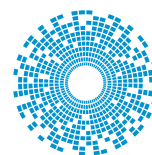


# White Paper



## Connectivity in the Military Drone Market

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# CONNECTIVITY IN THE MILITARY DRONE MARKET

The technology supporting the rapid adoption and development of unmanned aerial vehicles (UAVs) and unmanned underwater vehicles (UUVs) is relatively new, but it is developing at such a pace that even those closely aligned with the industry may not be fully aware of the most appropriate solutions.

## Growing market for drones

As commercial drones become commonplace in some skies, the military drone marketplace has seen increased requirement for unmanned vehicles that are compact and light yet powerful and packed with features. This has forced the technology that enables unmanned vehicles to forge ahead at a bewildering rate. Driven by the increasing use within military circles of drones for reconnaissance, surveillance and tactical mission applications, it is estimated that by 2025, 70% of the yearly global sales of UAVs (expected to reach around \$14bn by that date), will be military drones, making this one of the fastest growing markets for those operating in the electronics sector.

Of course, military drones have to be portable, they have to be versatile and they have to be sufficiently robust to operate and survive in the toughest environments imaginable. This can mean extreme temperatures (from -55°C to +200°C), in some of the most adverse weather conditions the world can offer and seriously high levels of shock and vibration. However, it can also mean operating continuously at high altitudes and being subjected to the general wear and tear that comes from regular handling, landing and transportation of a drone.

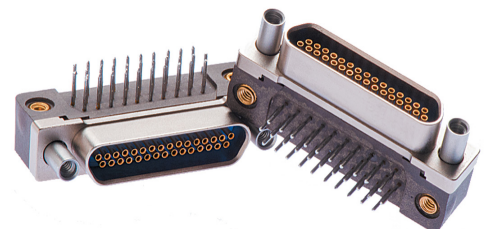
## Lightweight connector

To make a military drone developer's job even more challenging, at the same time as being as lightweight as possible and offering a minimal footprint, UAVs need to be laden with an increasingly vast array of features. These can include a satellite-based Global Positioning System (GPS), various cameras (including thermal and night-vision), sensors and detectors, wireless WAN (wide area network), Bluetooth and digital radio. Other features that state-of-the-art UAVs will require include the ability to store and/or stream substantial amounts of video data and even a range of intelligent weapon systems that can be deployed remotely.

Also, UAVs need to be resistant to any kind of electronic interference (ensuring uninterrupted operation and full integrity of any data transmissions) and to be capable of travelling long distances and returning to base in the best possible condition.

Making all of the above possible is the task of on-board interconnection units, which must deliver on all of these fronts. The more specialised and sophisticated these systems become, the more connections are required. Not only do the connectors need to be rugged, robust and reliable – yet lightweight – but they also need to offer high levels of performance, and inter-operate/inter-mate with other connectors that are installed in the UAV.

All rectangular microminiature D-Type connectors with solder or non-removable crimp contacts used in military drones must comply with the MIL-DTL-83513 specification provided by the USA's Defense Logistics Agency (DLA). This specification covers connectors designed for use where standard D-sub connectors would be unsuitable due to their weight and size. The industry is currently exploring technologies such as nano-miniature connectors, which could reduce weight and size requirements considerably. Despite the



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small form factor, these connectors would still need to include features such as low contact resistance, high current capability and high dielectric strength.

Today, circular connectors are perhaps the most versatile in terms of space, and the best drone application connector will also have a brass shell, which protects against electromagnetic interference (EMI) or radio frequency interference (RFI). Ingression protection to IP67 is also important, as is being flame retardant, and the connectors need to be secured in such a way that they never work loose due to vibration. Typical enemies of the connector in this type of application will include high humidity, corrosion through chemicals or acids, pressures of up to 20,000 PSI (if it is a UUV), along with dirt and dust. Other issues that must be avoided at all costs include mis-mating and unmating due to poor connectivity.



