Honda Aircraft Company, Inc. Form 442 STA application for Yuma International Airport justification

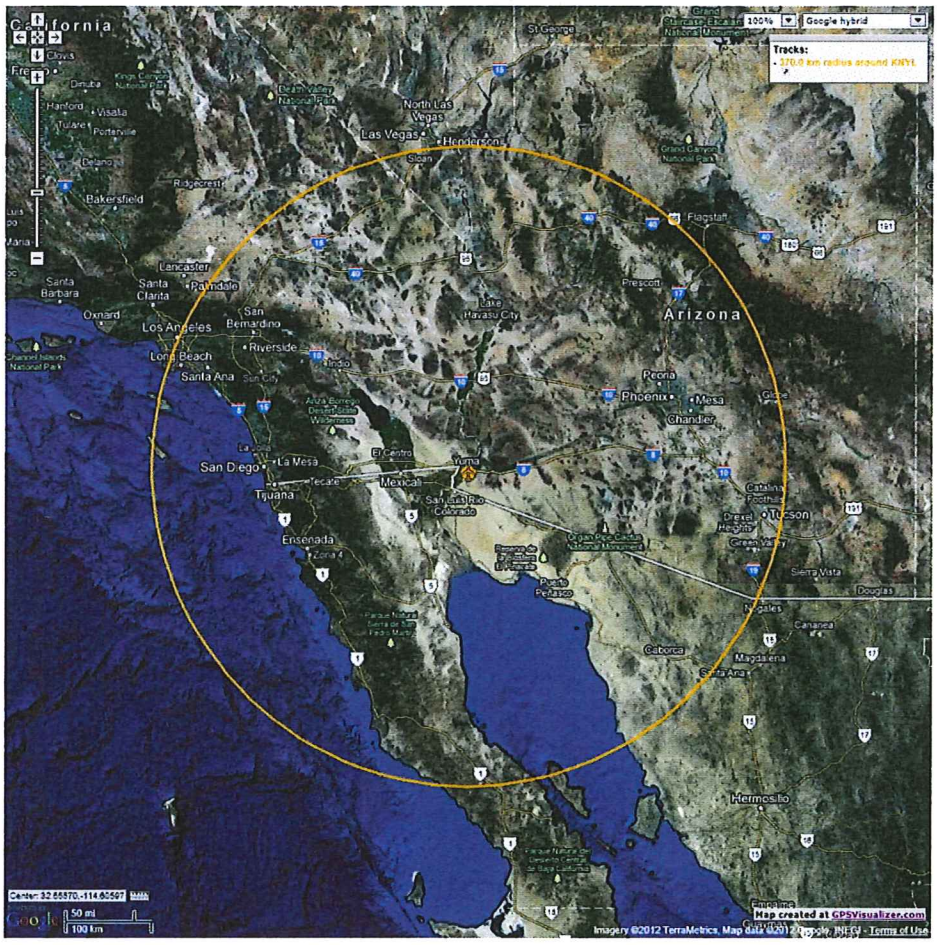
Honda Aircraft Company, as part of the Development and Certification of the Model HA420 aircraft, has the need to perform testing of the Flight Test Aircraft in order to determine & demonstrate the acceptability of the Engine and Aircraft systems performance when exposed to the maximum environment temperatures.

Honda Aircraft expects to be able to encounter the highest temperatures for these tests in the southwest region, and wants to base out of Yuma, AZ (KNYL Airport) for the performance of these tests.

Scheduling for facilities and equipment has identified the weeks of Sept. 17, 2012 through Oct. 27, 2012, and Honda Aircraft Company is seeking license approval to transmit the flight test data per the License application.

Honda Aircraft is seeking authorization to operate in the 2200 – 2300 MHz Band, requiring 9.8 MHz bandwidth. The transmitter is tunable across this band in 0.5 MHz increments, such that the frequency can be changed as needed in order to maintain coordination with other RF requirements as required by local/nearby facilities in that range.

