



# Radio Communications for the Soldier and Marine

Expanding the range and capacity of the tactical internet is a key goal for the dismounted infantryman or marine. Identifying the right mix of handheld and manpack radios in HF, VHF and UHF is increasingly central to success both on and off the battlefield and has become a major focus for procurement in the region.

by **Adam Baddeley**

*Elbit's PNR-710MB provides an ultra-lightweight V/UHF capability © Elbit*

The tactical internet of today, operated by dismounted soldiers and installed in the fighting vehicles directly supporting them, relies largely on Very High Frequency (VHF) Combat Net Radios (CNR) which have been proven by decades of reliable service on battlefields across the world in all environments. This battlefield role is being 'squeezed' - or complemented depending on your perspective - by the advent of smaller hand held and embedded UHF radios equipping the individual and larger, higher power wideband data radios providing a multi-megabit data backbone, supplemented of course by patrol High Frequency (HF) man-pack radios for Beyond Line of Sight communications. That said, the enduring voice and data capabilities that VHF radios provide will ensure that they will remain in military inventories for decades to come.

While CNR designs may differ, the VHF frequency they operate in imposes certain common criteria that are defined by physics and can't be evaded. Limited to line of sight communications, a dismounted soldier can quite achieve ranges of over 8Km using VHF links. VHF is also imbued with a significant block of frequency; 30 to roughly 300Mhz

**The Philippines have acquired a significant package of Harris Falcon II radios including the RF5800V-HH used during LIMA in December to link naval personnel on shore with their ships © AJB**



which enables generous, 25 kHz channel spacing which ensures high signal quality and more efficient coding and encryption as well as reasonable data qualities. Furthermore, VHF is unattractive to commercial entities such as mobile phone companies, unlike UHF, ensuring its availability in a congested electronic environment. Ergonomically both the antenna and selective tuning components on VHF radios are small and low in volume, further lending themselves to applications in the tactical arena.

Solutions have variable power outputs, a low battery saving mode of typically 2W, rising to five for hand held radios in roles such as squad radios, with the power output in manpack form factors rising to 10W and in some configurations higher. When mounted in vehicles, weight and power become functionally irrelevant, 50W can be used. Higher power ensures more reliable communications, particularly in cluttered urban terrain by increases the signal-to-noise and boosting the quality of the signal.

The Asia Pacific has seen major investments in radio communications reflecting a greater understanding that the potential of extremely capable platforms and weapon systems already in service can be enhanced by their implementation in a network.

Malaysian firm Sapura has teamed with Thales to produce the F@stnet for the Malaysian forces since 2007. The company also produce its own radio, the hand held PRC-5100 which is the standard hand held radio at the squad level. Since fielding the radio to the Malaysian armed forces, the radio has been acquired by a further six countries.

F@stnet has a number of international customers in addition to Malaysia with the radio being produced for Poland under license by Radmor with a similar relationship with Amper Programas for the Spanish armed forces. The Netherlands acquired the radio in 2008 as a its requirement for high capacity communications to support a new Battle Management System capability being brought into service. The radio is in French service where it is known as the PR4G VS4-IP. The 3kg IP radio operates from 30-88MHz

**F@stnet has a number of international customers in addition to Malaysia**



**Malaysia operates the Thales PR4G F@stnet, produced under license by Sapura © AJB**

and is capable of frequency hopping at speeds greater than 300hops per second and supports simultaneous voice and data, the latter using a 64Kbps waveform.

In North East Asian, Japan produces its own indigenous radios and neither imports nor exports any CNR capability. In Taiwan, the military's long delayed acquisition of its 37A voice and data tactical radio is now recently underway, offering both a voice and data capability. In addition to this indigenously developed radio, as part of the Po Sheng C4ISR network, Taiwan is acquiring the ARC-201 airborne Single-Channel Ground and Airborne Radio System (SINCGARS) for use with the Apache and UH-60M, along with ground based variants to provide a downlink for the aircraft with SINCGARS also being used in the networks supporting Patriot PAC-2 and Avenger.

South Korea's produces the PRC-999K VHF CNR frequency hopping data capable radio for its armed forces. The radio has also been exported to Indonesia with the radio becoming one of many types that Indonesia operates, leading to acknowledged problems with encryption interoperability.

