



bar **MICRO AIR DATA SYSTEM ( $\mu$ ADS)**



Pegasus



Endeavor



Destiny



Orion



Voyager



**MICRO AIR DATA COMPUTER SPECIFICATIONS**

**THE MICRO AIR DATA SYSTEM ( $\mu$ ADS)**

The Aeroprobe  $\mu$ ADS is a complete solution for in flight measurement of air data at an unprecedented combination of size and accuracy. The  $\mu$ ADS consists of two primary components: a multi-hole Air Data Probe (ADP) and a Micro Air Data Computer ( $\mu$ ADC). These components provide direct measurements of air-speed, flow angles (angle-of-attack and sideslip angle), static and total pressure, and barometric altitude. There are five models of  $\mu$ ADC that provide a range of features to meet mission requirements. With its internal Attitude Heading Reference System (AHRS), Destiny can also provide direct measurements of roll, pitch, heading, roll rate, angular rates, and 3-axis accelerations. With its GPS aided Inertial Navigation System, Voyager can provide additional measurements of latitude, longitude, altitude, 3-axis velocities, and time or UTC time.



**PRODUCT HIGHLIGHTS**

Table 1. Product Highlights						
		Pegasus	Endeavor	Destiny	Orion	Voyager
						
User Configurable Operational Modes		✓	✓	✓	✓	✓
Command Line Interface		✓	✓	✓	✓	✓
Field Upgradeable Firmware		✓	✓	✓	✓	✓
Battery-backed Real Time Clock/Calendar		✓	✓	✓	✓	✓
Start-up Sync Signal (TTL Trigger)		✓	✓	✓	✓	✓
Rugged Aluminum Enclosure		✓	✓	✓	✓	✓
LED Indicator Lights		✓	✓	✓		✓
Data Logging (Standard 8GB)		✓	✓	✓	External <sup>1</sup>	✓
GPS Aided inertial Navigation System (GPS/INS)						✓
Attitude Heading Reference System (AHRS)				✓		
External GPS Synchronization		✓	✓			
Extended Velocity Range		Option		Option	✓	
Extended Angle Range			✓			
Temperature Measurement		PT100 RTD	PT100 RTD	PT100 RTD	PT100 RTD	PT100 RTD
Quick Disconnect Pneumatic Connector		✓	✓	✓	✓	✓
Mounting Hardware		✓	✓	✓	✓	✓
Probe Heater Control		✓	✓	✓	✓	✓
Micro Purge System Control		✓	✓	✓	✓	✓

<sup>1</sup>Supplied by user. Must be compatible with USB 2.0 specification. Limited to 32 GB and 8192 block formatting.

<sup>2</sup>Not for use in high EMI/RF interference environment.



**CERTIFICATIONS AVAILABLE**

Certain models of the Micro Air Data Computer have been tested and certified compliant with the following military and commercial standards:

**TABLE 2. MILITARY AND COMMERCIAL STANDARDS**

Test Standard	Method/Procedure/Section	Title	$\mu$ ADC Model
MIL-STD 810G	Method 501.5, Proc. I, II, & III	High Temperature	Pegasus, Destiny
MIL-STD 810G	Method 502.5, Proc. I & II	Low Temperature	Pegasus, Destiny
MIL-STD 810G	Method 513.5, Proc. II	Acceleration (Operational)	Pegasus, Destiny
MIL-STD 810G	Method 514.6, Proc. I	General Vibration (Category 12)	Pegasus, Destiny
MIL-STD 810G	Method 516.6, Proc. I	Functional Shock (Operational)	Pegasus, Destiny
MIL-STD 810G	Method 520.3	Combined Environments	Pegasus, Destiny
MIL-STD 461G	RS103	Radiated Susceptibility, Electric Field, 2 MHz – 18 GHz Air Force Requirements (Table XI RS103 Limits)	Pegasus, Destiny
DO-160F	Sections 4.5.1 & 4.5.2	Storage & Operational Low Temperature	Pegasus, Destiny
DO-160F	Sections 4.5.3 & 4.5.4	Storage & Operational High Temperature	Pegasus, Destiny
DO-160F	Section 4.6.1	Altitude	Pegasus, Destiny
DO-160F	Section 7.2.1	Shock	Pegasus, Destiny
DO-160F	Section 8.5	Vibration	Pegasus, Destiny
MIL-STD 810G (with Change 1)	Method 507.6, Proc. I	Humidity - 15 Days (Induced Cycle B1 & Natural Cycle B2)	Orion
MIL-STD 810G (with Change 1)	Method 514.7, Proc. I	General Vibration (Category 24)	Orion
MIL-STD 810G (with Change 1)	Method 516.7, Proc. I and II	Functional Shock (Operational & Transportation)	Orion
MIL-STD 810G (with Change 1)	Method 520.4, Proc. III	Combined Environments	Orion



