

# The Changing Capability of Manpack Electronic Warfare Systems

by *Chris Tarran and Gavin O'Connell*

*Chris Tarran is Electronic Warfare Business Sector Manager, and Gavin O'Connell is Electronic Warfare Operations Specialist at Roke Manor Research, which is behind some of the most innovative technology in the defence sector. In this article, the authors describe the trade-offs that have to be made between functionality of electronic warfare (EW) manpack systems and such tactical considerations as weight, volume and power, and how these can be minimised through incorporation of new technologies.*

When developing systems for dismounted troops, some trade-offs between portability and functionality will be inevitable. However, at the early design stages these trade-offs can be minimised and be continually reduced as technologies evolve over time.

The battlespace in various campaigns across the world fluxes between a force-on-force and a counter-insurgency environment. For many dismounted troops the field of operation changes quickly and terrain is difficult, creating a high-intensity situation which requires new systems to more effectively fight this completely asymmetric battle. As systems must be developed to provide the two primary functions of force protection and intelligence gathering, it is imperative that existing products are upgraded and new ones developed to fill capability gaps in the new battle environment.

Land and littoral electronic warfare operations in today's battlespace require intuitive, lightweight and rapidly deployable manpack systems to monitor the diverse and constantly changing tactical environment. Man-packable, full suite Electronic Warfare (EW) systems must be designed to be carried by three people to be used on-the-march, in a static environment, or mounted on platforms of opportunity.

To maximise flexibility and functionality for troops in the field, the key requirements for such systems are:

- Scalability for operations on-the-march, static operations or mounting on platforms of opportunity.
- Modularity to provide electronic surveillance and electronic attack enabling the user to balance communications exploitation and denial in the electronic battlespace.
- Network-enabled to pass target data seamlessly between nodes for geolocation.
- Interoperability with other ISTAR systems to support the entire intelligence cycle, but at the same time the ability

to perform as a standalone, highly useful tool for land and littoral EW operations.

- Adaptability, using software that allows for the redefinition of applications in order to capture any new target types and battle requirements in the future.
- Ability to perform in extreme, hostile environments.

## Planning Ahead

With such a broad range of requirements, some trade-offs will be experienced. However, these should be researched and addressed at the outset when developing a new manpack system. This will ensure that maximum functionality will benefit the troops and their mission to the greatest advantage.

Roke has a long track record of developing new EW systems quickly to meet military demand. It was recently awarded a contract by the MoD to provide the next land EW manpack programme to British forces in a required deployment time frame that was extremely tight. This article will examine those considerations learned during the development of this system.

As with many military projects today, the required speed of development necessitated the use of a military-off-the-shelf (MOTS) system. While this meets the immediate need for a functioning system within a compressed timescale, this trade-off could result in a solution with a short life cycle. However, long-term use must sit alongside the requirement for the fast delivery of operational systems to create an immediate advantage for troops.

To reach an effective compromise it is imperative to build an upgrade solution into the programme. As the technologies used within the manpack programme mature and target sets evolve, so this enables improvement of the product and reduces the effects of any initial trade-off. This effectively fills the capability gap now and results in a very different system being used over the next ten years, enabling smarter exploitation of commercial-off-the-shelf (COTS) systems and minimising any compromises as the product develops.

## Lightweight Demands

For dismounted troops, two main concerns when developing a manpack system to support a mission effectively are weight and volume. This highlights trade-offs such as the 'ruggedised' requirement (to protect equipment in the theatre of operation) sometimes outweighing the 'portability' element for those troops on-the-march. In this respect the specific military

functionality requirements will outweigh the user benefits to ensure reliable functionality of the system and an extended product life in the theatre of operation.

Electro-magnetic compatibility (EMC) capabilities of a product are also vital to ensure that there is no interference with other mission-critical systems. Without careful research and development, the consideration of ruggedisation and EMC could at least double the size and weight of a system and thus compromise the effectiveness of a manpack system for any troops on-the-march.

Having a manpack system that can be used out in the field, away from recharge facilities for a length of time is vital to the success of any mission. As manpack systems provide a portable solution for dismounted troops, the ability to power a system effectively while out on operation is another key consideration. However, as technology advances, so there is an increased requirement for more capability and processing speed from systems. All of these of course represent an increased draw on power.

The focus is on developing manpack technologies that offer increasing support and levels of intelligence to troops on-the-march. While these technologies can be packed into an ever smaller box, the batteries to power them cannot.

Unfortunately it seems that battery technology is not keeping pace with the development of other manpack technologies such as sensors and computers, which are lightweight and can now be folded and easily collapsed for stowage. Very advanced systems are therefore often powered by old-style rechargeable batteries or primary cells. This adds weight and creates portability issues for dismounted troops, which could result in a significant trade-off between performance and power.

It is therefore vital to focus research and development (R&D) on successfully developing a system that minimises weight, but which integrates the advanced battery and power management technologies that allow it to be powered for several days, without the need for resupply whilst out on a mission.

Whatever the trade-offs, systems must be developed within the immovable confines of a maximum weight. A manpack system is designed to be carried by three people on foot. They must also carry their usual kit, including life support and combat supplies. A manpack solution such as the Roke RESOLVE system needs to be a small addition on top of that already significant weight load.

**Tailored Approach**

One solution to these issues is to develop a manpack system that can be configured and adapted in the field to meet the



*The manpack system can be used on vehicles of opportunity [Roke]*



*The modular approach to the RESOLVE system results in a system that can be operated stand-alone or as a networked multi-node baseline, either in pre-deployed configurations or for single-user, on-the-march operations, in all cases giving great flexibility and a distinct advantage for dismounted troops using the system [Roke]*

requirements of specific users and mission profiles. An effective manpack solution should therefore perform three distinct functions with associated levels of functionality to deliver the required flexibility in deployment. For example, a scaleable system that can be used statically, on vehicles of opportunity, or on-the-march. While the last of these will perform vital functions for dismounted troops patrolling on foot, it will not have the full capacity of a static environment.

A trade-off here is the ability to deny signals while using the system in a static environment, a function that is not available organically to troops on-the-march. However, a distinct advantage that the manpack system now delivers the commander on-the-march is an organic capability that will be persistent as long as there is battery life. This reduces reliance on high-demand, low-density support, such as the use of aircraft to deliver electronic attack and deny enemy signals.

As with the use of any equipment in the battlespace, tactical constraints often result in the compromise of a system's capabilities. What is needed is a manpack system that gives troops flexibility of use to meet specific user and mission profiles, from simple single-channel communications intercept to advanced multi-channel exploitation and geolocation.

Using one portable sensor node, the RESOLVE system enables troops to get a line of bearing on signals of interest.

With three nodes networked, the full geolocation of hostile targets can be accomplished. This modular approach results in a system that can be operated stand-alone or as a networked multi-node baseline, either in pre-deployed configurations or for single-user, on-the-march operations, in all cases giving great flexibility and a distinct advantage for dismounted troops using the system.

**Reducing Manpack Trade-offs**

Future development of the manpack system will aim to significantly reduce present trade-offs required now and increase functionality even further. One such function will be the ability for the manpack nodes to network directly with other ISTAR assets and seamlessly cue them into action along the Sensor to Decider to Response Asset Link. This will allow more focused cueing, indentifying the enemy's location more precisely and reducing the requirement for high-demand, low-density assets to support missions.

The manpack system of today has had a major impact on the flexibility and success of missions for dismounted troops. As those technologies develop and are upgraded, so it will deliver troops increased benefits through the more intelligent and 'joined-up' use of assets to reduce timescales and increase effectiveness of missions further. ■