native binary format. The format is a stream of binary packets that is run through the zlib on-the-fly compression library before being written to disk. This is an efficient (both in disk space and workload) format. The onboard binary format is identical to the format logged by the base station with the only difference being packet rates.

Exported (CSV) Flight Data Format

The `auraexport.py` script can be used to decompress and extract the flight data out into comma separated text files. This script creates several individual csv, all linked by a common timestamp.

The file name convention for csv files is `<packet_category>-<channel_number>.txt`

The files created by default are: `act-0.txt`, `air-0.txt`, `ap-0.txt`, `filter-0.txt`, `gps-0.txt`, `health-0.txt`, `imu-0.txt`, `pilot-0.txt`. The individual fields and units are described below:

Act-0.txt (Actuator)

Field	Units	Comment
Timestamp	Seconds	
Channel 1	Normalized (-1.0 ... 1.0) or Surface Angles (radians) depending on flight computer configuration.	-1.0 ... 1.0
Channel 2	...	
...	...	
Channel 8	...	
Status Flag		

Ex: `1096.755,0.591,0.013,0.629,0.000,0.000,0.000,0.000,0.000,0`

Air-0.txt (Air Data)

Field	Units	Comment
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Timestamp	Seconds	
Pressure	mbar	
Temperature	Degree C	Typically reflects avionics/cabin temp, not external air temp
Airspeed	kts	
Altitude	meters	
Altitude True (est)	meters	Estimated blend of gps alt and pressure altitude.
Vertical Speed	Feet per minute	
Wind Direction	degrees	"From" direction
Wind Speed	kts	
Pitot Scale Error		Estimated by flight computer
Status Flag		

Ex: 1023.028,988.6,0.0,44.5,206.63,288.81,-625.40,106.1,4.0,0.99,0

Ap-0.txt (Autopilot)

Field	Units	Comment
Timestamp	Seconds	
Master Switch	Bool	Autopilot master switch on/off
Pilot Pass Through	Bool	Pilot pass through on/off
Target Ground Track	degrees	
Target Roll Angle	degrees	
Target Altitude MSL	feet	
Target Climb Rate	Feet per second	Currently not used
Target Pitch Angle	degrees	
Target 'q'	Radians per second	Current not used

Target Airspeed	kts	
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Ex: 1014.968,215.80,-35.00,1141.00,0.00,0.00,0.00,20.0

Filter-0.txt (EKF)

Field	Units	Comment
Timestamp	Seconds	
Latitude	degrees	
Longitude	degrees	
Altitude	meters	
Vn	Meters per second	
Ve	Meters per second	
Vd	Meters per second	
Phi	degrees	Roll angle
Theta	degrees	Pitch angle
Psi	degrees	Heading (yaw) angle
p_bias	Radians per second	
q_bias	Radians per second	
r_bias	Radians per second	
ax_bias	Meters per second ²	
ay_bias	Meters per second ²	
az_bias	Meters per second ²	
Status Flag		

Ex:

34.7869,44.7260404213,-93.0770192985,261.79,0.0200,-0.2600,0.3000,-7.80,-0.90,231.60,0.000,0.000,0.000,0.001,0.068,-0.082,0

Gps-0.txt (GPS)

Field	Units	Comment
Timestamp	Seconds	
Latitude	degrees	
Longitude	degrees	
Altitude	meters	
Vn	Meters per second	
Ve	Meters per second	
Vd	Meters per second	
Unix Time	seconds	Since the epoch ...
Satellites	integer	Number of satellites used as reported by the gps
Horizontal Accuracy	meters	(added 11/23/2016)
Vertical Accuracy	meters	(added 11/23/2016)
pdop	pdop	(added 11/23/2016)
Fix type		0=no fix, 1=dead reckoning, 2=2d, 3=3d

Ex :

1007.168,44.7257163341,-93.0756655553,280.29,13.5700,9.1800,-5.0800,1
463499690.600,10,2.87,3.14,2.2,3

Health-0.txt (System Health Status)

Field	Units	Comment
Timestamp	Seconds	
Load Average	Average size of kernel run queue	1.0 would typically represent a saturated cpu
Avionics VCC	volts	

External Battery	Total volts	
External Battery Avg. Cell	Volts per cell	This saves the operator from having to do mental math when monitoring battery voltages.
Current Draw	amps	
Total Current Used	Millamp hours	An indicator of how much battery is consumed

Ex: 1007.328,0.87,5.03,11.87,3.96,2.35,875

Imu-0.txt (IMU)

Field	Units	Comment
Timestamp	Seconds	
p	Radians per second	+p corresponds to rolling right
q	Radians per second	+q corresponds to pitching up
r	Radians per second	+r corresponds to yawing nose right
ax	Meters per second ²	Nose straight down = -1 g
ay	Meters per second ²	Right wing down = -1 g
az	Meters per second ²	Level = -1 g
hx	varies	The direction of the mag vector is more important than the magnitude
hy	varies	
hz	varies	
Temperature	Degree C	The IMU (avionics) temperature, potentially useful for temperature calibration of uncalibrated IMU's
Status Flag		

Ex:

1007.029,0.7857,0.6960,-0.2153,3.9261,3.9478,-14.9071,-0.212,-0.354,0.516,29.4,0

Pilot-0.txt (Pilot Stick Inputs)

Field	Units	Comment
Timestamp	Seconds	
Channel 1	Normalized	-1.0 ... 1.0
Channel 2	Normalized	
...	...	
Channel 8	Normalized	
Status Flag		

Ex: 1096.755,0.591,0.013,0.629,0.000,0.000,0.000,0.000,0.000,0

Raven-0.txt (BFS Raven Module)

Field	Units	Comment
Timestamp	Seconds	
Pot 1	Raw ADC counts	0-65535
Pot 2	Raw ADC counts	
...	...	
Pot 10	Raw ADC counts	
Differential Pressure	Pa	(if air data module connected)
Static Pressure	Mbar	(if air data module connected)
Anemometer 1	Revolutions per Second	(if air data boom connected)
Anemometer 2	Revolutions per Second	(if air data boom connected)
Status Flag		0

