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Control of Electronic Equipment carried by the Infantry Soldier.

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Engage Quicker, Stay Safer

The mission of the infantry is to defeat the enemy through close combat. The Infantry closes with the enemy by means of fire and manoeuvre in order to destroy or capture him or to repel his assault by fire, close combat, and counterattack (US FM7-8, Infantry Rifle Platoon and Squad). Historically, to achieve this, the infantry soldier was equipped to defeat the enemy and to survive both battlefield threats and the environment in which he operates. Until quite recently, it was easy to equip an infantryman as he basically had clothing, load carriage equipment and a rifle with iron or optical sights. Little regard was paid to how this equipment worked together when carried by the soldier.

Overburdening the soldier with electronic devices

However, in the late 90s, with rapid advances in technology, NATO's Land Capability Group 1 defined a Soldier System as "*Integration of everything the soldier wears, carries and consumes for enhanced individual and collective (small unit) capability.*" To further break down this definition, five NATO capability domains were established: mobility, sustainability, C4I, survivability and lethality. This heralded the inception of a whole new area of development and innovation! A soldier version of "Robo Cop" was envisaged. NATO set up committees and global conferences flourished attracting the military, defence industry and academia. The vision of a fully integrated soldier system was born.

Initial enthusiasm centred on command, control and information and how the soldier could be included in "the network"; utilizing technology to allow soldiers to know where they are, where their mates are and where the enemy is. Digital radios and battle management systems were developed but were generally cumbersome, heavy and power hungry. Advances in technology have brought down the weight and size to manageable levels, but rather like early mobile phones; they work but there has not yet been an explosive uptake. The C4I equipment needs to be smaller, more reliable and easier to use in the field.

Surprisingly, very little work was conducted on the lethality system which is the tool that defines the infantryman and is a significant percentage of the weight he carries. I have come to the opinion that common themes across international soldier modernization programs today are: disappointment at the rate technology has matured, a lack of innovation with integration of electronic devices on the soldier and a realization that this whole business of soldier systems is pretty difficult to achieve! Continued conflict in Iraq and Afghanistan exacerbated the need to get some of the kit into the hands of soldiers quickly. Lofty ideals of an integrated Soldier System went out the window. The result was Rapid Procurement Initiatives and Urgent Operational Requirements of individual devices that make a real difference – personal role radios, night vision equipment and weapon laser pointers. But these have not been integrated into any form of system. As is now often said, the war fighter has become a Christmas tree. Many programs have ceased developing a complete integrated system and moved to one based on incremental development.

That is not to say that these devices have not made a huge difference and increased operational capability. Many regularly feature in prominent journals and websites but are presented as individual pieces of equipment and not a system. Few soldier systems have entered service. The French FELIN and German Idz have achieved initial operating capability. US Land Warrior saw operational service at unit level and is to be replaced by a simpler Ground Soldier Ensemble through the Nett Warrior program. These are first generation systems with undoubted lessons learned.

Size, Weight and Power (SWAP) have dominated equipment design but the soldier is still overburdened with equipment and also with the unexpected result of an increased cognitive load. Each new piece of electronic equipment has at least one control. A simple illuminator or torch has an on/off switch and a control for the IR filter. When looking at the control problem, it is useful to break down the soldier system into the lethality sub system and the torso or body sub system.

Let us therefore first investigate the lethality sub system and electronic devices on the assault rifle and light machine gun. Many infantrymen mount a minimum of a night aiming device such as PEQ2 and an illuminator or a combined laser light module on the weapon rails. Optical sights generally do not have controls but a thermal weapon sight, which is likely to be carried by one soldier in the Fire Team, has in excess of 4 control switches. Zoom (magnification), polarity change (white hot to black hot) and gain are those that might be used in combat. The thermal sight is passed around individuals in the Fire Team as operations dictate, so all soldiers need to be proficient in the controls. The infantryman could therefore have up to six switches on different devices in different locations on his weapon without taking into account remote push to talk switches for radios. Manufacturers of these devices have seen the problem and many provide a remote tail switch. This is fine in isolation, but when aggregated, the soldier can end up with 2 or 3 remote pressure switches.

On his body, the infantryman carries a personal role radio and wears night vision goggles on his helmet. The radio has push to talk, volume and channel controls. New night vision goggles with data input and image fusion have a number of controls. In addition, Commanders from Fire Team upwards carry a combat net radio. Software defined radios have a large control panel but in combat the most common switches used are push to talk, volume and channel change. Some devices are carried in places where they cannot be easily controlled except by removing body armour and load carriage equipment. Radio manufacturers have produced remote controls, some of which can be weapon mounted. Battle Management System computer controls are not included in this analysis as they are likely to be used only in planning stages and not in actual combat. Combined with the weapon accessories, a commander could therefore have in excess of ten switches to access different functionality during combat, all in different locations. This adds to his cognitive load, decreases his situational awareness as he looks down at equipment controls, increases movement and reduces engagement times whilst he takes his hand off his weapon.

Emerging international soldier systems have some form of control but these are mostly for the C4I functions only and are worn on the body. The French FELIN system has a set of buttons on the rifle fore grip to control

the multi-function integrated sight. The sight is linked to the communications system so that target images can be transmitted through the FELIN communications network. However, the control is both weapon and sight specific and cannot be fitted to the Giat FR-F2 7.62mm sniper rifle or the FN Herstal Minimi 5.56mm light machine gun carried in the Fire Team. When the soldier is the platform, the man machine interface is paramount. Integration requires a central point to control the system core functions.

Kord Defence has developed a unique and simple way of controlling legacy and future electronic equipment soldiers carry. This device, called the SmartGrip Rifle Input Control (RIC), is a weapon mounted programmable control which provides the soldier with a fast, simple and safe way of remotely controlling weapon mounted and body worn electronic devices without taking eyes off task or hands off the weapon, even on the move. The five-button control attaches to the weapon rail system and is operated by pressing single or multiple buttons (chords), similar to a computer game. It does not replace the standard device controls.

SmartGrip RIC on M4

Operational benefits of using the RIC are reduced cognitive burden and increased situational awareness, performance and safety. A significant improvement is the ability to multi-task. The infantryman can operate the night aiming device, illuminator and both radios whilst continually looking through a sight or night vision goggle making target indication and hand off quicker and easier; all whilst keeping both hands on the weapon in the ready position. This decreases target engagement time. Unnecessary movement is significantly reduced, decreasing the probability of detection.

Training on the RIC is quick and simple. A training package has been developed using VBS2 software and comprises four short interactive lessons. Muscle memory and full competency is achieved after no longer than 90 minutes, including practice time.

The RIC has been interfaced to control electronic devices such as thermal weapon sights, infra-red sensors, night aiming devices, laser range finders, radios, illuminators and computers. It has been fitted to M4, SA80A2, Steyr AUG and Beretta ARX 160 but can be mounted on any weapon with a Picatinny or NATO rail beneath the barrel. This low cost option turns legacy equipment into a more efficient system now with a growth path to future weapons and electronic devices.

The concept of a soldier system and the need to integrate all the equipment a soldier wears, carries and consumes is even more important now than it was when NATO provided us with a definition 15 years ago. The aim of improving individual and collective capability must not be forgotten. Miniaturization in the electronics industry and new materials will spawn even more electronic equipment to improve the infantryman's capability to achieve his mission. However, when drafting Requirements for the soldier system and its component electronic devices do not forget the human machine interface and the very real need for a simple central control that can be used without taking hands off the weapon or eyes off task.

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