

# Personal Flight Data Recorder with Display (PFDR-D) Version 2.0



**KUTTA**<sup>®</sup>  
Technologies for earth and air<sup>®</sup>

- 3-Axis Accelerometer
- 3-Axis Rate Gyroscope
- 3-Axis Magnetometer
- Integrated WAAS GPS Receiver
- Easy-to-Use Touchscreen GUI
- Attaches to Any Aircraft
- Does Not Require Connection to Onboard Avionics or Electrical Power
- Easy Post-Flight Analysis
  - Excel
  - Matlab



A variety of selectable options are provided to customize the user interface including real-time dials, gauges, sliders, XY plot (e.g. airspeed vs. altitude) or time-history (e.g. roll angle vs. time).

## Platform Specifications

- **Samsung Q1 Ultra Mobile PC.** The computer is a low weight, touch sensitive platform that is leg mountable with a custom knee board. The features of the Q1 are:
  - CPU: Intel Pentium M ULV 1Ghz
  - LCD: 7" WVGA • VRAM: Shared
  - MEMORY: 1 GB DDR 400 • HDD: 60 GB (4200 RPM)
- **Battery Life:** The PFDR-D includes a power supply to allow for full operation of the computing platform and the sensor package for over 3 hours on a standard 70°F day. This is achieved through the use of the internal Q1 battery along with an external battery. The external battery is engineered to fit within the PFDR-D knee board. Additional runtime may be achieved by using multiple external batteries. The PFDR-D system's internal and external batteries are COT parts and are easily replaceable. The internal and external batteries that power the PFDR-D device are rechargeable through a general U.S. wall outlet.
- **System Weight:** The entire system weight, excluding video recording support for the PFDR-D is less than 5 lbs.
- **Display Mounting Device:** The PFDR-D Display device is attachable to the pilot's thigh through the use of a custom knee board. The knee board is custom fitted to the Q1 computing platforms.
- **Sensor Mounting Device:** The PFDR-D sensor component attaches securely inside the cockpit of an aircraft through the use of a custom DZUS rail mounting bracket.



## IMU & GPS Specifications

- Typical position accuracy † ±2.5 m RMS horizontal, ±5 m RMS vertical
- Typical velocity accuracy † ±0.1 m/s to ±0.75 m/s RMS
- Typical attitude accuracy † ±0.35 deg RMS roll & pitch  
±1.0 deg RMS heading
- Update rate 100 Hz
- Data output rate 1 Hz to 100 Hz
- Attitude heading range 360° about all 3 axes
- Accelerometer range ±5g standard
- Gyroscope range ±300°/sec standard
- Static accuracy ±0.5° pitch, roll, heading typical for static test conditions
- Dynamic accuracy ±2.0° pitch, roll, heading for dynamic (cyclic) test conditions and for arbitrary angles
- Repeatability 0.2°
- Resolution <0.1°
- Data output rate 1 Hz to 100 Hz
- A/D resolution 16 bits SAR oversampled to 17 bits
- Baud rate 9,600 bps to 921,600 bps (115,200 bps default)
- Operating temperature -40 °C to +65 °C
- Shock limit 500 g

	Accels	Gyros	Mags
• Measurement range	±5 g	±300°/sec	±2.5 Gauss
• Non-linearity	±0.1 % fs	±0.03 % fs	±0.4 % fs
• In-run bias stability	±0.04 mg	18°/hr	
• Initial bias error	±0.002 g	±0.25°/sec	±0.003 Gauss
• Scale factor stability	±0.05 %	±0.05 %	±0.1 %
• Noise density	80 µg/√Hz	0.03°/sec/√Hz	100 µGauss/√Hz
• Alignment error	±0.05°	±0.05°	±0.05°
• User adjustable bandwidth	225 Hz	440 Hz	230 Hz
• Sampling rate	30 kHz	30 kHz	7.5 kHz max
• GPS receiver type	50 Channels, L1 frequency, GPS C/A Code SBAS: WAAS, EGNOS, MSAS, GAGAN		
• GPS solution update rate	Up to 4Hz		
• GPS tracking and navigation sensitivity	-159 dBm		
• GPS reacquisition sensitivity	-159 dBm		
• GPS cold start (autonomous) sensitivity	-141 dBm		
• GPS velocity accuracy	0.1 m/sec		
• GPS heading accuracy	0.5°		
• GPS horizontal position accuracy	< 2.5 m Autonomous < 2.0 m SBAS		
• GPS timepulse signal accuracy	30 nsec RMS < 60 nsec 99%		
• GPS acceleration limit	≤ 4 g		
• GPS velocity limit	500 m/sec (972 knots)		

## Camera Specifications

- 32-bit ARM9 RISC CPU
- 8 MByte flash memory
- 128 MByte SDRAM
- Supported image resolutions: 1280x1024 (SXGA 5:4), 1280x720 (720p HDTV), 640x480 (VGA) and 320x240 (QVGA)
- Supported video compression formats:
  - Motion-JPEG
  - MPEG4 Part2 (ISO/IEC 14496-2), Profile: SP
  - H.264-BP
  - 3GPP
- Video frame rate: - Up to 15 fps at 1280 x 1024 and 1280 x 720 - Up to 30 fps at 640 x 480 and 320 x 240
- Audio support:
  - Microphone: built-in
  - Audio input: 3.5 mm (1/8") microphone input jack