TABLE 3. OPERATIONAL SPECIFICATIONS

ELECTRICAL						
		Pegasus	Endeavor	Destiny	Orion	Voyager
Input Voltage Range, VDC		8 to 36			8 to 36	8 to 36
Current Draw at 12 VDC, mA		90			88	142
Power, W		1.1				1.7
Probe Heater Voltage Range, VDC		5-28				
Probe Heater Power at 28 VDC, W		56				
Thermocouple (Type K) Range, °C		-				
RTD (Class A or B) Range, °C		-200 to 600				
COMMUNICATION						
		Pegasus	Endeavor	Destiny	Orion	Voyager
Sampling Data Rate Options, Hz <sup>1</sup>		10, 20,50,100				
Serial Specification Options		RS232, RS422				
Serial Data Output Streaming Rate Options, bps <sup>1</sup>		460800, 230400, 115200, 57600, 38400, 19200				
Analog to Digital Resolution, bits		16				
MECHANICAL						
		Pegasus	Endeavor	Destiny	Orion	Voyager
Size, mm (inches)		66 x 79 x 41 (2.6 x 3.1 x 1.6)			Ø95 x 28 (Ø3.8 x 1.1)	66 x 79 x 41 (2.6 x 3.1 x 1.6)
Mounting Flange Footprint, mm (inches)		66 x 97 x 1.5 (2.6 x 3.8 x 0.06)			-	66 x 97 x 1.5 (2.6 x 3.8 x 0.06)
Weight, grams		181 <sup>2</sup>	202	181 <sup>2</sup>	220	285 <sup>3</sup>

<sup>1</sup>Serial streaming data rate and sample rate are interrelated. All combinations are not available. Refer to the Aeroprobe Micro Air Data Interface Document (Document No. 90001-14-ICD-03).

<sup>2</sup>Standard velocity range. For extended velocity range option add 21 grams.

<sup>3</sup>Includes GPS antenna.



TABLE 4. SENSOR RANGE OPTIONS (PROPERTIES AT SEA LEVEL, 15 °C )

Pressure Range <sup>1</sup>		0.5 inH <sub>2</sub> O	1 inH <sub>2</sub> O	2 inH <sub>2</sub> O	5 inH <sub>2</sub> O	10 inH <sub>2</sub> O	1 psi	100 mbar	160 mbar	5 psi	15 psi
Maximum Indicated Airspeed <sup>2,3</sup>	±20°	14 m/s, Mach 0.04	20 m/s, Mach 0.06	28 m/s, Mach 0.08	45 m/s, Mach 0.13	63 m/s, Mach 0.19	105 m/s, Mach 0.31	126 m/s, Mach 0.37	157 m/s, Mach 0.46	225 m/s, Mach 0.66	323 m/s, Mach 0.95
	±40°	n/a	17 m/s, Mach 0.05	24 m/s, Mach 0.07	39 m/s, Mach 0.11	55 m/s, Mach 0.16	92 m/s, Mach 0.27	110 m/s, Mach 0.32	138 m/s, Mach 0.41	199 m/s, Mach 0.59	323 m/s, Mach 0.95
Recommended Minimum Airspeed <sup>4</sup>		2.7 m/s	4.0 m/s	5.5 m/s	7.0 m/s	8.5 m/s	14 m/s	17 m/s	22 m/s	31 m/s	54 m/s
Minimum Reported Airspeed <sup>5</sup>		1.8 m/s	2.5 m/s	3.5 m/s	6.0 m/s	8.0 m/s	13 m/s	16 m/s	25 m/s	30 m/s	50 m/s
Maximum Safe Over-Pressure <sup>6</sup>		270 inH <sub>2</sub> O (9.7 psi)	270 inH <sub>2</sub> O (9.7 psi)	270 inH <sub>2</sub> O (9.7 psi)	300 inH <sub>2</sub> O (10.8 psi)	350 inH <sub>2</sub> O (12.6 psi)	10 psi	1400 mbar (20.3 psi)	1400 mbar (20.3 psi)	30 psi	30 psi

