

Gwyn Winfield talks to the team behind the US's robotic decon programme

Never send a man to do a robot's job...

AMONG those that take account of these sorts of things, there is a pecking order of CBRN machismo. At the bottom are the recon soldiers, those fine individuals who sit in comfortable, air conditioned vehicles, drinking coffee and reading sensors. At the other end are those Herculean individuals who sweat their guts out decontaminating vehicles – if you can't take the heat get out of the suit. Whatever the (dubious) truth of the matter, that image may change in the US. For the past few years, the US's Maneuver Support Center (Manscen) has been working on a robotic platform that is able to take up the mantle of decon soldier – eagle eye readers might have seen it at the 2006 Joint CBRN Conference in Fort Leonard Wood.

There are a lot of good reasons why a robotic platform is well suited to decon: it is a role that imposes a massive physiological burden, requires painstaking attention to detail and a high tolerance of tedium. Equally, there are good reasons why robots and decon shouldn't mix: contamination is not a simple procedure, it requires common sense and a technical understanding, and vehicles are becoming more complex, with a range of sensors on the hull, which makes it difficult to have a one-size-fits-all approach.

The US Army, Tank Automotive Research, Development and Engineering Center (Tardec), under a Joint Ground Robotics Enterprise (JGRE) research program, will assess whether the pros don't outweigh the cons, while the user community, Manscen, assesses whether and how a robotic vehicular decontamination system should be employed. To perform these assessments, they are developing a vehicular decontamination payload and modifying the Tags-CX robotic vehicle to perform the decontamination mission. Tags-CX has been developed by Tardec, under contract, to serve as a large research

robotics platform. Bob Watts, from Tardec, explained the history of the programme. "The reason Tardec has been involved in the development of this vehicle is that we wanted a vehicle that was about the size of the large research robotics platform," he said. "We developed this as a technology demonstrator platform, so that we can essentially create and show that you can take a large research robotics platform and reconfigure it for multiple missions. In prior years, we worked with ARDEC and integrated the Picatinny Lightweight Remote Weapons System as a separate payload. Tags-CX has been developed so it can quickly have different missions payloads integrated and remotely operated through the vehicle control system. We have worked with the Telemedicine and Advanced Technology Research Center – TATRC – for the development of medical payloads. With Manscen, we are trying to develop and integrate a payload system that can be used not only for robotic decon, but also to demonstrate a combat service support capability. In July we will be demonstrating that combat service support capability using the small earthmoving tools."

Decon was not an arbitrary choice for

Tags-CX; it came as a request from Manscen. Major Scott Werkmeister, Science and Technology Officer at Manscen, explained their input. "What we are doing right now is defining whether a robot can do thorough decon," he said.

"That said, some of the things we are also looking at is a stand-off sensor for decon; it is only one-to-three metres stand-off, so it is still close to the vehicle, and the scanning area is still relatively small. So to do a thorough 100 percent sweep of everywhere on the vehicle is unlikely. But if you look at the current process – with an ICAM and a human operator sweeping it around – I don't know how accurate that is, and I think the robot could be as accurate, if not more so, with the new detection capability."

The detector, a Targeted Ultraviolet Chemical/Biological/Explosive (TUCBE) sensor will be linked to the decontamination applicator through a world model interface, so a positive reading will trigger the release of decon solution, after the vehicle has been scrubbed. "If you can do vehicular cleaning through a robot, there are not too many things you can't do," said Bob Watts. "It is not a trivial task – some of the technical requirements are quite arduous. For the vehicle scrubbing, they



Tags-CX is the platform for the robotic decon vehicle ©Foster Miller

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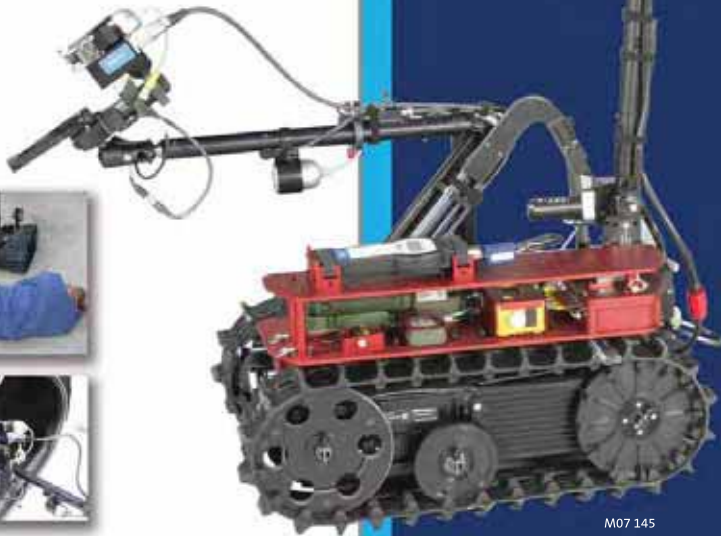
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have to maintain the brush surface pressure at +/- 5psi of the desired pressure because we do not want to damage the vehicle during the cleaning process. There are a number of requirements, and one of them is to develop an effective scrubbing mechanism. At the end of the back hoe manipulator, we will be integrating a sprayer and the decon system – and we hope to use the one (i.e., decon system) that ECBC will recommend for future Army use.”

