



Industry Case Study

BELDEN
universal

HIGH LIFT ACTUATION - AEROSPACE

A leading supplier of aerospace products turned to us with an order for torque-tube assemblies for high-lift actuation systems. Belden not only exceeded custom-design expectations of a highly-complex system based on simple envelope information - but satisfied the customer's unusually stringent manufacturing specifications that go beyond AS9100 requirements such as layered drawings, foreign object damage control, measures of potential process capability of CPU/CPL of 1.33 or higher and many others. To ensure performance through vigorous testing for the required 25,000 flight hours with minimal backlash, Belden custom-built its

own internal state-of-the-art testing machine, allowing us to perform our own in-house testing whenever necessary.

We can also custom-design and manufacture universal joints for a variety of applications including high-lift actuation and control mechanisms for aircraft where low deflection rates, high strength-to-weight ratios and long service life are essential.



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CUSTOMIZING AEROSPACE POWER TRANSMISSION PRODUCTS

A global designer, manufacturer, and integrator of precision motion control products was in need of universal joints to be used in sensor applications of aircraft wing High Lift Actuation Systems (HLAS).

Since the company's original universal joint vendor discontinued the product, it had to locate a new supplier who could satisfy an extremely tight production schedule quickly and skillfully. It was crucial for the new vendor to be thoroughly familiar with manufacturing standards specific to the commercial aerospace industry. AS9100 qualification, which is scarce among universal joint manufacturers, was an additional requirement.

Aircraft universal joints must be manufactured to withstand the most demanding operating conditions and the harshest working environments with as little maintenance in the

field as possible. Thus, low deflection rates, high strength-to-weight ratios and long service life are all essential qualities for transmission products.

The company's choice fell on Belden Universal, an AS9100 certified manufacturer in Broadview, IL, with extensive experience in designing custom universal joints for aerospace applications - including high lift actuation, flap opening, and steering and control mechanisms.

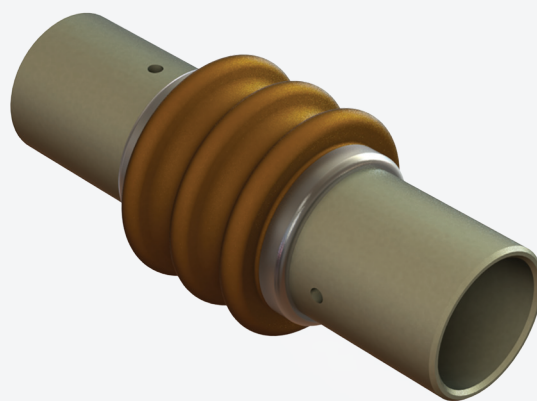
Engineering and quality management teams on both the customer's and Belden's side carefully reviewed design details and associated standards. The requested universal joints were intended to be used in aircraft fail-safe systems with stringent quality standards for ensuring reliability. Among the customer's specifications were in-process control and marking requirements along with performance and dimensional criteria. (Continued)

One of the challenges they faced was that the original product had been manufactured from a material only available through a European supplier. However, sourcing raw material from overseas would have resulted in critical time loss, making production from scratch out of question. To circumvent these time constraints, Belden's savvy design engineers proposed an innovative solution: applying a few minor modifications to Belden's existing Military Specification (Mil-Spec) joints would allow them to stay true to the original part and still meet the customer's Class 2 flight-critical application requirements. These joints are manufactured according to "MIL-J-6193" Mil-Spec requirements that satisfy the required quality standards. As a Mil-Spec "Qualified Product Listed" (QPL) manufacturer, Belden Universal had the necessary qualifications to manufacture the final product. Existing components in a suitable stage of the production process were rerouted which allowed for the necessary modifications and supported the tight timeline.

To ensure optimal performance, every lot of these joints are also required to undergo MIL-J-6193 Group A Lot Compliance testing. Belden's in-house testing delivered immediate results, ensuring consistently high quality and reliability of the universal joints along with reduced lead times, when compared to outsourced testing. The manufacturing process was further supported by Belden's paperless inspection platform, allowing for easier

maintenance of data. As opposed to traditional paper records where the operator manually checks off inspection and tool requirements, the software automates, simplifies and speeds up procedures and enables all members of the production team to view live data at any time. It specifies what features to measure, the proper tools for measuring and selects inspection specifications for the various features and pieces.

The end result was a universal joint that fit, formed and functioned in the same fashion as the obsolete part, delivered on schedule and in compliance with the stringent specifications of the aerospace industry. Belden Universal not only exceeded design expectations but satisfied customer specifications beyond MIL-J-6193 and AS9100 requirements. After this successful pilot project that resulted in rapid delivery of the products through innovative modifications, the customer has contracted Belden for the future production of its universal joints needs from scratch.



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SHAFT ASSEMBLY FOR AMPHIBIOUS ASSAULT VEHICLE

When it comes to military applications, your product must stand up to the harshest of environments. Recently, the development and manufacture of a complete shaft assembly for an amphibious assault vehicle demonstrated Belden's commitment to tackle the toughest applications.

Designed to withstand both nuclear and biological contamination, the joint yokes and shaft of the vehicle were constructed of 7075-T651 aluminum to provide a lightweight, high-strength, corrosion resistant solution. It was necessary to modify standard pin and block designs in various materials to create a custom assembly. The bushing and pins were made from hardened 416 stainless steel to combat corrosion and prevent galling and premature wear of the

yoke components. The pin and block section of the universal joints were covered with neoprene boots to prevent contaminants from invading the assembly. The boots were molded specifically for the shaft assembly to protect the joints and provide maintenance-free operation for extended periods of time. The end result was a solid solution that met the customer's exact application specifications.



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