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The future operating environment will be heavily weighted towards military operations in urban terrain, according to a UK MoD forecast covering the next 20 years.

By Andrew White

According to the UK MoD's Future Operating Environment 2035 report, first published on 30 November 2014 and subsequently updated, the majority of the world's population will live in cities with many positioned on or close to the littoral environment. Such a trend will provide significant challenges for armed forces

Camera's Xaver 400 has the ability to confirm the number of people and their location inside a designated room. (All photos: Camera)

IN THE

CITY



conducting operations in these areas.

'For our armed forces, the urban environment will be one of the most challenging areas to operate in,' the report explains. 'The city and its surrounds will become an increasingly complex and ambiguous tapestry of multiple actors with shifting allegiances, in which we may be required to operate in a variety of ways, from major conflict at range to peace support and humanitarian operations.'

'Where cities are located on the littoral – a difficult operating environment in its own right – the complexities of the urban environment will be amplified and even more dynamic. This will exacerbate further the operating challenges.'

However, the intricacies of operating in an urban and littoral environment are already being witnessed by armed forces worldwide, with special operations forces (SOF) and special mission units in particular, already well versed in military operations in urban terrain (MOUT) tactics, techniques and procedures (TTPs).

Critical in the planning and preparation ahead of, during and after any urban operation is the ability to generate situation awareness of the area of operation and target area, allowing troops to efficiently insert, execute and extract.

Addressing delegates at the Soldier Equipment and Technology Advancement Forum in London on 14 March, Lt Col Rob O'Connor, commanding officer, Infantry Trials and Development Unit, British Army, explained how contemporary and future MOUT would encompass a range of hazards, including electro-magnetic threats across the spectrum, UAV-borne dirty bombs or airborne IEDs.

Referring to the ongoing 'global urbanisation' featured in the MoD's forecast, O'Connor explained: 'The majority of activities will see a threat to navigation and movement, with an emergence in subterranean operations, enemy concealment, non-LoS surveillance, dismantled situation awareness and an importance to get away from reliance on GPS technology.'

Military sources associated with the NATO Special Operations Headquarters, located in Mons, Belgium, explained to *DB* how operations in 'high rise' urban and subterranean environments,

including more developed cities around the world, would continue to prove problematic for SOF units with regards to exploitation of GPS technology and data-driven operations.

'Thermal imaging is a serious issue, with urban clutter and high temperatures in certain urban environments around the world making it harder to optimise use of optical gunsights and helmet-mounted sensors. We have to be aware of ambient temperatures and target temperatures which can sometimes be very similar, especially during a more traditional window of limited utility, like dawn and dusk,' it was explained.

Additionally, the source described how enemy combatants continued to develop means of countering traditional advantages of night vision and thermal imaging, although further details cannot be published for operational security reasons.

Ground solutions

The past decade of operations, centred on counter-terrorism and counter-insurgency operations in the Middle East and South Central Asia, has seen conventional and unconventional forces conducting repetitive direct action and arrest operations, targeting high-value targets in order to attack insurgent networks.

These CONOPS heavily relied upon the generation of airborne ISR data in order to find and fix targets; understand a pattern of life in the target area; provide security overwatch and a 'talk on' capability guiding assault forces onto target; as well as coverage of an exfiltration to pick-up point for extraction.

There has been a wide range of support available to ground units for urban domain awareness, including space and airborne technology as well as ground-based systems, down to the lowest tactical level.

With many MOUT missions, much emphasis is rightly awarded to building and compound clearance drills, TTPs for which have significantly evolved over recent years. Following growing numbers of casualties and fatalities inflicted upon special operations task forces, NATO and partnering SOF units quickly revised more traditional TTPs used to storm buildings and compounds in favour of so-called 'call outs', and if necessary, much more intricate

movements around apertures designed to find, fix and neutralise enemy combatants before committing troops into 'fatal funnels' and dangerous and sometimes boobytrapped bottlenecks.

Through the wall

One piece of technology highly suited to supporting such MOUT tasks is see-through-wall technology, with companies including Israel's Camero continuing to supply Tier I SOF units worldwide with the capability.

Speaking to *DB*, company sources explained how Xaver 100, 400 and 800 products had been developed in line with requirements from IDF special forces, formations of which regularly conduct MOUT and Close Quarter Combat (CQB) operations in highly congested and contested built up areas.

