

## DATA SHEET

# Miro Airborne

Your Ideal Solution for  
Airborne Applications



*Shown with optional high-g lens mount.*

### Key Benefits:

#### WHEN IT'S TOO FAST TO SEE, AND TOO IMPORTANT NOT TO®

**Compact. Lightweight. Rugged.** The perfect balance of resolution, speed, and light-sensitivity. Flexible triggering. Secure, removable, non-volatile CompactFlash memory. Everything you need in a high-speed digital imaging system for airborne applications.

With a variety of image sizes up to 800 x 600 and a maximum full-resolution frame rate of **over 1250 frames-per-second** (fps), you will find a setting that matches your need. (Maximum frame rates at reduced resolutions are as high as 111,000 fps!)

The Phantom Miro Airborne's custom-designed CMOS active-pixel sensor has an ISO 12232 rating of 4800 (monochrome) ensuring the **light-sensitivity** required in high-speed imaging applications. And, it comes in color or monochrome versions. With access to all 12-bits of grayscale information, you can bring out the detail in shadows that result from uncontrollable and constantly changing lighting situations.

With shutter speeds as low as 2 microseconds, you can **freeze objects in motion**, eliminate blur, and bring out the detail you need for successful motion analysis.

### Key Features:

Resolution (Pixels): 800 x 600<sup>1</sup>

Continuously Adjustable Resolution (CAR): 32 x 8

Frames-per-second (fps) at full resolution:  
10-1265 (2252 at 512 x 512)

Maximum Frame Rate: 111,110 fps at 32 x 16

Exposure Time (shutter speed): 2µs to 1/frame-rate

Built in Memory: 2 GB

ISO (ISO-12232 Standard): 4800 Mono, 1200 Color

Non-volatile Memory: Removable CompactFlash

Memory Segmentation: 1 to 4

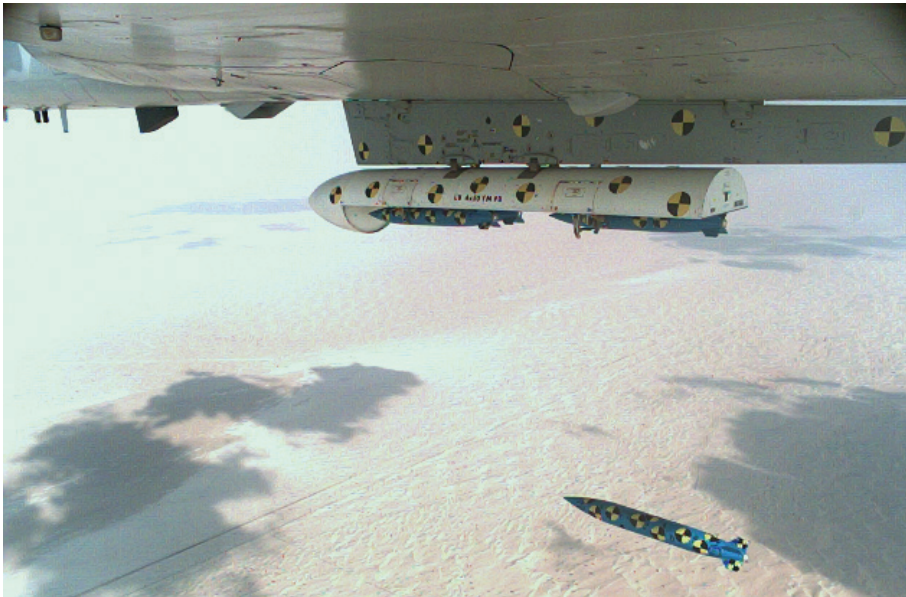
Pixel Bit-depth: 12-bits

Camera Trigger and Signals:

- Trigger (TTL or +28VDC)
- Aux (IRIG-out or Strobe)
- Ready
- FSync
- IRIG-in
- Video

10/100 Ethernet

<sup>1</sup> Very short focal-length lenses may exhibit some vignetting in the extreme corners at maximum resolution.



*EDR and AutoExposure help deal with subjects moving from sunlight to shadow*

Connect your Phantom Miro Airborne camera to a PC using 10/100 Ethernet for camera programming and control and to retrieve your test images in our efficient cine format for later analysis and processing. Set up the camera with the Phantom Software, and those settings will be retained, even after power down. You can then deploy the camera untethered from the PC if you choose.

The Miro Airborne camera has **two types of memory**: volatile for high-speed image capture, and removable CompactFlash non-volatile memory. After the camera is triggered, the captured images can

automatically be copied to the non-volatile memory for safe storage. If the mission requires multiple stores releases or has the possibility of false triggers, the camera can be automatically rearmed for the next trigger, and the process repeats.

