ASK THE EXPERT

Cable Assemblies for Aerospace and Defense

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The proliferation of RF and high-speed digital communication systems and electrified propulsion architectures is pushing the adoption of lightweight cabling to conduct data and RF signals throughout a variety of aircraft. For more than 50 years, PIC Wire & Cable has worked with customers to solve challenging problems and to help them integrate reliable cable assemblies into aerospace and defense applications worldwide.

Below, Rob De Grave, Director of Product Management and Marketing at PIC Wire & Cable, applies over 19 years of experience in developing optimized avionic-system interconnect solutions to answer some frequently asked questions regarding the design and processing of cable assemblies.

What are some key trends you are seeing in cable assemblies for aerospace and defense?

There are a number of trends we've observed that impact cable assemblies in different areas. These include:

- **Data Demands:** In aircraft production, we're seeing more and more sensors that require increasing connectivity to carry the data they generate. In-flight entertainment (IFE) systems are also increasing interconnect requirements.
- **Consolidation:** We're also seeing electronics being consolidated into fewer line-replaceable units (LRUs) distributed throughout the airframe. This approach can reduce the number of unique lengthy cable harnesses that carry power and signals to each LRU, thereby reducing overall cable weight.
- **Lighter Weight Solutions:** In electronic vertical takeoff and landing (eVTOL) craft and even some regional aircraft, hybrid electric propulsion systems are increasing the need for lightweight interconnect.

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What are some key mechanical and electrical specifications to consider when choosing a cable assembly?

The assembly must meet all relevant aircraft and MIL-spec qualification requirements, such as Radio Technical Commission for Aeronautics (RTCA) environmental standards and additional standards for specific aircraft OEMs. Coax cables must meet or exceed Radio Guide (RG) and MIL coax standards, and data cables must comply with the applicable American National Standards Institute/Telecommunications Industry Association (ANSI/TIA) testing requirements. For applications that are highly susceptible to EMI concerns, the assemblies may also require individual shielding to minimize EMI and crosstalk. And modern coax cables must meet these specs while weighing 40% less than legacy RG cables.

What factors should a customer consider when choosing a cable assembly supplier?

Look for a trusted expert with many years of aerospace and defense experience who can provide unparalleled levels of customer service. Also, look for a one-stop shop that can meet all your cable, connector, and assembly needs and employs technicians certified in accordance with the Global Electronics Association's IPC/WHMA-A-620 standard. And finally, choose a supplier who has products in stock and is ready to take on customer assembly needs with quick turnaround on drawings and production.

How can customers be assured they are receiving a reliable, durable cable solution?

At PIC Wire & Cable, all assemblies are constructed in-house by highly skilled technicians. Specialty tooling ensures your assembly is done with precision to optimize cable performance and durability. For customer-designed assemblies, we develop detailed termination instructions for each cable/connector type and make them available on our website. These instructions are the same ones we utilize in-house for PIC-designed assemblies. We include test data and validation results with every assembly we ship.

Do customers tend to buy complete terminated assemblies, or do they do the terminations themselves?

It's a mix of both. Sometimes, customers have access to aircraft data/models or survey results, and they can understand their program lengths. In these cases, they could choose to design their own assemblies and solicit competitive bids for manufacturing. But in many cases, they don't have the necessary time/data. In these cases, they typically design the lengths "on the fly" or during installation, and it's typical to purchase bulk products and create the drawings as needed. This approach is also typical if they need to route the cable through bulkheads or hard-to-reach areas through which an assembly cannot be routed. PIC supports both bulk and assembly options and can design assembly drawings from customer measurements.

What technical support do you offer to ensure customers order exactly what they need?

PIC engineering and manufacturing teams thoroughly review all assemblies during the development/bidding stage to ensure we are capturing all requirements, whether they are referenced in the drawings themselves or in external documents. We identify the need for any additional tooling, test harnesses, or even capital investments, making the customer's job easier.

You offer some pre-engineered cable assemblies and system-specific solutions. Could you describe those briefly and explain how they help your customers?

We have pre-engineered assembly drawings for our low-loss coaxial products (S cables) and our Ultralite coaxial products (UH cables). These drawings eliminate the need to create a custom drawing for each assembly program. The drawings are set up so customers can configure the connectors and specify the length as needed, where the length is built into the cable assembly part number. This process reduces design time and lets us get assembly products out to the customers very quickly. We also have pre-engineered

drawings for our digital video (HDMI, DVI), Ethernet, and USB assemblies, as well as for popular avionic and IFE systems that are currently being used in aerospace. The pre-engineered systems were developed directly with the system OEMs and are specifically designed to meet the system environmental and loss requirements.

What is the key takeaway customers should keep in mind when choosing cables and assemblies?

Choose a supplier who wants to be your partner — not just your vendor. At PIC, our number one priority is making your job easier, working with you to meet all your needs, whether you are buying bulk products or fully designed and manufactured assemblies.

***Rob De Grave** leads as the **Director of Product Management and Marketing** at PIC Wire & Cable, and ensures customer needs are seamlessly integrated into innovative solutions. With over 19 years' experience in aerospace and defense interconnectivity, Rob has been instrumental in developing innovative product lines for optimized avionic system solutions.*