Turkey, largely via Aselsan, has strong associations with Indonesia. In Turkey, two



*ITT's SINCGARS radios are used by Australia and New Zealand as key elements for their Tactical Internets © DoD*

radios will replace the current the current 30-88MHz 9600 VHF radio in service with the Turkish Armed Forces, which is a local licensed-copy of the GEC-Marconi Scimitar-V. The 9600 has been successfully exported to Uruguay, Sri Lanka and Bangladesh with 4000 sold to Pakistan where it is made under licence. The 9600 operates from 30-108 MHz in both frequency hopping and fixed frequency. The 9600 are to be placed by the manpack PRC-9661 SDR and the hand held PRC-9651. The 9661 operates over 1.6-512MHz, covering HF, VHF and UHF. The 9661 has been sold to Uruguay, Azerbaijan, Algeria and Egypt and has been proposed to Pakistan as a follow on to the 9600. Aselsan and the Turkish Armed Forces have avoided the need for US Software Communications Architecture (SCA)-compliance because of the implications for national control.

Thailand, like Singapore has historically

looked to Israeli firm Elbit C4I Systems-Tadiran for its CNRs. Elbit latest offering is the CNR9000 HDR CNR which is capable of 115Kbps throughput on a 25khz channel. New features have been developed for this waveform, including ad hoc networking and a new communications controller. The waveform is shared by the company's vehicle mounted new SCA 2.2 compliant SDR-7200 SDR due for imminent launch with the platform ultimately providing the basis for a family of radios. The company also offer the PRC-710 and ultra light fully-featured handheld VHF radio.

### **Australia acquired a number of SINCGARS as part of its acquisition of the M1A1 Abrams**

Thailand is acquiring HIMARS and may acquire SINCGARS radio as part of that FMS acquisition.

New Zealand and Australia both use the Advanced Systems Improvement Program (SINCGARS). Australia acquired a number of SINCGARS as part of its acquisition of the M1A1 Abrams with the same waveform also being operated by Thales AN/PRC-148 MBITR radios which has been in Australian service for some time. As part of its Land 125/75 or Land '200' requirement Australia is acquiring a combined dismounted and mounted BMS. For the dismounted element, Australia has selected a combination of the Raytheon's EPLRS MicroLight to link down to the platoon develop and then using the VHF Harris RF Communications AN/PRC-152 to connect sections using the SINCGARS waveform with US Type 1 encryption. Australia and New Zealand are the only countries in the region to have access to Type 1 SINCGARS, the latter country initially acquiring the radio to equip Piranha vehicles.



Both Singapore & Thailand are equipped with communication systems sourced from Elbit Systems © Elbit

Outside the US, the biggest operator of the SINCGARS in Asia is Iraq who has been acquiring the radio under contracts date from November 2007 buy both the manpack, and vehicle mounted versions as well as the hand held iteration of the radio known as the Spearhead which has also been acquired by Saudi Arabia. In total, over 40,000 radios have been fielded or ordered with a cumulative order value which exceeds \$200m.

In June, ITT won a US contract to supply 58,000 new SINCGARS radios and ancillaries valued at \$363 million with provision to buy as many as 174,000 further radios.

Currently, the US Army's Acquisition Objective for SINCGARS is 581,000 with 430,000 already fielded. ITT is in the process of switching production to the 'G' SINCGARS model SINCGARS. This noteworthy for the inclusion of technology from the Thales JTRS Enhanced MBITR (JEM), related to security and the SCA. Over 300,000 of the Army's current SINCGARS were acquired since 9/11 ensuring that this radio will be in frontline US inventories for years to come.

Harris is a major supplier of CNRs to the region. Australia and New Zealand are two of a small number of countries in the Asia Pacific operating the firm's AN/PRC-117 multi-band multi-mode radio. The latest version of the radio the AN/PRC-117G, which has already been field with US forces in Afghanistan and Iraq and chosen as the sole Single Channel JTRS manpack solution in an October 2009 award valued at up to \$419m.