Using the Phantom Software you can **save slow-motion movies in popular formats** such as QuickTime or AVI, or you can save frames as JPEG or TIFF images. Easily email movies or frames to colleagues.

Take advantage of our **flexible triggering**. When you power-up the camera, it begins taking images at the programmed settings and stores them in a circular buffer in internal memory. Set up the camera so that a trigger (from external hardware or software on a connected PC) starts your recording, stops your recording, or records a selectable number of frames before and after the trigger.

The Phantom Miro Airborne can be connected to a standard analog video monitor (PAL or NTSC) for real-time monitoring of the camera image or for playback of images stored in the camera's memory. This provides a great way to check camera status prior to a mission. Camera live video can even be fed into the aircraft's telemetry system for ground station monitoring.

Lens mounting holes provide anchorage for additional lens support and flange mount High-g and vibration resistant lenses. Mounting plates with standard 1/4-20 holes on two sides of the camera give you plenty of mounting options. Or, you can remove these plates and replace them with custom plates that meet your specific requirements.

The Miro Airborne camera has passed the following qualification tests

	Miro Airborne Test Conditions	Test Method
<b>Operating Temperature</b>	-30°C to +50°C	Mil-Std-810G Method 502.5, Proc III Mil-Std-810G Method 501.5, Proc II-III
<b>Storage Temperature</b>	-50°C to +70°C	Mil-Std-810G Method 502.5, Proc I Mil-Std-810G Method 501.5, Proc I
<b>Altitude, Operating</b>	Sea level to 40,000 feet	Mil-Std-810G Method 500.0, Proc III
<b>Altitude, Non-operating</b>	-500 to 50,000 feet	Mil-Std-810G Method 500.0, Proc III
<b>Humidity</b>	95% non-condensing	Mil-Std-810G Method 507.5, Proc I, II
<b>Random Vibration</b>	Functional: 0.20g <sup>2</sup> /Hz for 1 hour in each of the three orthogonal axes Endurance: 0.83g <sup>2</sup> /Hz for 1 hour in each of the three orthogonal axes	Mil-Std-810G Method 514.6, Proc I
<b>EMI/RFI</b>	Passed	EN-55033A, IEC-61000-3-2 and 3-3, EN-55024, EN-50082, IEC-61000-4-2
<b>Acceleration</b>	6g for 1 minute on all axes	RTCA/DO-160E Section 7.3.3 Crash Safety Sustained
<b>Shock</b>	40g, 10ms in all three axes, saw tooth	Mil-Std-810G Method 516.6, Proc I, III
<b>Magnetic Field Immunity</b>	500A/m	Mil-Std-1399-70-1
<b>Regulatory</b>	Passed	EN-60950-1, UL-60950-1
<b>ESD</b>	8kV air discharge	IEC-61000-4-2

H	V	FPS
800	600	1,265
640	480	1,949
512	512	2,252
512	384	2,985
512	256	4,429
320	240	7,155
256	512	4,192
256	256	8,146
256	128	15,325
128	128	25,477
128	64	43,010
64	64	58,823
32	32	95,238
32	16	111,111

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## Miro A0



The Miro Airborne is a **High-g camera**, ensuring you will get great pictures, even when subjected to 40gs of shock. All internal electrical components are conformally coated to protect against damp/humid environments and condensation.

IRIG-B input gives you a GPS-derived time reference input to the camera. This allows you to time stamp each image if running asynchronous to IRIG timing. Or, phase-locking to IRIG allows frame synchronization to the GPS timing at **key frame rates such as 100, 200, 400, 500, 800 and 1000 fps**. This permits synchronization of the camera to a time standard or to other cameras without additional wiring.

### Additional Features:

Analog video out: PAL & NTSC

Lensing: 1-inch C-mount

Size (without lens): 11 x 6.5 x 8 cm  
(W x D x H) 4.3 x 2.56 x 3.15 in

Weight (without lens): 2 lbs (0.9 kg)

Standard Accessories:

- AC power supply with power cord
- Capture cable with 5 BNCs - 18"
- Ethernet cable - 5m
- Single-user software license
- Software CD

External Power: 12-30 VDC, 12W

Recording time at full resolution, 200 fps,  
maximum built-in memory and 8-bit depth: 44 seconds

### Focused

Since 1950, Vision Research has been shooting, designing, and manufacturing high-speed cameras. Our single focus is to invent, build, and support the most advanced cameras possible.

**VISION**  
**RESEARCH**  
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