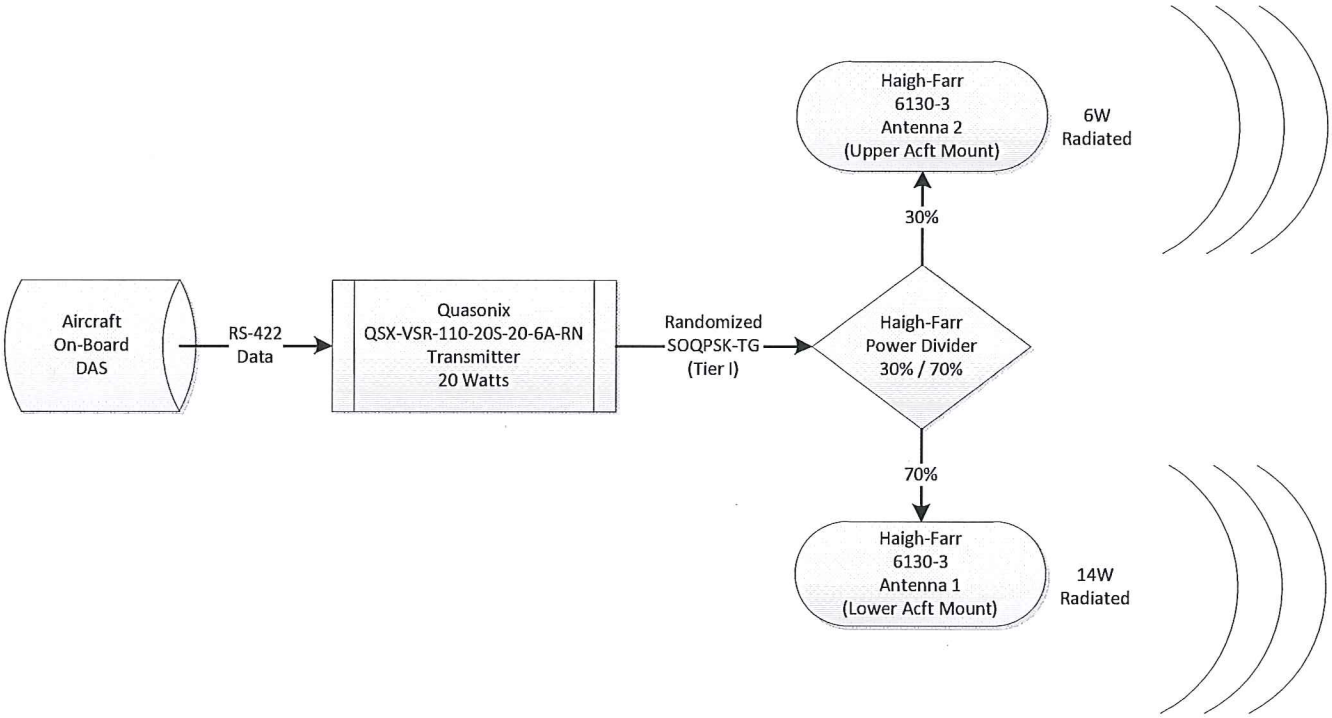
The tests will include ground tests for heat soak and ground/taxi operations, as well as flight tests from ground to 45000 ft {13716 meter} for general maneuvers and systems operation at intermediate altitudes within that envelope. In order to perform cruise tests, and allow space for aircraft coordination with Air Traffic Control, Honda Aircraft is requesting a range radius of 370 km about KNYL Airport. No operations are to be performed across the United States – Mexico border.



The operation of the HondaJet Model HA420 requires the monitoring of on-board aircraft and engine systems during the test flights, which requires the transmission of the on-board data system stream for ground monitoring.

The Aircraft On-Board Data Acquisition System (DAS) provides the signal conditioning and interface to digitize the various transducers to be measured, and communicates to the Transmitter via RS-422 communications on board the aircraft. The Transmitter then generates the Randomized-SOQPSK modulated signal to be transmitted from the aircraft. The 20W output of the transmitter goes through a Power Divider, providing the transmission signal to 2 separate antennas mounted on the aircraft. 70% of the power is directed to Antenna 1 mounted on the bottom of the aircraft, and 30% of the power is directed to Antenna 2 mounted on the top of the aircraft.

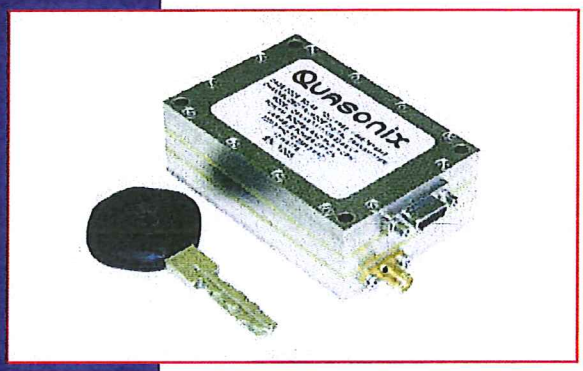
The following is a simplified block diagram of the transmitting system components. The component data sheets are provided on the following pages.

