Esterline
Communication Systems

Wired for Sound? Wireless is More or is it?

Racal Acoustics has been working on all aspects of "the wireless problem" and is planning to show working prototypes to selected user groups shortly

For years the soldier has wanted to be free from the wires and cables that connect communications and other electronic systems that are integral to the soldier platform. And for years Industry has been looking for the solution, with limited success. The certainty of cables, jamming, detection, security and bandwidth are all factors that have to be considered when providing a truly operational wireless solution. Many have failed to consider these factors fully and have provided solutions of limited usefulness; Racal Acoustics, part of the Esterline Communications Systems group, has continued to track developments and used its expertise, and that of selected partners, to address the issues of wireless solutions for military audio ancillaries before proposing a workable solution.

Although the provision of wireless control of simple radio functions, like "Push to Talk", seem straight forward, a number of technical and operational challenges has made this far from simple to achieve. This challenge is enhanced when it is audio that is being transmitted.

However, the benefit of not having wires running around the body, needing to be dressed and potentially causing snag hazards is obvious. This is further illustrated when additional capability like remote PTT's are added. When a soldier is active, hands on weapon ready for action, removing a hand to operate a body worn PTT is not ideal, better to have a remote butt mounted switch that can be operated easily and conveniently. Equally, head or arm movement may be restricted by cables that have become tight or looped, especially in the prone position, when the headset was fitted when standing up. There are some

sound practical and logical reasons for providing wireless capability so why has it proved to be a challenge?

Operationally, the key concern has been reliability and the certainty that the wireless system is working. "In conversations we have had with operational military users there is always the worry that a wireless system may not be working and the user would not know. If the same occurs in a wired system, connections can be inspected, as can the cable, to find points of failure, something that is much more difficult to do in a wireless solution" Rist stated. "The main issue being if you don't know that it is working and you rely on wireless PTT to transmit a vital communication and it doesn't, you have a problem." For this reason, there is almost always the request that any wireless capability is integrated with a wired PTT as a back up" he continued.

It continues to be an aspiration of many Armies around the world to use COTs technology to deliver capability like wireless. Unfortunately that same, or similar, COT's technology, in the form of Bluetooth headsets and mobile phones, provides insurgents and terrorists with remote control capability for their own ends. "The need to jam the frequencies at which these technologies operate has become an operational imperative in theatres like Iraq and Afghanistan. This renders many of these solutions useless for active, operational applications. A smarter, more adaptable military focussed solution is going to be required."

Another issue which was originally touted as a reason for not using wireless was that it could be detected by opposing forces, thus giving away the position of the user.

"To be honest, the wireless signal detection issue has

become a bit of a non-subject with the ability to limit the range of the wireless support for PTT and audio. The range requirement is essentially only around the body, so limited to a maximum of 2m. If any enemy is within range to detect the wireless signature, assuming they are not using any ultra sensitive detection system, they are probably visible and certainly in shooting range! Besides, the soldier's personal radio signature is significantly higher and easier to detect." Rist says. Indeed, the wireless signature over a greater distance using more sensitive detection equipment is more likely to be impaired by jamming equipment as discussed earlier.

Equally, encryption of a simple PTT has no real value as it is the simple pressing of a key, it is totally different however if the wireless capability is being used to transmit audio from a headset to the soldier radio. The communications between these two elements will contain tactically sensitive information which could be very useful to opposing forces.

So what is the need for wireless audio?

For some time the dressing of a cable from the torso to the head, whilst allowing free movement, had been a reason for promoting wireless headsets. The challenge of encrypting that communication for one or more channels, the need to power that wireless capability on the head, adding weight and bulk, and the cost of doing so had all been factors to complicate the issue.

Clearly any encryption system used for this purpose would need to use military standard application. Although standard versions exist and are available, there are also a selection of proprietary encryption algorithms that may

need to be supported. "From the development point of view, for a wireless audio solution, the exam question has to be which ones of these needs to be supported to deliver a market viable solution. Not an easy call in a market where the adoption of wireless is still sketchy at best." Rist noted.

"The need for a wireless headset has been further diluted by the connectivity and power needs of all of the other head-worn technology that is being adopted. All of these devices need data connectivity to the soldier platform, and the need for power, so, in the absence of high bandwidth wireless data capability and low weight / volume power packs on the helmet, it looks like cabling will continue for some time to come".

The bandwidth required, to make the headset as light as possible, is also considerable for this type of wireless application. For a military headset, two way communications on one or more channels, audio situational awareness and, in the case of high noise solutions, the support of ANR, would make the system requirements considerably more complex than your average Bluetooth earbud.

The need for increased bandwidth, to support a range of head worn applications does raise the question of converting the current audio analogue signal into a digital one. This integration would facilitate support of the required bandwidth although body worn processing would be required to combine and separate datastreams into their constituent parts.

Racal Acoustics has been working on all aspects of "the wireless problem" and is planning to show working prototypes to selected user groups shortly. "Rather than rush headlong into delivering something, we are taking the time on developing a real capability that will be robust and usable. That's the way we do things at Racal because we understand that gimmicks get left in the barracks, working kit gets used for its intended purpose."

It is quite clear that a wireless PTT can be relatively easily achieved provided that its operation is assured both from a reliability point of view and in adverse ECM environments. The benefits of a remote wireless PTT are quite clear operationally, especially for use in theatre.

The case for the wireless headset though is less compelling, depending as it does on what other head worn equipment is being used and how that is connected and powered. Once you have a single wire going to the head, the need for wireless is less obvious. However, Racal Acoustics will, being forward looking and innovative, continue to look for technical solutions to prove that wireless is more… ■

Talon (PTT System) in the field © Esterline Communication Systems.