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DATASHEET

Hughes Dual-Band (Ka/Ku) In-Flight Connectivity System

As demand and performance expectations for In-flight Connectivity (IFC) grow, gate-to-gate connectivity for global flight routes has become a critical need and a serious challenge. While Ka-band satellites are often the first choice for supporting IFC traffic, many flight routes simply do not have access to Ka capacity, either for portions of the route, or in some cases, for the entire route. Further, since aircraft are often assigned to different routes from time to time, it is not typically feasible or efficient to configure an aircraft for a single type of connectivity. Thus, to meet passengers' ever growing expectations for end-to-end connectivity regardless of flight route, and to ensure maximum flexibility for airlines in assigning and routing aircraft, it is essential to have the ability to use both Ka- and Ku-band satellites for many long-haul flight routes, and even many short-haul routes that operate in regions not served by Ka capacity.

To solve this challenge, Hughes has developed an advanced dual band IFC solution that delivers unsurpassed performance, reliability, and up-time. This system is designed to be fully compatible with all commercial Ka- and Ku-band satellite resources throughout the world, making it the ideal solution for airlines having trans-oceanic flight routes and those that have routes that are otherwise not served well with a single frequency band. The advanced capabilities and performance of Hughes' aeronautical IFC system, combined with the ability to use the best available satellite capacity over each flight route, enables airlines and their passengers to enjoy uninterrupted, high-performance connectivity for the entire gate-to-gate duration of every flight, regardless of where in the world the flight is operating.

The airborne portion of Hughes' IFC system is composed of two major components: a high performance, high-throughput satellite modem system (ModMan) and a compact, lightweight dual-band antenna system (fully compatible with off-the-shelf aeronautical radomes). Together, these components enable delivery of over 400 Mbps to a single aircraft and are designed to operate with any commercial Ka- or Ku-band satellite. Further, the system can dynamically switch from one type of satellite to the other (and from beam to beam within the footprint of a single spot beam satellite) with no interruption of service or manual intervention of any sort, thus ensuring passengers of a superior user experience and no loss of connectivity from gate-to-gate.

Satellite Modem System (ModMan)

The ModMan combines the functionality of a high performance airborne satellite communications modem with a full-featured airborne server. The 4 MCU ARINC 600 Line Replaceable Unit (LRU) incorporates Hughes' latest and most advanced JUPITER™ HTAero Modem plus an airborne server with functionality and features that go well beyond the requirements of ARINC 791. The advanced modem technology of the ModMan, together with the unique set of advanced mobility and traffic handling features, enable it to deliver superior spectral efficiency, link availability, and application performance.

Spectral Efficiency Features

- DVB-S2X standard for the receive channel
- TDMA return channel with adaptive inroute selection
- Automatic power control to maximize return channel efficiency
- Spread spectrum

Aeronautical Mobility Features

- Automatic beam switching and/or satellite switching
- Doppler compensation
- OpenAMIP interface standard

Application Performance-Enhancing Features

- Quality of Service (QoS) for efficient traffic prioritization
- Solid state storage for caching and other application-specific functions

High-Performance Modem Manager (ModMan)

Aero Antenna System

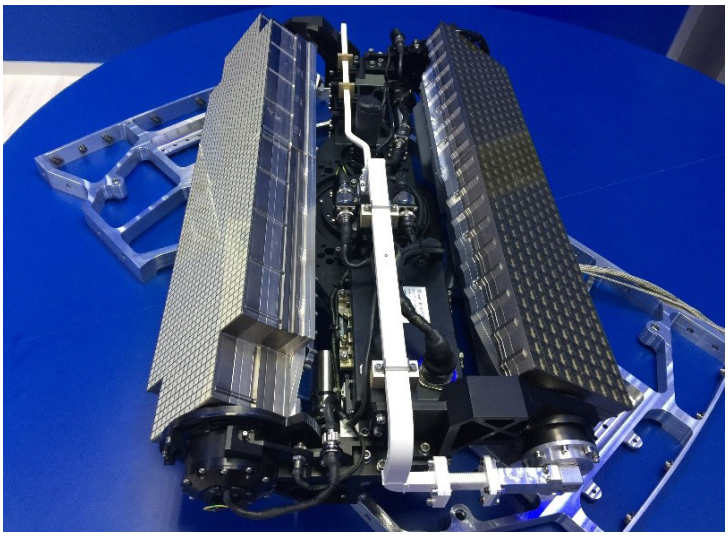
Hughes aeronautical antenna delivers industry-leading RF performance and supports transmit/receive across the full bandwidth of all standard commercial Ka- and Ku-band satellites. The antenna has been specially designed to have low weight and a low profile, enabling compatibility with industry-standard aeronautical radomes. Mechanically, it incorporates features that enable precise, reliable tracking and rapid change from band to band.

