

Wrapping the Soldier in Voice and Data

Wearable communications allow for individual soldiers to wear communications devices that are small, compact and lightweight and whose functionality can also be distributed around the person. A distributed system would for example separate the power supply, RF front end and antenna from each other and place them at different locations, allowing them to be optimised for technical performance or load carriage and enable for example multiple devices to share a single power supply.

by **Adam Baddeley**

Headsets like Racal Acoustics' Frontier family allow radios to be positioned to optimise ergonomic or RF performance and controlled remotely via the headsets control panel © AJB

One of the drivers for wearable communications is the need to support soldier modernisation programmes like Land Warrior in the US, Land 125 in Australia and ACMS in Singapore. In this context, worn solutions are often the bearer for information to other devices such as computers, display devices and body worn weapon sensors and geolocation devices. Full and widespread deployment of such systems however, is still some way off and today the dominant use for wearable communications is for low level voice communications.

Personal communication devices have been adopted with alacrity as the tactical benefits that arise from having every member of a squad within a network have become obvious.

These radios provide both voice and data communications although the former have priority and have been supplemented with basic situational awareness functionality, typically automated but with additional data applications being fielded.

The US Joint Tactical Radio System's (JTRS) Handheld, Manpack, Small Form Fit (HMS) programme, led by General Dynamics C4 Systems will produce a range of wearable communications, some are conventional stand alone designs while others are embedded and rely on other programmes and equipment for aspects such as control interfaces and power for example.

The first and only standalone 'wearable' radio currently planned under JTRS HMS will be the AN/PRC-154 Rifleman Radio which passed its Limited User Test (LUT) in the Spring and which operates the ITT/DARPA developed Soldier Radio Waveform (SRW). The radio is due to achieve its Milestone C procurement decision in November, leading to final testing and an initial production run with an eventual requirement for several hundred thousand radios.

The first 'embedded' radio for individual soldiers will be the SFF-B which will equip squad and team leaders equipped with the Ground Soldier Ensemble (GSE) system, the successor to Land Warrior. This radio's LUT is planned for 2010 with a production decision potentially being made in 2011. The SFF B will be Type 1 encrypted and will operate from 30-2.5GHz, offering the SRW as well as

Harris RF Communications has scored a number of successes with its RF-7800S Secure Personal Radio (SPR) outside the US

SINCGARS, UHF Satcom and potential EPLRS too.

Harris RF Communications has scored a number of successes with its RF-7800S Secure Personal Radio (SPR) outside the US. The SPR offers voice and data communications, a built-in GPS receiver, and incorporates easy-to-use position tracking using the SPR's own Utility Software as well as messaging services via Harris' TacChat application.

The SPR uses Harris proprietary Advanced Network Wideband Waveform (ANW2) to support 256Kbps

throughput with a range of 2-3km with three simultaneous speakers and unlimited listeners. Harris has also begun work in July on the Leader variant of the SPR which is due to be completed in 2010. This is an additional compact module which can be screwed into a basic SPR adding a computing hub for more complex applications with the facility to add a basic display type to the radio such as a helmet or wrist mounted display.

Brunei, along with Norway was one of two announced launch customers for the SPR, the latter deploying the system to Afghanistan. Sweden too has opted for the SPR with the first 900 such radios being delivered in July, with further radios being used to equip Sweden's contribution to the Nordic Battlegroup, intended for international peacekeeping.

In addition to its publicised sales, the SPR has been adopted by a number of NATO member and coalition allies such as Romania and the Czech Republic, often supporting their special forces operating in Afghanistan, and typically funded under the aegis of FMS.

ITT's SpearNet Team Member radio provides wideband connectivity in a form factor that the company describes as the world's "smallest wideband networking radio" and weighs 700g with battery and integrated CA code GPS. With a maximum of 6Mbps transmission data burst and a proven sustained link of 1.5Mbps, the system supports streaming high quality video. The system comes with a Radio Access Unit to control functionality and allow connectivity to a number of different devices. Reflecting the company's growing experience in counter-IED technology - ITT provides the CREW 2.1 IED jammer to US armed forces - it claims improved performance for the SpearNet over single channel radios in a jammed environment. Spain has acquired the SpearNet to support trials with the EADS-led 'Combatiente Futuro' (COMFUT) soldier modernisation programme as well as for other users in the country. The basic radio has a range of 1.5km with a power output of 700mW, operating between 1.2-1.4GHz.