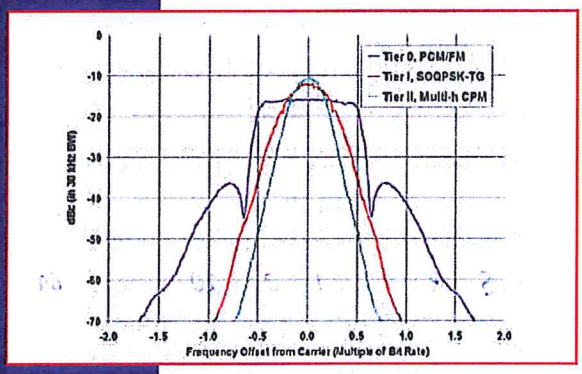


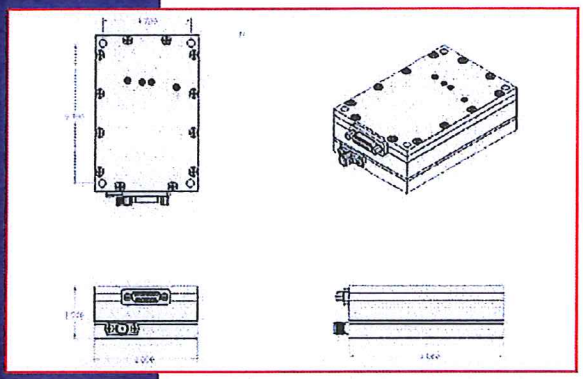
Reinventing Telemetry™

Quasonix

SINGLE-BAND MULTI-MODE TRANSMITTER







- ***PCM/FM Modulation***
  Legacy waveform for maximum compatibility with existing range ground equipment. Premod filtering is built in, eliminating external filters.
- ***SOQPSK-TG Modulation***
  Advanced Range Telemetry (ARTM) Tier I waveform delivers twice the spectral efficiency of PCM/FM. SOQPSK-TG is fully interchangeable with FQPSK, but SOQPSK requires no intellectual property license.
- ***Multi-h CPM Modulation***
  ARTM Tier II waveform delivers 2.5 times the spectral efficiency of PCM/FM.
- ***Direct Digital Synthesis***
  Exceptional spectral purity, without spurious spectral lines due to I-Q modulator imbalances.
- ***Automatic Data Rate Tracking***
  Premod filtering and deviation automatically track the data rate, with no programming or configuration.
- ***VCO-free Design***
  Immunity to shock and vibration, allowing application on platforms with severe dynamics.
- ***Bypassable Randomizer***
  Standard IRIG-106 fifteen-stage randomizer, for applications with non-encrypted data.
- ***Standard Package***
  Uses industry standard mechanical outline and mounting hole pattern.
- ***Exceptional DC-to-RF Conversion Efficiency***
  Draws less current than legacy analog PCM/FM transmitters, at any RF output level.

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SPECIFICATIONS:

Characteristic	Specification
Size, weight	6 cubic inches, 2.00" (W) x 3.00" (L) x 1.00" (H), 6.7 oz.
Modulation type	PCM/FM (ARTM Tier 0), SOQPSK-TG (Tier I), and Multi-h CPM (Tier II)
RF output power	5 mW, 5 W, 10 W, or 20 W, specify in model number Option DP: Dual power, 2 settings, selectable via serial control Option VP: Variable power, 31 settings over 24 dB range (non-uniform, largest step approximately 1 dB)
Carrier frequency tuning range, any one model covers all of any one band	Lower L-band: 1435.5 MHz to 1534.5 MHz Upper L-band: 1750.0 MHz to 1855.0 MHz S-band: 2200.5 MHz to 2394.5 MHz
Carrier frequency tuning increment	0.5 MHz
Carrier frequency accuracy	± 2.5 ppm over temperature ± 7.5 ppm, all causes, including aging over 5 years
Data (bit) rate, automatic rate adaptation	Standard: 1-20 Mbps (0.5-10 Mbps for PCM/FM) Option LR: Extends lower limit to 50 kbps (25 kbps for PCM/FM) Option HR: Extends upper limit to 28 Mbps (14 Mbps for PCM/FM)
Input voltage	+28 ± 4 VDC
Input current at 28 VDC	5 Watt (05S models): 1.2 Amps max all conditions; 1.1 Amps typ. 10 Watt (10S models): 1.8 Amps max all conditions; 1.5 Amps typ. 20 Watt (20S models): 2.9 Amps max all conditions; 2.5 Amps typ.
Power reversal	Reverse voltage protection
Turn-on startup time	< 240 mS
Control interface	RS-232 serial control
Signal interfaces	Serial data with separate synchronous clock, TTL or TIA/EIA-422
Randomizer	15-stage LFSR, per IRIG 106. Selectable for bypass or enable

MODEL NUMBERS:

QSX-V(S)(R)-(1)(1)(0)-(20)S-20-(6A)-(RN)

Band (L = Lower L, U = Upper L, S, or M = Tri-band)
Baseband Interface (T = TTL, R = RS-422)
ARTM Tier 0, PCM/FM (1 = Include, 0 = Exclude)
ARTM Tier I, SOQPSK-TG (1 = Include, 0 = Exclude)
ARTM Tier II, Multi-h CPM (1 = Include, 0 = Exclude)
Power in Watts (00, 05, 10, or 20)
Package (6A = single-band, 7A = tri-band, 9A = EC / PF / PM options)
Options (separate multiple options by a dash "-")