When deciding which connector is the correct one for a given application, there are various factors that need to be considered. These include the voltage requirement, the gauge of wire that will be needed (and how many wires), and whether they will be crimped or soldered. Also, a decision needs to be made on whether accessories such as ID solutions and backshells will be required, what the finishing will be on the connector and whether the installation will be cable-to-panel or cable-to-cable.

## Solutions to the drone sector

As a global leader in delivering reliable connectivity solutions, Cinch Connectivity Solutions (a Bel group company) supplies high-quality, high-performance connectors and custom-designed solutions to the military sector as well as aerospace, broadcast, commercial and other industries with challenging environments. Cinch's application-sensitive connector solutions have been designed to be capable of integrating with ease to other systems used within drones, whether they are UAVs or UUVs. This inter-mateability with competitors' solutions enables Cinch to offer lower-cost solutions that can be incorporated into a drone developer's current and future programs.

Specifically for the military drone sector, Cinch has developed many effective connectivity solutions, one of which is the Cinch Mil/Aero Circulars MD801 Series connector, which can be supplied in a standard or speciality plated finish. Designed to deliver optimum performance levels in extreme environments, this connector is available in crimp, solder and PC tail terminations and can offer between one and 130 contacts. The MD801's shell styles include jam nut receptacle, square flange receptacle and in-line plugs.

Cinch offers various Dura-Con Micro-D connectors that are rugged, high-performance, densely compacted units with a 1.27mm (0.05") pitch interconnect. For applications where leak prevention is a major issue, for example, the shock-resistant Dura-Con Micro-D hermetic connector is sealed to a leak rate of less than  $1 \times 10^{-8}$  cc He/sec across a 1 atmosphere pressure differential. Built to meet MIL-STD-1344 requirements and with a current rating of 3A and an operating temperature of between  $-55^{\circ}\text{C}$  and  $125^{\circ}\text{C}$ , this is the ideal connector for applications where weight and space must be kept to a minimum while maintaining maximum reliability. This is achieved through the use of a wire form pin (with twist pin technology) that provides seven points of contact when mated. Other features include plugs and sockets in 9, 15, 21, 25, 31, 37 and 51 positions, an Al shell that provides EMI shielding, cable-to-cable, cable-to-board, cable-to-panel options, and the choice of pigtail or solder cup terminations.

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Cinch Connectivity Solutions also offers a range of nano miniature circular connectors and custom connectors that have a hermetic sealing. This makes them ideal for critical applications where leakage must be prevented – even under extreme changes in temperature, pressure, and humidity. Cinch's customizable range of blind mateable, in-line, panel or box-mount receptacles is available in a choice of composite, stainless steel or aluminium with between two and 19 contact insert arrangements.

## Conclusion

The demands made of engineers to meet the requirements of this burgeoning market show no sign of abating, especially since much of the future growth will be driven by micro-UAVs and nano-UAVs, pushing still further the need to develop and install connectors that are optimised for delivering the best size/weight/power combination. In the coming years, military drones will need to fly longer distances, incorporate more features, carry more weapons, store and deliver more data, communicate even faster, clearer and more effectively, and deliver maximum reliability while operating in increasingly harsh environments. Connectors and cables will not only need to use lighter materials and smaller components as miniaturisation continues apace in this uniquely demanding market, but will also need to be equally if not more robust than at present. The challenge goes on but the tools are in place to meet it.



### About Cinch Connectivity Solutions

For over 100 years, Cinch Connectivity Solutions has manufactured high quality and reliable high-performance connectors and cable assemblies. Cinch is recognized as a world class connectivity supplier of RF, fiber optic, hybrid, microwave components, circular, d-subminiatures, modular rectangular, electronic enclosures and cable assemblies. Cinch provides innovative solutions to the military, commercial aerospace, networking, telecommunication, test and measurement, oil and gas and other harsh environment industries. We aim to exceed our customers' expectations and continually offer innovative solutions to the rapidly changing needs of the markets and customers we serve.



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