The antenna system is based on ARINC 791 architecture and consists of four Line Replaceable Units (LRUs):

- Outdoor Antenna Equipment (pedestal, Ka and Ku apertures)
- Ka RF Unit (Ka KRFU)
- Ku RF Unit (Ku KRFU)
- Antenna Control Unit (KANDU)

The OAE is mounted on top of the aircraft fuselage and incorporates two high-performances, back-to-back light weight apertures: one for Ka-band communications and a separate one for Ku-band communications.

The KRFUs and KANDU are mounted inside the aircraft cabin above the headliner.



High-Performance Dual Band Aero Antenna

Modman Specifications

Component	Description
Processor	Intel® Multi-Core Processor
Ethernet Switch/Router	Ethernet Multi-Port switch/router
Aircraft Discrete I/O	Per ARINC 791
ARINC 429	RX Interface
Cellular Modem	4G/LTE Cellular modem
Internal Mass Storage	Solid State Drive (SSD)
Status LEDs	Front panel status indicators
Airplane Personality Module (APM)	Support for APM available
Security	TPM per TPM 1.2 specifications
Power	115 VAC, 320–800 Hz
Power Dissipation	<100 W
Form Factor	4MCU per ARINC 600
Qualification	RTCA/DO-160G

Dual-Band Antenna Specifications

Mechanical	
Dimensions (Diameter/Height)	37.7 (d) x 9.4 (h) inches (95.7 x 23.8 cm)

Electrical	Ku-Band	Ka-Band
Receive Frequency [GHz]	10.7–12.75	17.8–18.8, 18.3–19.3, 19.7–20.2
Transmit Frequency [GHz]	13.75–14.5	29.25–30
Polarization RX/TX Selectable via A791 AMIP	Linear VP/HP	Circular LHCP/RHCP
Receive G/T (at 30° elevation)*	11.6 dB/K @ 12.75 GHz (cruise level)	15.4 dB/K @ 20.2 GHz (cruise level)
Transmit EIRP [dBW]*	43 dBW @ 14.5 GHz	48 dBW @ 30GHz
Transmit Antenna Patterns	FCC 25.209	FCC 25.209
EIRP Spectral Density	FCC part 25.222 and 25.227 ETSI EN 302 186	FCC Part 25.138, ETSI EN 303 978
IF Input (TX)	950–1700 MHz	
IF Input (RX)	950–2150 MHz	
Antenna to Modman Interface for configuration, control, and monitoring	ARINC A791 AMIP	
Antenna to Inertial Reference Unit (IRU)	Supporting ARNIC A429	
Power Consumption (antenna only)	240W (average)	

Antenna Performance	
Azimuth (Az) Range	360° continuous
Elevation (El) Range	0° to 90°
Az/El Velocity; Acceleration	>30°/sec; >50°/sec^2
Tracking Accuracy	<0.2°

Electrical Interfaces	
DC Power	115 VAC (320 Hz to 800 Hz)

Environmental	
Operating Temperature	Modman: -15° C to +55° C, Antenna/OAE: -55° C to +70° C
Altitude	16,800 meters (55,000 Feet)
Environmental Compatibility	RTCA/DO-160G

*Excluding radome loss. EIRP includes 0.6 dB/1.6 dB (Ka/Ku) coupling loss.

Note: Equipment specifications are subject to change.

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