<sup>1</sup>Specified pressure range. Pressure inputs greater than this range may cause accuracy degradation. See Maximum Safe Over-Pressure.

<sup>2</sup>Endeavor model not available with 0.5 inH<sub>2</sub>O sensor range.

<sup>3</sup>Endeavor model can achieve ±40° flow angle with a reduction in the maximum airspeed. Within ±20° the airspeed limit is increased.

<sup>4</sup>Indicated airspeed below which expected error in AoA could be greater than 6°. See Figures 1 & 2 for more detail.

<sup>5</sup>The minimum reported airspeed is dictated by the minimum dynamic pressure that can accurately be measured for the given sensor range at zero altitude.

<sup>6</sup>Pressures above the specified maximum safe over-pressure will cause damage to the internal pressure sensors.

TABLE 5. MICRO AIR DATA SYSTEM SPECIFICATIONS

Parameter	Typical	Unit
Indicated Airspeed Error <sup>1</sup>	±1m/s or ±1%	-
Angle of Attack Range	±20 (±40 Endeavor)	deg
Angle of Sideslip Range	±20 (±40 Endeavor)	deg
Flow Angle Error <sup>1</sup>	±1	deg
Barometric Altitude Range	-298 to 20000	m
Barometric Altitude Resolution	1	m
Barometric Altitude Error at Sea Level <sup>2</sup>	±24	m
Operating Temperature Range <sup>3,4</sup>	-40 to 85 (Pegasus, Endeavor, Destiny, Voyager, Orion)	°C

<sup>1</sup>See Figures 1 & 2 for expected errors for each sensor range.

<sup>2</sup>Does not include error due to local barometric pressure variance. See Figure 3 for more detail.

<sup>3</sup>Still air at sea level pressure.

<sup>4</sup> $\mu$ ADC specification only. Check Air Data Probe Technical drawings for operating temperatures.



■ TABLE 6. GPS AIDED INERTIAL NAVIGATION SYSTEM (GPS/INS) SPECIFICATIONS (VOYAGER)

Parameter	Typical	Unit
Roll/Pitch	0.2 (static), 0.3 (dynamic)	deg
Heading	0.8	deg
Horizontal Position ( $1\sigma$ STD)	1.0	m
Vertical position ( $1\sigma$ STD)	2.0	m
Velocity accuracy ( $1\sigma$ RMS)	0.05	m/s
Output Rate	Up to 2000	Hz
Gyro Range	$\pm 450$	$^{\circ}/s$
Gyro Non-linearity	0.01	%FS
Gyro Noise Density	0.01	$^{\circ}/s/\sqrt{Hz}$
Gyro G-sensitivity	0.003	$^{\circ}/s/g$
Gyro In-run Bias Stability	10	$^{\circ}/hr$
Gyro Bandwidth	415	Hz
Accelerometer Range	$\pm 20$	G
Accelerometer Non-linearity	0.1	%FS
Accelerometer Noise Density	60	$\mu g/\sqrt{Hz}$
Accelerometer Zero g-output	$\pm 5$	Mg
Accelerometer In-run Bias Stability	15	$\mu g$
Accelerometer Bandwidth	375	Hz
Magnetometer Range	$\pm 8$	Gauss
Magnetometer Non-linearity	0.2	%FS
Magnetometer Total RMS noise	0.5	mG

■ TABLE 7. ATTITUDE HEADING REFERENCE SYSTEM (AHRS) SPECIFICATIONS (DESTINY)