OPTIONAL FEATURES:

- > PS Multiple presets (specify 2, 4, 8, or 16)
- > WV Wide input voltage range
- > CG Clock generator output
- > RN Randomizer output
- > DP Dual power (two settings, "full" and "low" – specify settings)
- > AC Automatic carrier wave output
- > VP Variable power (31 settings, spanning 24 dB)
- > CF Clock-free baseband interface
- > HR Increases max bit rate to 28 Mbps (14 Mbps for Tier 0)
- > LR Decreases min bit rate to 50 kbps (25 kbps for Tier 0)
- > EC Forward Error Correction / Turbo Product Codes
- > PF Parallel Port Frequency Programming
- > PM Parallel Port Mode Selection

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CLASSIFICATION UNCLASSIFIED	PAGE of Pages

TRANSMITTER EQUIPMENT CHARACTERISTICS

1. NOMENCLATURE, MANUFACTURER'S MODEL NO. QSX-VSR-110-20S-20-4D-WV-DP-HR-AC PCM/FM, SOQPSK	**2. MANUFACTURER'S NAME** Quasonix, LLC
3. TRANSMITTER INSTALLATION Airborne	**4. TRANSMITTER TYPE** Digital Telemetry
5. TUNING RANGE 2200.5-2394.5 MHz	**6. METHOD OF TUNING** Phase-locked loop synthesizer, 500 kHz reference frequency
7. RF CHANNELING CAPABILITY 0.500 MHz	**8. EMISSION DESIGNATOR(S)** See Remarks. PCM/FM mode 1M62F1DBN SOQPSK mode 780KG1DDN
9. FREQUENCY TOLERANCE ±20 PPM, maximum	
10. FILTER EMPLOYED *(X one)* ☒ a. YES ☐ b. NO	
11. SPREAD SPECTRUM *(X one)* ☐ a. YES ☒ b. NO	**12. EMISSION BANDWIDTH** *(X and complete as applicable)* ☐ CALCULATED ☒ MEASURED
13. MAXIMUM BIT RATE 23 Mbps for PCM/FM, 46 Mbps for SOQPSK	a. -3 dB 1.02 0.35 MHz b. -20 dB 1.22 0.93 MHz
14. MODULATION TECHNIQUES AND CODING PCM/FM: Binary FM with premodulation filtering, no coding SOQPSK: Offset QPSK with premodulation filtering, no coding ARTM CPM: 4-ary FSK with premodulation filtering, no coding	c. -40 dB 2.68 1.43 MHz d. -60 dB 3.96 1.99 MHz e. OC-BW 1.14 0.78 MHz
	15. MAXIMUM MODULATION FREQUENCY See block 24.
16. PRE-EMPHASIS *(X one)* ☐ a. YES ☒ b. NO	**17. DEVIATION RATIO** 0.7 for PCM/FM, 0.5 for SOQPSK, 0.28 for ARTM CPM
	18. PULSE CHARACTERISTICS
19. POWER	a. RATE NA
a. MEAN 20 W	b. WIDTH NA
b. PEP NA	c. RISE TIME NA
20. OUTPUT DEVICE Transistor, operated in class C	d. FALL TIME NA e. COMP RATIO NA
	21. HARMONIC LEVEL
22. SPURIOUS LEVEL -68 dBc within ± 100 MHz, -80 dBc outside ±100 MHz	a. 2nd -57 dBc
23. FCC TYPE ACCEPTANCE NO.	b. 3rd -57 dBc
	c. OTHER -80 dBc

24. REMARKS

In all modes and all bands, waveform filtering is applied in three steps:

- Digital premodulation filtering, scaled automatically with the bit rate.
- Multiple stages of LC and stripline filtering in the upconversion circuits.
- 7-pole Butterworth LPF after the final output stage.

Block 15: Maximum modulation frequency: PCM/FM: Fmax = 0.35 x bit rate
SOQPSK: Fmax = 0.25 x bit rate

- All emission bandwidths in item 12, harmonic levels in item 21 and spurious levels in item 22 are measured values.
- The three different sets of emission bandwidths in item 12 are for PCM/FM and SOQPSK mode, respectively.
- For all modes, Emission Designator and Emission Bandwidths are for bit rate of 1 Mbps, and scale in direct proportion to bit rate.

CLASSIFICATION UNCLASSIFIED	

DD Form 1494, AUG 96

THE WORLD LEADER IN HIGH PERFORMANCE WRAPAROUND™ ANTENNAS.

