

SEVERE WEIGHT LOSS

Gwyn Winfield looks into whether the trend for lightweight PPE can be realised or is just a fad

THE Spring edition of *CBRNe World* contained an article from Eugene Wilusz of Natick (read it at www.cbrneworld.com/articles_spring_2007) where he commented that, "It is anticipated that a lightweight, self-detoxifying CB duty uniform will be delivered in the not-too-distant future." He is not alone in thinking this; many ministries/departments of defence are looking at something that will bring greater, or similar, protection at lower physiological burden levels – *plus ça change*. Whether due to a maturation of technology or a renaissance in CBRN thinking, however, many more people think that this is possible.

"I tell customers – and you should never do this – that I have told lies in the past," said Hans Jorg Wickert from Blücher. "One lie is that there is a balance between protection and comfort; we've told customers that whatever your protection is it will have an effect on this balance, a bigger requirement for protection means you lose comfort and vice versa. We gave our R&D guys the task of getting rid of this balance. We needed a system that made sure the protection level stayed the same, as a minimum, but dramatically improved the comfort and reduced the heat stress. This invention of the perpetual mobile was one of the better tasks we gave to our research guys. We spent some money on solving it – about 70 million euro – not just on the R&D but also on the practical side. We widened the range of competence and activities, we built a facility for the raw materials – the spherical absorbers – and that provided us with a lot of influence over the product which we did not have in the past – and we built a new coating line. Those two, with the R&D, cost the 70 million that was needed to ensure we had the right components for solving the task."

This is a big claim. Hans' assertion that this is similar to creating the perpetual motion device is not far wrong, if Blücher's claim can be substantiated then this is the moment that protection has been waiting for. Personally I remain sceptical; previous



Overgarments will take away any of the advantages in low observability that the combat uniform has

improvements in carbon have seen marginal improvements – a 10 per cent gain in comfort or protection. Hans Wickert disagrees strongly, "My impression is different. In terms of weight we are very close

to the weight level of an ordinary battle dress uniform, and I would call that a significant improvement; better than 5-10 per cent, it is a leap forward! In the military, one idea is common: having a protective performance in the standard suit. The first conceptualisation that we reached – the first level of integration – is the fielded IDz [for the German army] which is the first battledress suit with NBC protection built in. This will happen in other fields and areas as well, and we are not far from the step that a permanent level of protection will be worn as a vest to be worn under the battledress, not just for performance purposes but psychological purposes as well as political; troops abroad would not want to show themselves as Darth Vader look-alikes in their appearance to the public; this is not good for peace enforcement! A lot of customers are looking forward to integrated protection – not just for CBRN but ballistics and other protection against insects and weather, etc."

This is where the problems begin, however; once you start building a suit that has CBRN, ballistic and insect protection, combined with low-observability, etc, you have a piece of clothing that is a serious investment. Once you put an activated carbon liner in there it is like driving a new car off the lot – the value decreases immediately. Activated carbon deteriorates in washing until the level of CBRN protection is negligible, so every time the threat level warrants it and the suit is worn and laundered the value of it drops – until it has to be thrown away and all the other aspects of it lost

One solution to this has been semi-permeable membranes, or selectively permeable membranes, yet these have closure problems and can result in a bellows effect. The usual solution to this is to have a thin layer of activated carbon in there, which brings us back to square one. "If you combine two technologies in CBRN, and you are able to distil only the advantages of the technologies, then fine," said Hans Jorg Wickert. "But our experience is that you have to accept the disadvantages you have to buy the whole package. If you combine activated carbon (AC) with membrane then you will have both the advantages and disadvantages and in our opinion there are a lot of disadvantages. The AC is only a thin layer – it is not standalone, it is emergency only, so the capacity is low. Membrane manufacturers always say that a membrane

© USMC



Creative Technologies
Worldwide

Advanced Technology Products

GORE™ CHEMPAK® Family

Recognised worldwide for materials technology and primarily for products marketed under the GORE and GORE-TEX® brands, GORE has a long tradition of providing high-performance fabrics that offer the ultimate protection in demanding applications while increasing the user's functional capability. GORE has focused its unrivalled expertise to create a range of protective fabrics for the CBRN marketplace. The family of GORE™ CHEMPAK® products offers the user the safety that the environment demands, while allowing them the freedom, comfort and focus to carry out the required activities to the utmost of their skills.

GORE has taken an evolutionary step ahead of the competition, producing a range of clothing systems that deliver genuine top line protection and comfort. There are three fabrics in the range:

GORE™ CHEMPAK® Sorptive Fabric provides improved protection over traditional protective carbon materials. The combination of a moisture vapour breathable GORE membrane and an activated carbon layer offers improved protection against liquid, aerosol and particulate forms of challenge agents.

GORE™ CHEMPAK® Selectively Permeable Fabric provides lightweight, low bulk, breathable chemical and biological agent protection. This unique, moisture vapour breathable, non-carbon based fabric is significantly thinner with less bulk than typical carbon-based material. It offers increased protection against liquid and wind-driven chemical warfare agents.