Parameter	Typical	Unit
Roll/Pitch	0.75 (static), 1.0 (dynamic)	deg
Heading	2.0	deg
Output Rate	100	Hz
Gyro Range	$\pm 2000$	$^{\circ}/s$
Gyro Non-linearity	0.1	%FS
Gyro Noise Density	0.01	$^{\circ}/s/\sqrt{Hz}$
Gyro G-sensitivity	0.001	$^{\circ}/s/g$
Gyro In-run Bias Stability	10	$^{\circ}/hr$
Accelerometer Range	$\pm 16$	g
Accelerometer Non-linearity	0.5	%FS
Accelerometer Noise Density	200	$\mu g/\sqrt{Hz}$
Accelerometer Zero g-output	$\pm 2$	mg
Accelerometer In-run Bias Stability	0.1	mg
Bandwidth	180	Hz
Magnetometer Range	$\pm 0.8$	Gauss
Magnetometer Non-linearity	0.1	%FS
Magnetometer Noise Density	200	$\mu G/\sqrt{Hz}$
Magnetometer Non-linearity	0.2	%FS
Magnetometer Total RMS noise	0.5	mG



■ EXPECTED MICRO AIR DATA SYSTEM ERRORS

Figure 1. Angle Error ( $2\sigma$ )

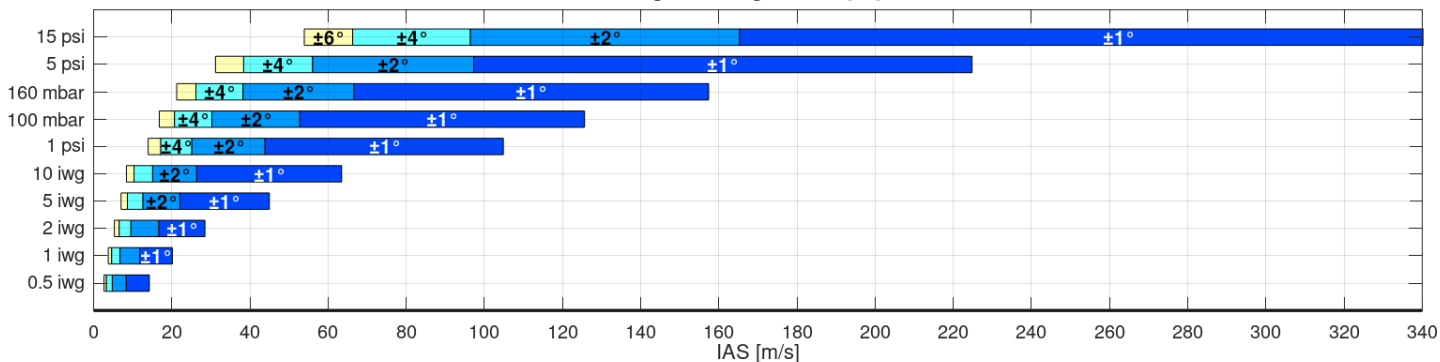


Figure 2. Indicated Airspeed Error ( $2\sigma$ ) [m/s]