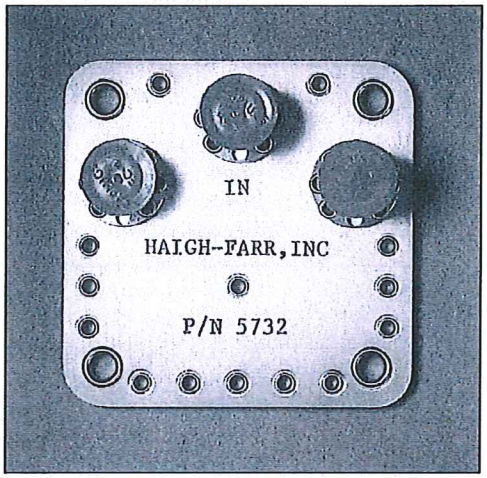
POWER DIVIDERS

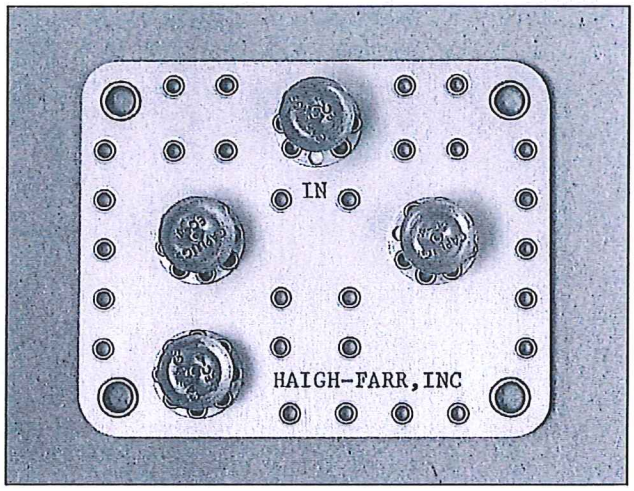
Haigh-Farr Power Dividers utilize the same materials and methods of fabrication as our well-proven Wraparound™ antenna.

Designs providing 2, 3 or 4-way division are available from 100 MHz to 13 GHz.

Haigh-Farr can provide matched cables which, when combined with our Power Dividers and our off-the-shelf antennas, form a low cost, readily available antenna system.

When the Haigh-Farr Power Divider is used to feed multi-element Haigh-Farr antenna systems, it may typically be incorporated directly into one of the antenna elements, thereby reducing the total number of connections and internal vehicle space required.





FEATURES

- 100 MHz to 13 GHz
- 2, 3 or 4-way Designs
- Integral or External to Antenna
- Small, Compact Footprint
- Conformal and Custom Footprints Available
- Built for Extreme Shock & Vibration Environments

APPLICATIONS

- Launch Vehicles
- Atmospheric Rockets
- Missiles
- Drones
- Aircraft
- Helicopters
- Spacecraft
- Multi-Element Systems

DESIGN CAPABILITY

With over 30 years of design history, your antenna configuration/ performance requirements may already exist, or extrapolations from similar Haigh-Farr designs may be possible with minimal effort. If a design meeting your requirements does not exist, Haigh-Farr has the experience and modeling capability to customize a solution. Contact Haigh-Farr for a review of your antenna requirements.

Haigh-Farr, Inc. 43 Harvey Rd, Bedford, NH 03110
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E-mail: sales@haigh-farr.com, Web Site: www.haigh-farr.com

POWER DIVIDERS

THE WORLD LEADER IN HIGH PERFORMANCE WRAPAROUND™ ANTENNAS.

TYPICAL SPECIFICATIONS

Operating Bands:	100 MHz to 13 GHz
Division:	
Type:	2, 3 or 4-way
Amplitude:	Design parameter, equal or unequal distribution
Phase:	Design parameter, equal or phase progression
Insertion Loss:	0.3 dB
Input Impedance:	50 Ohms
Bandwidth:	Design parameter, 5% - 10%
Input VSWR:	1.25 max across Band
Power:	40 W cw, 5 kW peak
Connector:	SMA standard, other connector options available including direct cable feeds
Weight:	Function of electrical requirements
	1.2 ounces (34 g), 2-way S-Band
Dimensions:	Design parameter
	2-way S-Band dimensions:
	Width: 2.2" (56 mm)
	Length: 2.2" (56 mm)
Mounting Surface:	Manufactured to naturally mate with specified cylindrical, conical or flat surface
Securing:	Screw and/or bond
Altitude:	Any
Environment:	Design parameter, typical of tactical supersonic missiles and kinetic kill weapons

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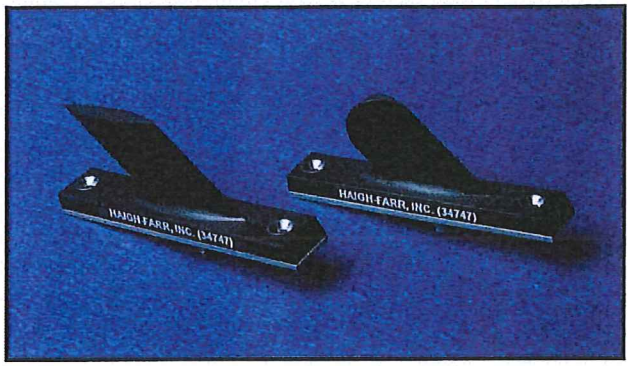
Represented by:

THE WORLD LEADER IN HIGH PERFORMANCE WRAPAROUND™ ANTENNAS.

