TECHNICAL ARTICLE

RF INTERCONNECT FEATURES

5 KEY INTERCONNECT FEATURES THAT PROPEL AEROSPACE TECHNOLOGIES

Is your aerospace and defense application reaching its full potential, or is it being hindered by overlooked interconnect solutions? Cables and connectors play a pivotal role in the performance and reliability of aerospace and defense applications but are often overlooked. From meeting system requirements and tackling various operating conditions, to managing weight and ensuring signal integrity, these unassuming cables are a key player that can make or break your mission. PIC Wire & Cable® has pinpointed five crucial cable features that empower aerospace systems to break through these limitations!

1

LIGHTWEIGHT DESIGN

Weight is critical in aerospace applications, as it directly impacts fuel consumption and efficiency.

The ability to improve fuel efficiency and lower operational costs is crucial in today's market. Improved fuel efficiency leads to reduced greenhouse gas emissions and a smaller environmental footprint making it easier to meet the required Environmental Protection Agency (EPA) regulations.

Every ounce of weight shaved off an aircraft carries a cascading effect from lower emissions to an increase in payload. More payload means more passengers, cargo, or equipment which translates into increased operational capabilities and profitability.

A pivotal player in this weight-saving endeavor is the implementation of lightweight cables. Their streamlined design, characterized by a reduced outer diameter (OD), proves to be a game-changer. This attribute makes them an ideal choice for intricate routing within confined aircraft spaces by reducing your cable footprint and optimizing cable bundles for your application. Now, aerospace engineers and maintenance technicians have design flexibility to route less cable in tighter spaces efficiently, leading to reduced turnaround times during both aircraft assembly & maintenance. These efficiencies will contribute to improving operational efficiency.

Selecting the right lightweight cable and connector for your application involves navigating through numerous variables. By considering your applications requirements, you can match the proper cable construction to meet your system's needs. It's important to note that opting for a lightweight cable without considering its performance capabilities won't yield the desired results.

A solution to this is ULTRALITE, a groundbreaking solution that is up to 80% lighter than similarly sized RG cables. ULTRALITE cables feature a silver-plated copper-clad aluminum or steel conductor surrounded by a PTFE dielectric (see fig. 1). This core is further shielded by a silver-plated copper-clad aluminum (SPCCA) braided shield and a flat spiral-wrapped shield. What sets ULTRALITE coaxial cables apart from others on the market is its lightweight cable construction that is built without compromising the durability and reliability demanded by your application.

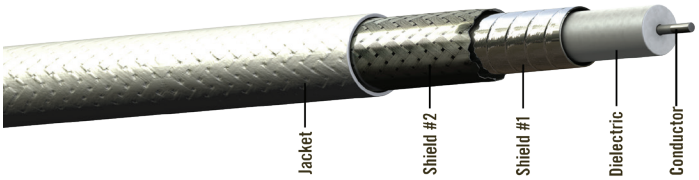

Figure 1: Cable Construction of UH22089

While lightweight aerospace cables may have higher initial costs due to the utilization of advanced materials and manufacturing processes, the long-term benefits of fuel savings, increased payload capacity, and reduced installation costs can quickly offset the initial investment.

ULTRALITE APPLICATION SPOTLIGHT-51% CABLE WEIGHT SAVED

A leading helicopter manufacturer asked PIC Wire & Cable to help find a solution to reduce coax cable weight on one of its airframes. Each helicopter used 809.1 feet of coax cable and the manufacturer needed to reduce the 59.06 pounds of cable on the airframe. To reduce this weight, ULTRALITE RF cables were installed on the airframe weighing only 28.82 pounds. Choosing ULTRALITE RF cables reduced the helicopter's cable weight by 51% and saved 30.24 pounds.

2

STRENGTH & DURABILITY

Cables used in aerospace and defense must be able to withstand harsh conditions, including vibration shock, extreme temperature, and abrasion. These cables might even encounter exposure to fuels, lubricants, and other chemicals as well. To overcome these harsh environments, cables are designed and built with excellent mechanical properties to ensure reliable performance over extended periods in these conditions.