The export version of the AN/PRC-117G

is the AN/PRC-7800M manpack, which offers similar wideband capabilities using the Advanced Networking Wideband Waveform (ANW2) to provide high capacity ad hoc links protected by a exportable commercial encryption. In conjunction with Boeing, Harris recently conducted simulated C4ISR trials in Australia using the RF-7800M-MP Falcon III, the export variant of the radio to link ground troops, UAVs and a Chinook.

In April 2008, Harris announced a \$60m deal with the Philippines which included the Falcon II RF-5800V VHF handheld radios. At the LIMA show held in Malaysia in December, Philippines naval personnel used the RF5800V2 establish a link between personnel ashore although communications were undertaken in clear, again reflecting the communication disconnect between different radio types.

Brunei also signaled its intention to equip its armed forces with Harris radios

**The AN/PRC-148 family provides a capability used by a number of countries in the region © Thales**



with a \$25m award in February 2008 which also included the RF5800V-HH and order which is now completed with a local support and maintenance facility quickly established.

Though not in Asia, Romania has implemented an advance communication system based around the Falcon II and Falcon III families. The lowest level is the RF-7800S Secure Personal Radio, which links to a suite of vehicle mounted radios using the ANW2 UHF waveform. Inside each

vehicle are RF-5800V-MP VHF and RF-5800H-M HF Falcon II radios for voice and simple situational awareness messaging, the latter for Beyond Line of Sight communication. In addition for high data rate communications are handled by the RF-7800M-MP. This solution equips two mountain and a single mechanised battalion and command post.

It is noteworthy that these radios operate using the proprietary Citadel or other non US Type 1 encryption already widely exported around the world making this tactical network easily realisable by most nations of the world.

A recent addition to the Harris product line is the RF-310H which is similar in appearance to and interoperable with AN/PRC-152 and interoperabil-

ity but without the full Type 1 security requirements that increase costs and other procedural burdens.

While exportable, the radios are still governed by US ITAR regulations. A number of countries require an entirely ITAR free solution. General Dynamics UK have provided a brigade sized solution for Libya and are beginning to offer the solution to a wider market.

Rohde and Schwarz's M3TR range has been providing an ITAR free solution for some time using the SECOS and SECOM waveforms. The radio comes in two versions covering the HF, VHF and UHF frequency domain with the main CNR solution offering VHF and UHF range (25 MHz up to 512 MHz). Malaysia uses the Rohde and Schwarz M3SR to link its fleet of Offshore Patrol Vessels to shore based systems although it doesn't operate the manpack version.

Radmor's have widely exported their product line to a number of countries. Its R-3501 VHF radios have been sold to a number of customer including Algeria, the Czech

Republic, Iraq, Latvia, Lithuania, Poland and the Slovak Republic. The company has also developed the new R3505, a 20-520 MHz hand held software defined radio.

Kongsberg's Multi Role Radio VHF has been sold to a number of countries including Kuwait and Hungary. Barrett, better known for HF in the region also offer the PRC-2080 Tactical VHF which is backwards compatible

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with the ubiquitous but ageing PRC-77.

High Frequency radios have rationally been less compact and weigh more than squad and section level VHF radios. This is now changing to meet the requirements of foot patrols, where the ability to lighten the load provides greater operational flexibility. Codan's 25W 1.6-30MHz, 2110M HF Manpack transceiver is one of the lightest feature-rich HF radios available today, coupled

with a highly capable weight-to-performance ratio. The 2110M transceiver weighs just 2.9Kg, at least a quarter less than its competitors and its 8Ah 2.1Kg battery has a life of over 30 hours with a 1:9 TX: RX ratio. Users can opt to use an alternate 13Ah solution, boosting the radio's battery life by over 50 hours. This life has been achieved by working with customers to pare down those features they deemed unnecessary to a core set. Additional features can then be added via software according to customer needs both at the time of purchase and throughout the radio's service life. Standard features include FED-STD-1045 ALE/CALM, Selcall, SMS and an internal speaker with ease of training enabled via the use of a 'Nokia-look' menu structure. Recently, Codan released the DV 256 AES Encryptor supporting both 256-bit AES encryption and MELPe digital voice. Codan is also the only HF radio manufacturer to offer an internal GPS and its antenna, eliminating the need for an external box, cables or antenna. [AMR](#)

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