BLADE ANTENNAS

Haigh-Farr's family of rugged Blade antennas are available in frequencies ranging from UHF to upper C-band, and may be provided in either straight or rounded blade configurations. These antennas have demonstrated proven reliability in over 30 years of high-performance airborne applications. Blade antennas are also used extensively in ground-based vehicles such as race cars, trucks, tanks, and motorcycles, to name a few.

These Blade antennas exhibit quasi-uniform null-free hemispherical patterns.



FEATURES:

- **Hemispherical Coverage**
  (see patterns on next page)
- **Frequencies from UHF to C-Band**
- **Small, Compact Footprint**
- **Aerodynamic Design**
- **Common Footprint for All Models**
- **Built to Withstand Extreme Shock & Vibration Environments**

APPLICATIONS:

- **Data Links, Telemetry, Transponder**
- **Aircraft**
- **UAVs**
- **Helicopters**
- **Tactical Missiles**
- **Ships**
- **Ground-Based Vehicles**
- **Single or Array Implementations with Matching Power Dividers and Cables**

DESIGN CAPABILITY

Haigh-Farr has a more than 40 year history of designing and producing exceptionally rugged, high-performance antennas. If you don't find an antenna meeting your requirements in our standard list of products, Haigh-Farr has the experience and modeling capability to customize a solution. Adaptations of existing designs can be done with very short lead times. Contact Haigh-Farr for a review of your antenna requirements.

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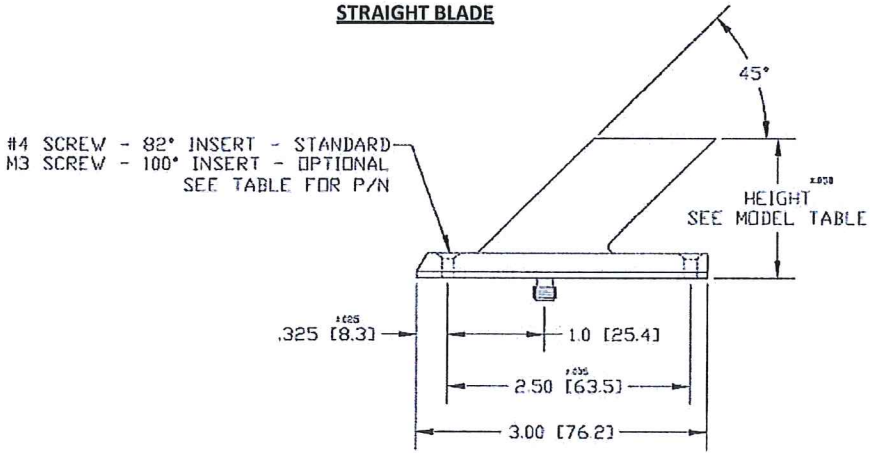
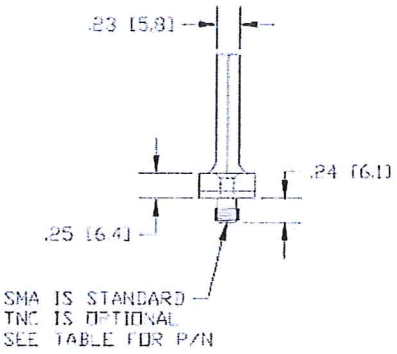
General Blade Rev B 05/10 Approved for release DF 5/10