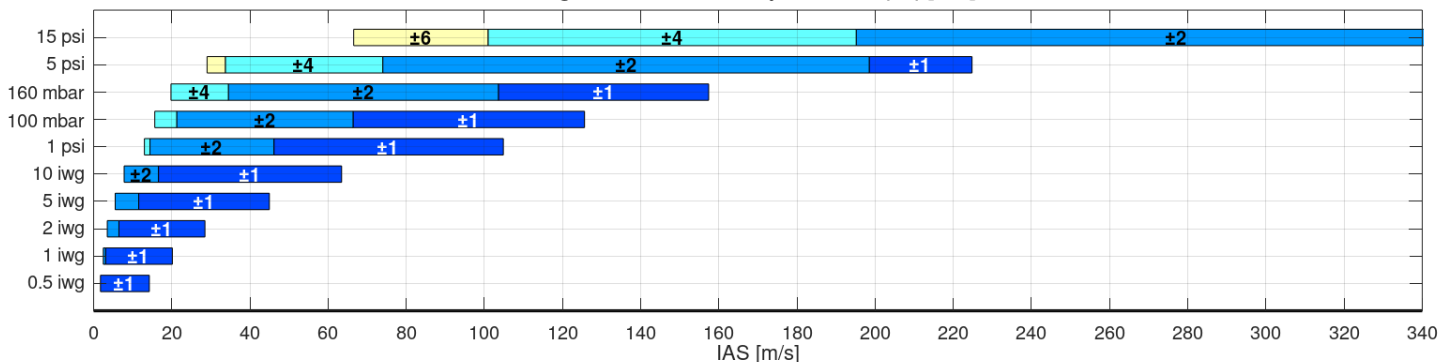
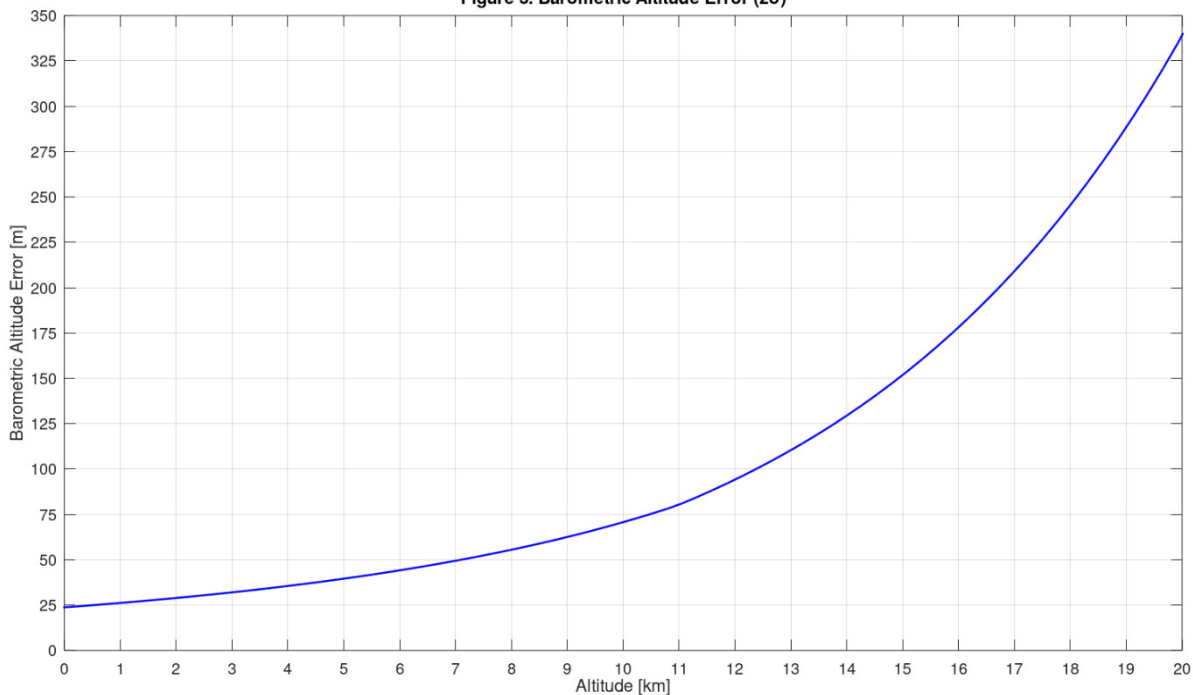


Figure 3. Barometric Altitude Error ( $2\sigma$ )