Aselsan's launch customer for its new personal radio design has been the Turkish Armed Forces © AJB



Cobham Defence Communications Eagle Close Combat Radio has recently established itself in the market with a number of international sales outside Europe presenting itself as a low cost ad hoc networking solution offering simultaneous voice and data and protected using AES 128 encryption.

Eagle is already deployed in the region with the Royal New Zealand Navy on boarding parties ensuring that each member is in constant communication as well as linking back to more powerful radios to connect to the 'mothership'. The radio is full duplex and uses a Dynamic Net Controller to seamlessly and automatically establish RF connections to the desired recipient. The radio has two PTTs on the radio as standard for remote operation by the soldier with a second link for use with a vehicle intercom system such as the company's widely used ROVIS/VIC-3 and new VIS-X solution.

Wearable communications are typically associated with small, short range personal radios such as the ubiquitous Selex Personal Role Radio (PRR). In the region, Australia and Singapore are among those have both acquired Selex Communications radios for their requirement, Australia acquired number of the PRR for initial stages of the Land 125 Project Wundurra while Singapore have opted for the more recent Soldier System Radio Plus (SSR+). The latter radio which operates 350 to 400MHz and can achieve ranges of 2km in rural areas and can operate on two nets simultaneously.

Kongsberg are building a complete, interoperable broadband technical communication system under its fully-IP TacLan concept. The soldier worn element to this is the 225 to 400 MHz UHF band SR600, providing team/squad communications from 10mW to 1W. The radio won a key contract in neutral Switzerland being selected as part of an EADS-Sagem team selected to supply the country's IMESS soldier modernisation programme. The SR600 provides for up to five virtual voice nets in one RF-network Multi hop voice and data communication network.

Elbit's PNR500 has won a number of contracts around the world, weighing 370g and operates over 15 channels at full-duplex capability. A new version, the PNR-1000 has been developed which adds an ad hoc networking capability and will be formally launched at the turn of the year.

A range of new entrants have also arrived

Over the years, as the battlefield task of the infantryman or marine has become more complex, so too has the functionality of their headsets

on the personal radio market. The Turkish Armed Forces requirement are being met through their 380-400MHz PRC-5712 'Squad Radio', beating out competition from Selex and Elbit with deliveries of the first batch of 2000 radios beginning in June last year. Radmor's R35010 Personal Role radio operates in a 2405-2480 band providing power output at 100mw and communication over 16 channels.

It's not just radios that create a wearable capability. Headsets continue to provide what they have always done, namely a more effective means of communicating using voice. Over the years, as the battlefield task of the infantryman or marine has become more complex, so too has the functionality of their headsets, enabling the user to use their headsets. Today for example headsets allow the user to remotely control their radios via an integrated chest worn device.

Silynx Communications has been firmly focused on meeting the headset requirements of special forces. Its C4OPS modular headset represents the firm's latest generation solution and is in widespread usage in that community. It has been described by the company as a mini soldier system. Control for the system is provided via the Dual Wireless PTT, which is software

Land Warrior is exploring using L3's SIR as a worn link between dismounted soldiers and UAVs © AJB

defined with inbuilt GPS. Radios are controlled via a side connector and when used in conjunction with the Thales AN/PRC-148 and Northrop Grumman C2PC battle management system, C4OPS automatically transmits its GPS location to the system, eliminating the need for a separate blue force tracking device.

Nacre's QuietPro and more recent QuietPro Plus are used widely by US forces, becoming a standard of the Land Warrior and now the Ground Soldier Ensemble (GSE). The digital QuietPro+ is a fully digital system allowing multiple radios to be integrated.



Racal Acoustics have recently launched a family of radios dubbed Frontier, with the Frontier 1000 designed specifically for the Selex PRR and with the Frontier 1400 being optimised for the Harris SPR, each allowing for different degrees of control of the radio with other family members moving from a single radio input to a dual solution. Later versions for the family will include an in-built gunfire detection system.

Selex Communications have developed the ITE headset family as a seamless integration with existing and new PRRs via highly power efficient Digital Signal Processing, allowing no appreciable drain in battery life. A second variant, designed to operate with non-Selex radios has a tri-input system enabling up to two radios and an intercom system to be connected simultaneously.