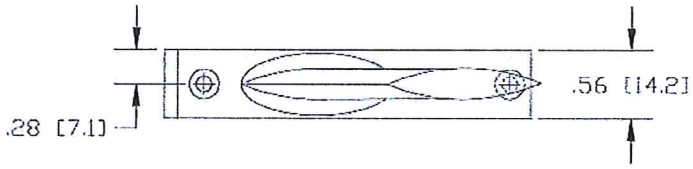
MECHANICAL DIMENSIONS

HAIGH-FARR

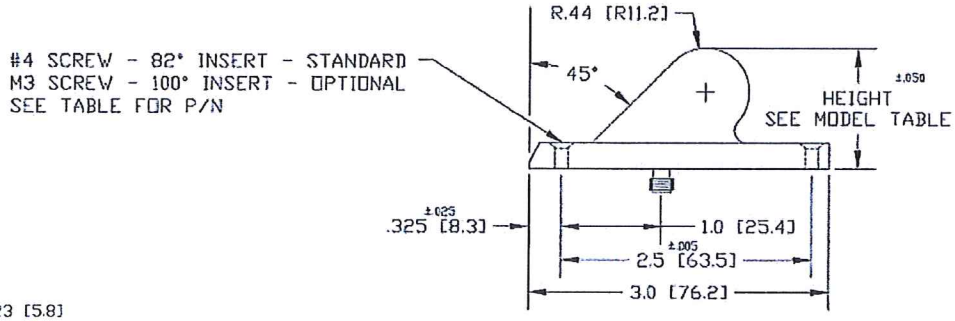
STRAIGHT BLADE

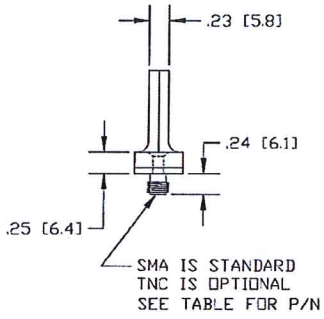


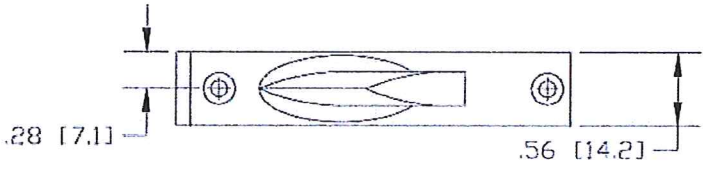




ROUNDED BLADE







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BLADE ANTENNAS

HAIGH-FARR

Round Blade P/N	Straight Blade P/N	Frequency Range GHz	VSWR MAX/TYPICAL	5KW[1] ALTITUDE	PEAK[2] POWER	Height Inches [mm]	Weight (SMA) OZ [grams]
6107	6007	1.060 ± .030	2.0:1/1.50:1	116	160 W	2.30 [58.4]	1.0 [28.3]
6108	6008	0.9165 ± .025	2.0:1/1.50:1	116	160 W	2.30 [58.4]	1.0 [28.3]
6109	6009	1.35 – 1.54	2.0:1/1.50:1	116	160 W	1.75 [44.3]	0.9 [26]
6110	6010	1.43 – 1.54	1.5:1/1.25:1	116	160 W	1.54 [39.1]	0.8 [23]
6110-2	6010-2	1.425 – 1.525	1.5:1/1.25:1	116	160 W	1.54 [39.1]	0.8 [23]
6110-3	6010-3	1.45 – 1.65	2.0:1/1.50:1	116	160 W	1.54 [39.1]	0.8 [23]
6110-4	6010-4	1.50 – 1.80	2.0:1/1.50:1	116	160 W	1.54 [39.1]	0.8 [23]
6115	6015	1.60 – 1.70	1.5:1/1.25:1	116	160 W	1.54 [39.1]	0.8 [23]
6120	6020	1.71 – 1.85	1.5:1/1.25:1	114	240 W	1.45 [36.8]	0.8 [23]
6125	6025	2.00 – 2.10	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6125-1	6025-1	2.00 – 2.30	2.0:1/1.50:1	110	350 W	1.19 [30.2]	0.7 [20]
6130	6030	2.20 – 2.30	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6130-1	6030-1	2.30 – 2.40	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6130-2	6030-2	2.40 – 2.50	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6130-3	6030-3	2.20 – 2.40	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6130-4	6030-4	2.30 – 2.50	1.5:1/1.25:1	110	350 W	1.19 [30.2]	0.7 [20]
6130-6	6030-6	2.20 – 2.50	1.75:1/1.50:1	110	350 W	1.19 [30.2]	0.7 [20]
6135-1	6035-1	3.10 – 3.30	1.5:1/1.25:1	106	350 W	1.19 [30.2]	0.7 [20]
6135-2	6035-2	3.45 – 3.55	1.5:1/1.25:1	106	350 W	1.19 [30.2]	0.7 [20]
6135-3	6035-3	3.65 – 3.85	1.5:1/1.25:1	106	350 W	1.19 [30.2]	0.7 [20]
6140	6040	4.50 – 5.00	1.5:1/1.25:1	104	1.5 kW	0.90 [22.9]	0.6 [17]
6150	6050	5.40 – 5.90	1.5:1/1.25:1	102	2.2 kW	0.75 [19.1]	0.6 [17]
6150-1	6050-1	5.25 to 5.85	1.5:1/1.25:1	102	2.2 kW	0.75 [19.1]	0.6 [17]
6150-2	6050-2	6.40 – 6.60	1.5:1/1.25:1	102	2.2 kW	0.75 [19.1]	0.6 [17]

- Thermal environments: -50°C to 150°C; 300°C Transient
- Polarization: Linear, predominately vertical
- Connector: SMA (50 Ω) Standard; TNC (50 Ω) Optional
- Required Mounting Screws: 82° Flathead #4 Standard; 100° Flathead #4 or M3 optional
- UHF models are available in different configurations
- Mechanical outline drawings are available upon request

[1] The 5kW altitude (k ft) is the approximate altitude at which the antenna will experience external corona with 5kW peak power.