Currently the robotic decon programme is ahead of the schedules of complementary programs. ECBC has been researching the best ways to do vehicle decon – not limiting the approach to a robotic solution. Working in concert with the other decon research efforts has impacted a number of elements on the robotic decontamination program; but, since some of the required components were long-lead items, like the detector, the team has had to make decisions and backfill later. Though, as the team admitted, this was not a major problem; as the programme is designed to show that a robotic platform can be used as a decon asset – and that is regardless of the type of solution/detector used; it is a more proof of principal. Of greater challenge is how the system will be operated – a team of men with stirrup pumps and brushes might be manpower intensive, but it is low-cost. How would the UGV be used? Would it be one UGV per vehicle, one for each side and then a smaller one for underneath the vehicle? These are all problems that will be looked at by Manscans at Fort Leonard Wood over the next few months. Major Werkmeister explained, “The purpose of this programme is to bring what is available right now – a prototype or something that is fielded – and to build a platform that can help Manscans further define concepts and develop requirements,” he said. “So we are working with ECBC and the Automated Decon project to get recommendations, and we are bringing a platform to FIW to help define what the requirements might be. We don’t know if one robot can completely drive around the system, or if it needs two; that is what we hope to find out by bringing it here, running it through experiments and kicking the

tyres, to help us visualise how it could best be employed.”

Lieutenant Colonel Pat Terrell, Chief of Operational Maneuver Support Branch within the Concept Development Division, explained the bigger picture. “What this will tie in with is a separate experiment looking at the future of decon from a conceptual view, not in bending metal but in the four levels of decon and what we want in the future,” he said. “How do we better integrate detection and decon for where we want to go? So, from that seminar-based documentation process, I would have expected that within nine-12 months we will be able to go forward with a joint requirement for what we want the next decon systems to look like.”

Yet certain assumptions must be made before an ACTD can be created, so is there a plan to keep a man in the loop, or is it going to be an entirely automated process? “For this programme we are only doing semi-automation; there will be a man at the operators’ terminal watching what is going on, using the manipulator, human intervention in areas where it needs assistance,” said Bob Watts. “We are also looking at the overall decon mission, for preparation of decontamination – that is why we are providing some of the tools. We will be providing a trench digger – some of the people from the CBRN School stated they often had to call in engineer support to prep the site; but, with the robot having a trencher, they could effectively dig their runoff areas – and we are also providing a fork lift as they have to unload the trucks themselves. In terms of being able to decontaminate the undercarriage, we are interested in a telescopic device that could be at the end of the manipulator and could extend underneath the vehicle. We are building towards defining what we can and cannot accomplish.”

Lieutenant Colonel Terrell suggested the idea was not to eradicate specialist training and understanding, but more to take some of the “donkey work” out of the process. “Can we, through automation, get the soldier out of the loop?” he asked. “Conceptually, what we really want to do is get the soldier as far out of the loop as possible. The hardest part of the decon with the man in the

loop at the moment is the fatigue factor; that he becomes so fatigued that he is no longer able to make decisions and see the bigger picture of the process he is in. Even semi-autonomous – with detection and spraying ideally – the robot will be able to do everything, but the soldier can stand back and say, “Wait a minute, I know this because I have communicated with the unit, and I know the circumstances in which it got attacked – IED, mine, surface contamination, etc.” So our soldiers, as we make them more technically proficient through training, can make the right decisions and leverage the greater capability they have with the robotics to make the process go faster and be more thorough as they can apply common sense and a greater technical knowledge.”

Currently the system is being designed to address existing Army decon assets; soldiers would use their current decon systems as part of a decon module for the large research robotics platform, but the concept generally is Army focussed. “The Joint Ground Robotics Enterprise is a joint organisation, but for our purposes we are limiting the scope for Army systems. We are keeping the joint community in with this, and if something applies we would be looking to a joint requirements document that could apply across all services,” said Major Werkmeister. It would seem that, while the most obvious user of this system would be the Army, experiments with Naval decon (such as described by Major Kuhar in CBRNE World Summer 2007) suggest that it is the psychological burden of such a large vessel that poses the greatest challenge – a problem the robot would not have.

There are a number of question marks over the general use of UGVs; many users in Iraq have not embraced them as warmly as they have UAVs, but it would seem as if decon would be a good fit. For a start it is not a bespoke chassis – merely a module that fits on top of a utility platform, and the technically difficult part of decon (the understanding of interaction between agent and surface) is retained and only the dull bit – the scrubbing – is lost. Quite what this will do to the CBRN mackie pecking order is another matter however...