GORE™ CHEMPAK® Ultra Barrier Fabric provides lightweight protection against a broad range of industrial chemicals and chemical warfare agents. Products using the GORE™ CHEMPAK® Ultra Barrier Fabric have shown excellent durability in the field. The high strength, tear resistant properties enables this fabric to be integrated into new design concepts for garments, hoods, gloves, socks, overboots and shelters.

Leading the way

In an ever-changing world, with continual CBRN threats now being very much a reality, GORE strives to stay ahead of new developments and lead the marketplace. Through continual research and investment the company takes pride in the products and the protection they provide, ensuring that the only fabric to exceed the end user's expectations carries the GORE brand.



“GORE has focused its unrivalled expertise to create a range of protective fabrics for the CBRN marketplace.”

For more information

visit www.gore.com

SEVERE WEIGHT LOSS

is breathable and I always challenge them to breathe through it, but they never accept!”

It is not just the military who are looking at this; civilian forces are also interested in having an integrated CB protection level in their service clothing. One solution that would fit both realms would be a low level of protection – a membrane along the lines of a plasma coating, which will give them time (once the respirator is donned) to retire and decon, or change into ‘normal’ PPE and return to the scene as the mission demands. The other alternative is the suit version of an escape hood – a pouch with a ultra-lightweight suit, such as Tyvek F, that the user quickly pulls out and dons and then retires or returns once more suitably dressed.

Captain (Ret) Ian Jarvis, of ILC Consulting, insists that this has to be taken back to basics, – back to the mission. “It is down to concept of operations when under attack; you try to balance your risk/threat assessment and concept of operations – at all times you are trying to maintain your operation that you are undertaking. Start at the end and work back – is there a problem out there or isn’t there? The second aspect is what you are going to do if you encounter that problem, and there will be a level of preparedness that you will have to counter that. If there is no CBRN threat then the threat level will be low and you tool up for a conventional effort. These guys try to carry the world on their shoulders, so saying that they can carry Tyvek F, etc, comes down to do they need that? There are lots of other things being incorporated into materials – low observability, intelligent material, etc, – and the last thing you want to do is put a suit on top that that negates it. So this is where the conundrum starts; how do I incorporate it? How do I make it part of every day work clothes, so that I have a level of protection that allows me to get out and either retire or take more protective action? Another problem is that it is a balance between physiological burden and comfort for operations; if you wander round in CS95 (Combat Soldier 95, the standard British Army battledress) you have lots of flapping cuffs, pockets and buttons which is not the way you want to go to deal with CB. So how do you close that up with everyday work wear and with a smart material so that you can put a respirator on and get out of dodge? You say it will be expensive, but how do you manage risk; look at a Tyvek suit, is that really, really cheap? Does it last ten minutes or three

Missions and technology are imposing a greater burden on the soldier before CBRN is even considered



©DoD

hours; is it the time that is required for the mission? What happens if it happens in a fire fight; you don’t want to hang around, you might not want to show yourself to do it, but the mission might not let you retreat.”

William Finegan, of the US Response Corps Association, agreed that too much of this was technological navel gazing without the doctrinal leg work. “We are spending too much time trying to find technological solutions to problems which are doctrinal and operational, and until we do that we can’t determine what our functional needs analysis is. If you haven’t determined at the front end whether the adversary is the agent or the bad actor, then you need to determine

how you are going to defeat him, and that involves time and order of magnitude; then you can start building against the threat. There has been a difficulty in recognising and differentiating within the CBRNE environment that there are two parallel threats: the bad actor and the agent. We need to be dealing with both at the same time. The solution is not about application; it is about healthy doctrine, which starts with needing better language and from that comes better analysis and better understanding of what is going on.

“We need to recognise what isn’t going to happen and then diligently deal with what we think the credible threat is,” he

NUCLEAR, BIOLOGICAL, CHEMICAL. NOTHING COMES CLOSE.

THE NBC MK IVA PROTECTION SUIT

In a nuclear, biological or chemical attack the NBC Suit is the British Army's first and second line of defence. The Mk IVA utilises the latest advances in fabric technologies and garment design to provide essential protection against liquid and vapour chemical agents as well as primary biological agents. Nothing comes close. Of course, protection is nothing if it stops you doing your job. Maximising on the latest fabrics and ergonomic design advances, the Mk IVA causes minimum impact on operational capability whilst providing world leading protection for up to 24 hours.

Remploy Frontline has been manufacturing NBC Suits for over thirty years. In uncertain situations they're a company you can trust with your life. For more information, call +44 (0) 845 241 2990 or visit www.remployfrontline.com



SEVERE WEIGHT LOSS

continued. "What are we vulnerable to, what do they have the intention to do and what capability can they assemble? Once we have those three things then we can get rid of a lot of the noise. Can they launch a Scud from Badladistan and hit Pattison New Jersey? No. Their order of battle impacts on their organisation and that is a big part of the puzzle and as soon as we understand that we can figure out what the scenario or plume looks like and plan. You can't define equipment until you know what your tactics and doctrine are."