[2] Peak power indicates the maximum power that may be radiated without experiencing external corona at any altitude. These antennas routinely handle average power in the 25-30W CW range. Sufficient airflow is required at the higher power levels.

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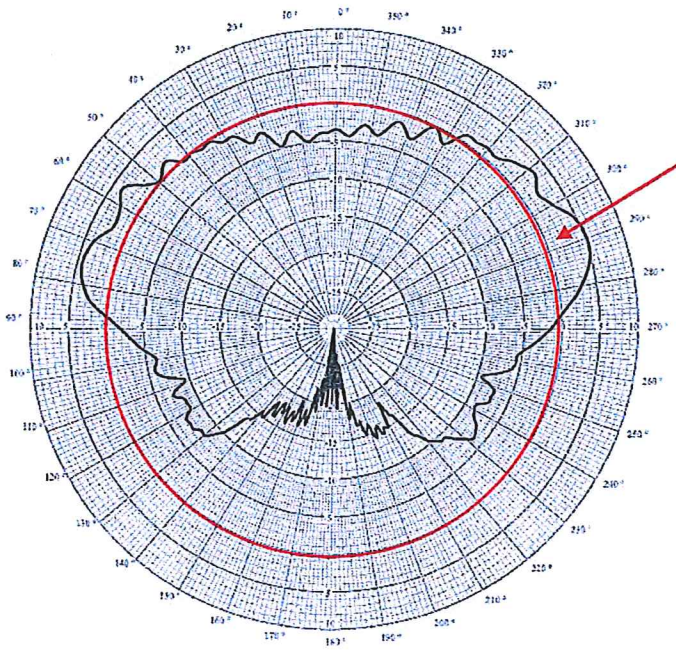
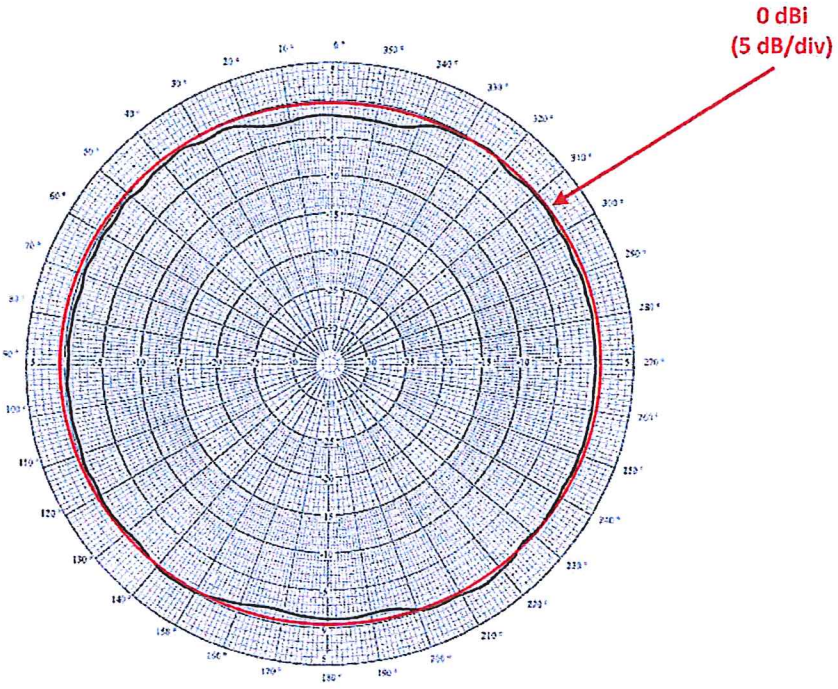
BLADE ANTENNAS

HAIGH-FARR



ELEVATION (PITCH)
2.250 GHz



AZIMUTH (YAW)
2.250 GHz

Note: The patterns shown above were measured with model 6130 on a cylindrical ground plane but are typical of the other Blades used. Fins and other protrusions on the vehicle will perturb the radiation pattern. The extent of any perturbations cannot be fully determined until radiation patterns are either calculated or measured on a model of the vehicle. Haigh-Farr offers engineering services, which include the calculation of radiation patterns on a specific vehicle.

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