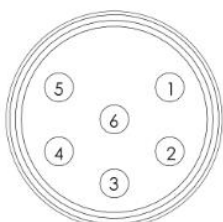
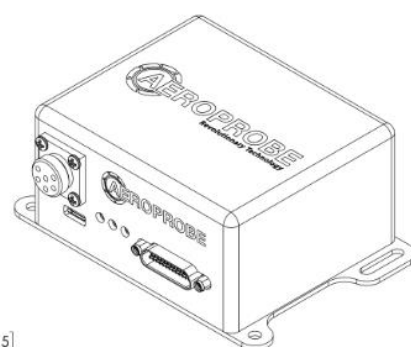
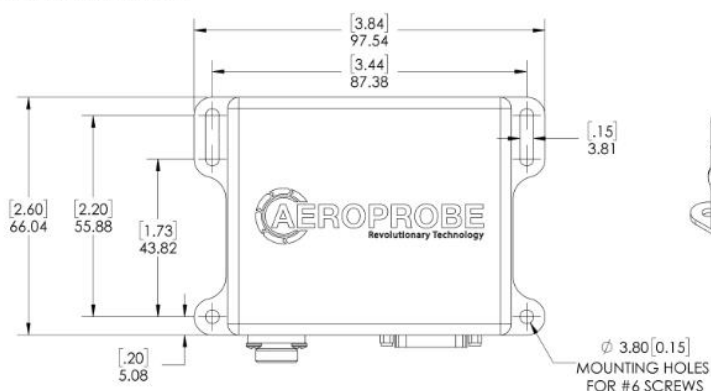


**MECHANICAL PROPERTIES**

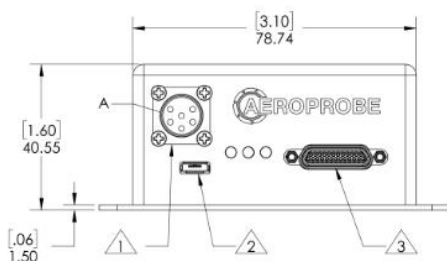
**Pegasus, Endeavor, & Destiny**

NOTES:

- 1 6 PORT PNEUMATIC QUICK-DISCONNECT
- 2 MICRO USB CONNECTOR
- 3 25 POSITION (F) CANNON MICRO "D" CONNECTOR



DETAIL A  
SCALE 5: 1  
PROBE PNEUMATIC CONNECTOR  
PORT LOCATIONS





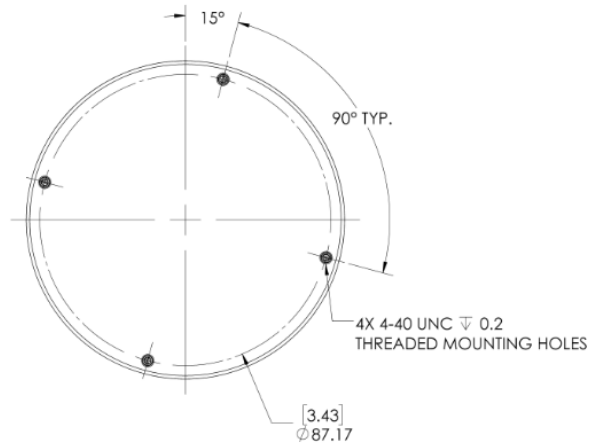
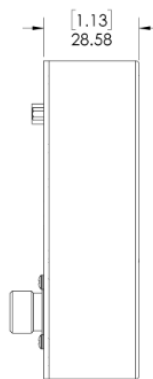
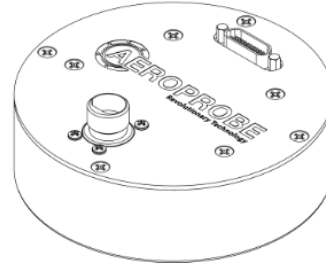
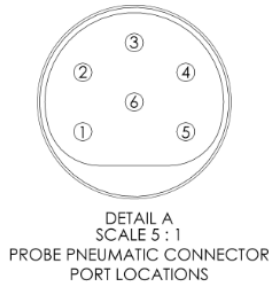


**MECHANICAL PROPERTIES**

**Orion**

NOTES:

- ① 21 POSITION (F) MICRO "D" CONNECTOR
- ② 6 PORT PNEUMATIC QUICK-DISCONNECT



**Voyager**

NOTES:

- ① 6 PORT PNEUMATIC QUICK-DISCONNECT
- ② MICRO USB CONNECTOR
- ③ 25 POSITION (F) CANNON MICRO "D" CONNECTOR
- ④ SMA (F) CONNECTOR

