The integrated soldier

by Gina Gillespie

DND tests IT to support the decision-making processes of Canadian soldiers

IN THIS AGE OF increasing globalization and economic interdependence, today's soldier faces national security challenges remarkable in their complexity. Giving junior ranking soldiers the information required to make life and death decisions in tense and stressful situations is the basic concept behind the Canadian Forces Integrated Soldier System Project (ISSP).

"The more we can give them the situational awareness and the knowledge of what's going on around them, the more likely it is that their junior leader will make an appropriate decision that will reinforce the commander's aim," says Doug Palmer, a defence consultant working with the Director of Land Requirements to outfit the soldier of the future.

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A miniature computer screen display presents information to the soldier's left eye; the microphone and headset keep him in voice communication with his team members.

Although the project is still 5-10 years from completion, soldiers and scientists alike are pouring over laboratory results and testing concepts with the aid of allied forces worldwide.

The project roots trace back to 1988, when the "soldier of tomorrow" was pictured, encased in an exo-skeleton along the lines of a robo-cop.

"It became apparent that situational awareness, command, control and information gathering tools were a much bigger bang for the buck, so we concentrated on those," says LCol Jacques Levesque, project manager for the ISSP. "Blast weapons came in, so blast protection became a high priority, and the project morphed along those lines," he says.

Near Fort Benning, Georgia sits the McKenna MOUT (military operations in urban terrain) site, 430 acres that house an instrumented, mock European village – essentially a battle lab. Over 60 indoor and outdoor infrared cameras monitor the village. Soldiers' movements are tracked by global positioning systems (GPS), and closely watched on large screen monitors in a control room. The soldiers wear a sophisticated form of laser-tag equipment, showing who fired their weapon, when they fired, and if they hit their target. Scientists can data-capture movement, track voice communications, and tape the communications on all the radio systems.

"It is a very scientific testbed that you can put soldiers into to test equipment," says Palmer. The Canadian Forces (CF), through Defence Research and Development Canada (DRDC) in Toronto, ran more than 70 separate experiments, sending Canadian soldiers to Fort Benning's lab seven times to test the best way to use

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Soldiers familiarize themselves with a tablet and digital map display prior to an experiment. "Finger mice" are one means by which to control the computer system.

existing technology to benefit the soldier. So they questioned, for example, the validity of digital versus paper maps. Is information best displayed on a head unit, a flip down instrument on your chest, or on the back of your wrist? And how do you put face protection onto a headwear system and still provide night vision capability, or devise a TV or video screen that pops up in front of a soldier's eye, yet still integrate that with a respirator mask for chemical protection? "Exactly how we do that is what we're trying to address," says Dr. John Frim, a scientist at DRDC Toronto. They're also researching ways to impart data that doesn't create visual overload. They've tested passing directional information aurally (via the ear) through sound cues, and placed vibrators on the chest and torso to assist with cross-country navigation.

"If you can imagine walking through the woods at night, it would probably be a lot easier to detect enemy targets or be watchful of where you're going if your directional information was just a little vibration on the side of your body that said turn right or turn left, says Frim. "So we've explored, not only the kind of information, but the method of providing that

information." The soldiers understood that they weren't testing hardware prototypes, but the capability of technology to assist them in their duties. So they weren't bothered by carrying a laptop in a rucksack with cables hanging out. "We heard comments from people at Fort Benning who said, 'our soldiers wouldn't tolerate that sort of thing. They would trash that concept because of the way it looks.' But because we used the soldiers repeatedly, they understood that this was research, this was science, this wasn't a prototype. I think that was important," says Frim.

Most NATO forces have a soldier modernization program underway. In the US it is known as the "Land Warrior" program, which has been in definition for 13 years. They've played with different concepts, including a heads up display like a little TV in front of the eye, and putting a camera on a weapon so you can aim through a window or around a corner without exposing your body. The French Felin Infantry Combat Suite incorporates sensors on the helmet, and a display device that shows the soldier whatever the camera on the weapon or helmet sees. In Germany it's Infanterist der Zukunft (IdZ). Every soldier wears a GPS receiver, transmitter and radio, all wired to something resembling a palm pilot. They can pull down screens and see local maps, learn of enemy sitings and access situation reports. In the United Kingdom, it's Future Integrated Soldier Technology (F.I.S.T.) "The Spaniards, Italians, and Dutch tend to either hop into bed with one of the other countries, or buy a simpler version," says Levesque. All the countries are trying to address the same problem – how to give the soldier the capability to operate in a digitized battle space, in complex terrain in a network enabled environment. The Canadian ISSP approach is unique within NATO due to an emphasis on human factors.

"All of these nations have all done these things without studying whether it was handy or not. Did it actually make a difference in how the soldier did his business?" questions Levesque.

A soldier interacts with his portable computer system through a wrist-mounted touch screen display.

The CF took five years and $7 to $10 million and did field trials using commercial, off-the-shelf software not hardened to military specs, or hooked the soldiers up to technologies still sitting on the laboratory bench. These studies provided scientific data to support whether these technologies were actually useful or not.

"That makes us very smart buyers, and we're now in a position where we can look at what our allies have done and give more specific direction to our systems – which direction we go with procurement to be able to pick the features that we want," says Levesque. The studies used a robust, scientific approach, including repeated measures, good statistics and good experimental design.

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The program will unroll in three separate "builds," or phases in 2010, 2013, and 2017. There will be technology freezes at the end of each build. So, while build one probably won't incorporate intelligent textiles and active camouflage, that technology may be advanced enough to include in build three. "If we wanted to field one monolithic design that meets everybody's needs at the get-go, we'd never get there," says Levesque. "We'd be like the Land Warrior program, 13 years on, still looking for the full design."

The ISSP is just completing the options analysis phase. The next step is to seek preliminary project approval to obtain Treasury Board funding, followed by a 2-3 year definition phase, where the chosen option is fleshed out, plans are made and prices hashed out. Hardware options will be narrowed from thousands of possibilities to a more manageable number. Computer-generated models will aid in correcting design conflicts, such as how to provide cooling inside the helmets. "Are we going to put fans in there, for example, and how much power does that take?" questions Frim. "We're doing all these trade-offs at the digital level, and then we'll get into producing mock-ups." Once they reach the functional mock-up level, it's back to Fort Benning for more field trials.

"I think we're spending the taxpayers money wisely because we're getting educated before we spend, which is always a good thing," says Levesque.

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