Headsets are also undergoing changes to provide not just hearing protection and hearing enhancement for situational awareness but are now also being used as a host for the communications devices themselves. An example of this is Thales' Autonomy Tactical Wireless Intercom system, seen at DSEi but formally launched at AUSA. An over ear headset with built in boom mike, Autonomy also integrates an 802.11b based wireless communications device operating at the 2.4Ghz range with AES encryption for secure voice and data with a peak rate of 250Kbps over 16 autoscanning channels. Characterised as a 'PRR in a headset', the device has a range of 400m in clear and drawing power from two AAA batteries, can operate for 12 hours at continuous operation and weighs just 160g. Applications for Autonomy would include providing vehicle crews with a rapid solution for dismounting for reconnaissance in person or similar role.

Control of communications devices are not just down to headsets and PTTs. With the advent of soldier modernisation programmes, single devices controlling a range of functionality ranging from helmet mounted display, worn computing, ISR assets and voice and data communications all need to be managed, ideally from a single device. Within Land Warrior programme, General Dynamics have fused a number of separate control boxes into single device known as Fusion between the first version of the system being sent to Iraq and the latest version

Antennas positioned on the back provide better reception, requiring it to be remotely controlled © AJB

Fischer Connectors AluLite connectors are claimed to be over 50 percent lighter than conventional metal connectors and can be sealed to IP68 levels

which was deployed to Afghanistan in July.

Rockwell Collin's Tactical Control Module (TCM) was developed as a centralized control for a range of devices and roles, not least is the company's bid to supply the US Army's requirement for the Ground Soldier Ensemble requirement. The TCM was originally designed to control the company's Tactical Video Downlink Receiver but can be extended to other communications and other electronics devices.

An often overlooked aspect of worn communications are connectors. While wireless communications replaced the field telephone system with wires criss-crossing the battlefield, individual wireless links such as Bluetooth are not being adopted, as these links can be jammed and can create an 'electronic Christmas tree effect' on the individual, lighting them up to the enemy. Instead, soldier programmes have opted for cabling to send voice and data around the individual soldier.

Cabling can be protected and sealed and is relative straightforward to secure. The weakest link in any cabling ensemble is the connectors and here a range of companies are battling to gain a s c e n d a n c y . Requirements are complex and subtle; at the point of connection they must be secure from the environment and while they should stay connected even if a cable snags or catches, in some scenarios soldiers may prefer the connection to be pulled apart

after a certain level of force is achieved. There is also a general push towards push pull features, allowing for quick, one-handed disconnect. As these systems will be taken off and on by soldiers, perhaps several times a day when in operation the connectors must be able to perform repeatedly. Furthermore, deployed in large numbers on each soldier, any small reduction in individual connector weight can have a significant cumulative effect.

In the US, Glenair's connectors have been mandated as standard on the Army's GSE programme. Fischer Connectors AluLite



US Marine Corps and US Air Force personnel are already using Harris' RF7800T ISR Video receiver, formally announced in July

connectors are claimed to be over 50 percent lighter than conventional metal connectors and can be sealed to IP68 levels.

In addition to local communications between soldiers, more capable systems are being fielded, allowing soldiers to access to real time ISR data while on the move. L-3 launched its Soldier ISR Receiver (SIR) at AUSA. Weighing 450g and consisting of a modem and one antenna sitting on the soldier's shoulder it is designed to provide a dismounted platoon section with access to video downlink feeds from UAVs and surveillance aircraft. With no power supply of its own, the SIR is designed to work with soldier systems such as Land Warrior with



Like other soldier modernisation programmes, Italy's Soldato Futuro uses a single control device to control worn communications and other equipment © AJB

which the Army has explored its integration on the system for potential deployment.

Designed to provide a wearable solution for the L-3 ROVER kit today, which is only available at the halt. The SIR will be able to

receive Common Data Link and supports MPEG2/4, H.264 and MJPEG with a maximum throughput of 10.71Mbps.

There is no 'new' technology in SIR which has taken largely off the shelf components from existing system. The innovation lies in its systemisation and reduction in size weight and power.

US Marine Corps and US Air Force personnel are already using Harris' RF7800T ISR Video receiver, formally announced in July. Using the same packaging as the better known AN/PRC-152 although instead of offering 30-512MHz coverage it covers the L, S and C-band covering portions of the spectrum from 1700 to 5800MHz, allowing users to access a number of ROVER analogue and digital feeds. The 1.27Kg RF-7800T is typically worn on the soldier's back, connected to a display which the user can easily access. A number of options are provided for displays including the company's own Monocle VGA display with the system also supporting SVGA 640x480 and NTSC Video output. ■

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