Capable of penetrating walls at a range of 20m, the Xaver 100 has been designed to provide a go/no go capability within ten seconds for assault teams stacked up outside a building or compound. Systems also provide range to the closest targets in a room. Described as a handheld through-wall life detector, the Xaver 100 is designed for tactical entry and assault operations, alerting operators to the presence of threats during hostage rescue and CT operations.

The device is capable of penetrating up to 85cm thickness in cement, plaster, brick, concrete, reinforced concrete, adobe, stucco, drywall and other building materials with a 120° FoV in azimuth and elevation.

Operating in the RF range between 3GHz and 10GHz, the Xaver 100 measures 21x9.7x6.5cm and weighs 630g, providing a lightweight and portable solution, powered by two AA batteries. The system can also be wirelessly operated for remote monitoring at a distance out to 100m, especially suitable for chemical, biological and radiological threat levels where a stand-off position is required.

The technology has a 'micro-power ultra-wideband pulsed radar sensor operating at very high bandwidth with mathematical algorithms used to cope with cluttered environments, resulting in a highly reliable object presence and



The Xaver 100 encompasses Camero's See-Through Technology at the lowest tactical level, and provides assault teams with situation awareness before breaching.

distance detection', the Camero source outlined.

The larger Xaver 400, meanwhile, is described as a compact radar-based device, with a 3D or 2D variant of the Xaver 100. Networked to a Toughpad end-user device (EUD), the Xaver 400 has been optimised as a 'quick tactical decision making tool for urban operations', providing 'real-time mission-critical information on live and static objects hidden behind walls and barriers'.

Information which can be confirmed by the Xaver 400 includes the presence of life in a room; number of personnel and their location inside a room; tracking of target movement patterns; and room layout, including dimensions and major infrastructure elements at 4, 8 and 20m range intervals.

Reliable data

The Camero source explained to *DB*: 'Military and law enforcement teams conducting urban operations require reliable information for determining the necessary tactical approach to assure successful mission execution. The Xaver 400 dramatically improves SA, providing a clear operational advantage and the ability to "step into the known".'

Similar to the Xaver 100, the Xaver 400 operates in the 3-10GHz frequency range with 120° FoV. The system measures 37x22.5x12cm, weighs 3.2kg and has a

rechargeable battery capable of providing 7 hours of continuous use.

Finally, the Xaver 800, which is in use with IDF special operations units, is designed to help assault teams identify hostages in a room who might be static. Described as a high-performance ISR portable through-wall imaging system, the Xaver 800 provides a 3D ISR device optimised for the generation of 'mission-critical, accurate real-time information on live and static objects from behind solid walls or barriers including presence of life in the room; number of people and their location inside a room; tracking of target movement patterns; target height and orientation; and room layout, including dimensions and major infrastructure elements'.

The system is capable of penetrating the same types of walls as other variants although the Xaver 800 has an FoV of 80°. Weighing 14.5kg, the system can be carried in a backpack with ruggedised carrying case.

Camero continues to conduct specialist training packages for undisclosed NATO and non-NATO partner SOF units, with some six operators trained to use the system at any one time over a two-day training package.

Referring to its utility within special operations, Camero sources explained to *DB* how Xaver variants could help identify

the type of method of entry required to breach a building or compound. IDF special forces have used the technology during operations in Gaza and Lebanon over recent years, including employment during subterranean operations.

However, the company is also considering future upgrades, including elimination of false alarms (generated by reflections on walls) and increases in range, although the latter will invariably mean additional weight.

'We are trying to implement this technology into larger conventional military formations and beyond SOF. So we are working on something to detect objects up to 70m away but remain unsure as to whether it will be vehicle-mounted,' Camero officials explained. However, any potential for an airborne solution was discounted due to stability required to gain a detailed sight picture.

'This technology has changed the TTPs of soldiers conducting operations in urban terrain, with an ability to identify threats and non-threats in the "critical corners" of a room during dynamic room clearance drills,' an ex-IDF SOF operator disclosed to *DB*.

'The world will take time to understand this technology, and for a soldier to change TTPs will take years,' Camero officials warned. 'But Xaver will become bigger and change capabilities in the urban environment. But it will take time to implement it into tactics.'

'Commanders want speed and this technology is all about thinking quickly,' it was added, explaining the potential CONOPS for assault teams carrying this technology. This would see the Xaver technology carried by a breaching team, with a commander stood off at a tactical distance with networked Toughpad EUD to confirm go/no go for the assaulting team.

Finally, IDF SOF sources explained to *DB* how the technology had also proven an ability to detect tunnel openings in buildings, particularly pertinent to the contemporary operating environment in the Middle East.