Standards have been established along with rigorous testing by various associations including EWIS, FAR, ASTM, FAA, NEMA, RoHS, Skydrol and SAE which verify the performance of interconnect cables in these challenging environments.

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Take, for instance, ULTRALITE cables—a remarkable solution that not only endures, but excels in temperatures spanning from -65°C to 150°C. It is certified to SAE AS4373E, Method 601, RoHS Directive 2002/95/EC), FAR Part 25.869 (a) App. F, Part 1, (a)(3), and DFARS 252.225-7014, Alt 1 standards. EWIS testing can be requested for all ULTRALITE cables.

LOW SIGNAL LOSS

Signal integrity is crucial for communication systems and data transmission. To ensure an accurate and reliable data transfer, cables should have minimal signal loss (attenuation). This is imperative for applications where sensitive data is being transferred.

Selecting the right cable involves addressing potential issues like signal derogation/interference and Electromagnetic Interference (EMI). Aerospace and defense systems often operate in close proximity, making them susceptible to varying degrees of interference.

Signal derogation/interference can occur from interference caused by the electromagnetic fields generated by one signal affecting neighboring signals. This will lead to signal distortion, data corruption, and reduced overall system performance.

EMI can arise from sources such as radio frequency (RF) emissions, electronic devices, power lines, and lightning. This can interfere with communication, navigation, and sensor systems, jeopardizing the safety and effectiveness of the equipment.

In defense applications, cables require additional protection against electromagnetic pulses (EMP) to protect sensitive electronic systems from threats as well.

ULTRALITE cables offer exceptional shielding performance up to -110 dB. This superior shielding ensures the highest level of protection, effectively minimizing signal degradation/interference. The result? A secure, precise, and dependable data transmission for your electronic systems. By addressing these crucial aspects, ULTRALITE cables reinforce the reliability and efficacy of communication and data transmission in even the most sensitive environments.

HIGH-SPEED DATA TRANSFER RATES

With the advancement of various systems, data transfer rates are becoming increasingly important. Cables need to meet higher capabilities to enable faster data transmission for real-time communication, data exchange, and mission-critical operations.

The evolution of cable design and materials has paved the way for RF cables to operate within higher frequencies ranges, (such as 5 GHz and beyond), enabling faster data transmission. From radar systems and avionics to navigation systems, electronic warfare, and the vital communication between military vehicles and aircraft – all rely on high-speed data transfer to ensure swift, accurate, and effective operations.

Engineered for outstanding performance, ULTRALITE cables are equipped with an exceptional rating for high-speed data transfer, reaching superior loss requirements vs all other market competitors up to 5.0 GHz. This robust performance ensures unwavering reliability even in the most critical scenarios.

RELIABILITY

In aerospace and defense, equipment is expected to have a long service life. Cables are no exception to this requirement; they must be designed for longevity and reliability to minimize maintenance requirements and downtime. Choosing cables crafted from top-tier materials that also have undergone rigorous testing ensures this reliability.

For more than five decades, PIC has established itself as a trusted partner in high-quality, premium interconnect solutions. Over this period, our PICMates cables and connectors have been selected by numerous OEM system manufacturers and have been spec'd into a range of aerospace and defense systems. This attests to our dedication to excellence and reliability, resonating across decades of service.

To further enhance the process, PIC has simplified cable design through our user-friendly and comprehensive cable builder, found at https://picwire.com/Cables/Ultra-Lightweight-Coax. This tool empowers you to seamlessly navigate the world of interconnect solutions, ensuring that your choices align with the steadfast reliability expected within the aerospace and defense domains.

ACCESSING YOUR INTERCONNECT APPLICATIONS

Cables play a large role in overall performance and reliability of aerospace systems in the modern era. With technologies rapidly evolving, it is imperative to regularly reassess your interconnect solutions. This assessment can be achieved by understanding these five critical cable features. Remember that these features are not only beneficial individually, but also complement each other to enhance the overall performance of your aerospace and defense applications! For more information on ULTRALITE cables from PIC Wire & Cable, visit www.PICwire.com or reach out at 1.800.742.3191 to unleash the true power of interconnected excellence for your systems.