Any discussion on the threat level, to determine the protection level, must necessarily involve the sort of doctrinal work that Capt. Jarvis and Mr Finegan suggest. This dichotomy is at the heart of any debate on lightweight clothing – who is the enemy, what are his agents and how much of them does s/he have? The Cold War could answer this question nicely, yet currently there is still the indecision about whether the next enemy is the Garage Fundamentalist preparing bags of Tabun or Kim Jong Il (feel free to replace with your favourite leader who ought to be displaced) and barrages of military rockets filled with thickened VX.

There is change coming regardless of threat, however; a myriad of future soldier programs – Felin, Fist, IdZ, Soldier, Norman, etc – are going to upgrade the clothing of land forces. If CBRN doctrine can't decide on what the threat is then it will be left behind. "I've been through Natick previously and their future fighting soldier looks like Darth Vader, the suit is made of all sorts of the latest fabrics. Once you start to make a suit with low observable, ballistic protection, etc, incorporating one layer with chem-bio protection should be fairly straightforward – but it needs to be incorporated right at the start. That is better than having something extra strapped to their belt – be it an escape hood, gas cape or lightweight suit. Get it incorporated into the kit and give yourself a half hour of protection, but it has to have utility, robust and be compatible with other kit," said Capt. Jarvis.

Adding a plasma, or similar, layer to combat dress would be one way forward, but it would also require a change in doctrine and tactics, techniques and procedures. Currently it is a binary equation; you are either in a suit or not. If you are not and there is hazard you are in trouble and need to retire and take medical counter-measures. The change that an effective membrane might make could



IDZ is the first future soldier ensemble to have integrated CBRN protection

complicate matters for commanders too much – should I withdraw the troops if they only have 20 per cent skin protection? – and force them to act in a conservative manner and continue to back carbon.

The latter might not be the worst option. Blücher are not alone in offering lightweight suits; the TOM suit from Paul Boye and the Cougar from Remploy Frontline are also in the market, all with their own niche advantages. While the civil market is looking at the issue of lightweight suit too, there is likely to be little read-across between the two; indeed, it might well complicate matters. Next-generation military outfits are likely to be far too highly engineered for the civilian forces needs, and equally there is a realisation that the civil roles are just as arduous but in different ways (having to enter into contaminated areas to save lives, for example). The two are diverging and this is likely to become apparent as Nato and NFPA's standards take them in different directions.

Does launderability pose a problem? Neither Hans Jorg Wickert or Ian Jarvis thought so. "None of the suits that crossed the border when they went into Iraq were

laundered because in the rapid movement no-one could tell the commander 'Right, there will be a halt here because it is laundry day!'" said Hans Jorg. "Even if he could, the logistics managers would kill them saying 'We have ammunition, water and fuel problems, never mind laundry!' So launderability from the current understanding has to be looked at from the practical aspect."

Ian Jarvis suggested other issues. "There has to be a managed transition from CS95 to FIST; it will be tricky to map that out and a number of people like Gore, Blücher and Steadfast think they have the solution; all will try and solve it one way or another. They will all try and come to a conclusion but end up with the same sort of conclusion that you are drawing – that you have to stay with AC. You then have to do your through-life management – what will it cost, is it a one-off emergency use or do I have it incorporated in my suit? Whichever way it goes, the real situation is that once it is contaminated it will go in a plastic bag and be destroyed – that will be the cost when it gets nasty."

While these are both true, there were enough false alarms prior to the 2003 Gulf War that suits did need to be laundered. While slimed items might not be the issue, they were in the Cold War; false alarms will drive laundering onto a force until the cost of laundering surpasses the cost of the garment.

Membranes offer promise for an integrated protection and, if Natick can deliver on their promise of providing a lightweight, de-toxifying suit, then they too might have created the perptuum mobile, which would be an equal first with delivering on the long-marketed promise of SPMs. The UK Police is looking for their lightweight 'quick-don' suit, and one of the strongest contenders may well be a Tyvek F-type garment, yet this is unlikely to be a military solution because of its over-garment nature (and the problems inherent in that) and its physiological burden. Meanwhile, the military look to the sunlit uplands of future soldier technology, yet if they cannot agree on the sort of doctrinal problems that William Finegan is concerned about, the idea of an integrated level of protection will be lost and the military doomed to two suits for another product generation. Carbon does continue to get lighter and better, and will inevitably be surpassed sometime in the future, but that doesn't appear to be anytime soon.



Paul Boyé

The World's preferred
CBRN Suits

The best combination between
COMFORT & PROTECTION



The Swedish Army has selected
Paul Boyé Technologies
to supply the
C-Combat suit 08

Paul Boyé
TECHNOLOGIES

www.paulboye.com
1564 AVENUE DE LAGARDELLE
31810 LE VERNET - FRANCE

TEL: +33 (0)5 34 48 21 10 - FAX: +33 (0)5 34 48 21 15 - email: export@paulboye.fr

MILIPOL PARIS - Paris Expo Porte de Versailles
STAND 2G91 9-12 October 2007