Next-generation thermal

Referring to issues relating to thermal imaging sensors employed in the urban environment, director of advanced programmes at Rochester Precision

Optics, Rick Bryant, explained how industry had finally started to 'think outside the box' with regards to listening to end-user requirements.

'There have been some rather significant improvements across the board in performance, durability and effectiveness. Digital, thermal and SWIR sights have all improved greatly and bring new clarity and resolution to the battlefield, adding capabilities that have never been utilised before,' Bryant explained to DB.

'Thermal imaging sights must be flexible and adaptable on the go to meet the many combative situations that's before it. Running around with fixed 4x or higher magnified optics is fine for open environments, however, trying make offensive/defensive shots in close proximity and under stress with a magnified optic is challenging. It can be done with copious amounts of proper training, but since most line infantry units

don't get the training required, having a sight that can't adapt is not a good thing,' Bryant continued.

Day to night

Rochester Precision Optics continues to offer its CMOS Night Observation Device (CNOD), described as an HD sight that enables its operator to see in bright sun as well as low light. Essentially, the CNOD comprises three systems in one, reducing traditional requirements to switch out day and night devices over the course of a mission.

'The CNOD is a high-definition digital day/night sight that enables the operator with the capability of seeing in the day as well as night with high contrast and high resolution all in one sight. The CNOD gives the operator the capability to perform day and night reconnaissance, surveillance, target acquisition, covert operations, tactical assault, border security and search warrant interdictions,' Bryant explained.

Capable of being used in handheld, clip-on and standalone rifle sight, the monocular system also includes a reticle for zeroing and targeting of small arms systems with 1-6x electronic zoom capability.

Increased awareness

Describing how the system is already in service with US Army 'Green Beret' special forces groups, initially for the joint terminal attack controller role, Bryant explained how it had increased the awareness of operators conducting MOUT.

'The CNOD takes high-resolution pictures day or night with internal storage, has standard high-resolution video out, can see through glass, including both building windows and automobile glass, very low halo and external light bloom - ie sees through street lights and automobile lights - and has the capability to see hostile/friendly infrared lasers and provides 100% facial identification and has a front-mounted LED illuminator.'

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Operating in the spectral range between 550nm and 1080nm, the CNOD has a sensor format of 1280x1024 with 9.7µm pitch and weighs less than 525g in line with operational requirements to reduce the burden of warfighters. The sight also has a small form factor, measuring 14x8x6cm and is ruggedised up to MIL-STD-810F.

'A gunsight must be able to rapidly change based off the operational task at hand. Most infantrymen can find themselves in wide open spaces, then ten minutes later they could be going room to room clearing rooms and houses. The sight needs to allow the shooter to rapidly place rounds exactly on a predetermined point on a target. Far targets require more precision to engage, thus more magnification. Close targets need to be removed as quickly as possible, thus wide FoVs to allow for rapid engagement is a requirement. Clear precise sight windows are the key to engaging effectively,' Bryant explained while highlighting the CNOD's wide range of capabilities in single system.

Time delay

However, referring to warnings regarding the overburdening of warfighters during missions, Bryant explained how overcomplicated optical gunsights and sensors would only delay the amount of time required for an operator to accurately and efficiently engage targets.

'Your head needs to be on a swivel, gathering information. When it's time to shoot, the shooting process should be fast and effective. If an operator mounts his weapon and then needs to digest the data being pumped into his eye before making a shot... it's time lost and time in a gunfight is critical,' he explained.

'Technology such as digital will keep moving forward and the soldier will have to learn to break away from conventional warfare. The shooter/operator desires situation awareness that C4ISTAR brings to the battlefield. However, he has to have the ability and modularity to pick and choose what the situation requires to be more effective on the battlefield, so that sensory overload does not overcome him. But all operators won't need the same information - the soldier, the platoon commander or commander on the field of battle will all require different information

to make the decision on how to engage in battle.

'There is one common denominator desired on the entire battlefield all the time - all operators from the soldier to the commander desire clarity and resolution day and night and the only devices that will provide this will be digital devices,' Bryant concluded.

Success rate

While airborne ISR technology is capable of providing the overwatch and pattern of life

required ahead, during and after a mission conducted in the urban environment, the fundamental success of the operation will depend upon the sensors utilised by ground force elements.

As adversaries continue to gain access to COTS night vision and thermal imaging technology as well as an understanding to counter such systems, the requirement for armed forces and industry to remain ahead of the game has never been more important. ■

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