Hold the line: Border security technology developments aim to stretch resources

Maintaining security at a country's border remains a challenge for military and security forces. *Grant Turnbull* assesses some of the latest technologies used and how they are evolving to address new threats

Myriad security challenges present themselves at a border, including migrants fleeing from conflicts or natural disasters, organised criminal networks smuggling goods and people, terrorist infiltration and attacks, and military skirmishes with unfriendly neighbours. Borders and territorial boundaries can also be contested, adding to the complexity associated with their security.

The CBP operates a fleet of eight large aerostats known as the Tethered Aerostat Radar System (TARS) along the US-Mexico border. (US DoD)

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It is, therefore, vital for security forces to be able to identify and address potential threats before they spill over a border and threaten the wider population, while at the same time not restricting the movement of legitimate people and goods that are essential for healthy economic activity. This requires layers of security measures, from rudimentary physical barriers to complex digital technologies such as artificial intelligence (AI)-driven sensors that can detect and identify suspicious vehicles, objects, and humans in cluttered and crowded environments. Terrain conditions can vary, adding to the challenge.

Large borders, which are impossible to secure with physical barriers and personnel alone, are particularly challenging so technology can play a key role in addressing resource shortfalls. Long-range sensors such as powerful electro-optic/infrared (EO/IR) cameras, radars, and electromagnetic and acoustic monitoring devices are ideal for early warning and therefore enabling security forces to deploy personnel where needed.

Unmanned systems across all domains are also playing an increasing role in border security operations, owing to their persistent nature and ability to carry an array of sensors for detection, recognition, and identification.

Command-and-control (C2) centres are then needed to fuse, digest, and disseminate data from these various sensor nodes. There appears to be a growing use of automation and AI within these C2 systems, which alleviates some of the cognitive burden associated with monitoring large and diverse arrays of sensors and systems.

In the United States, the Trump administration has sought to construct controversial infrastructure along its border with Mexico, including a border "wall". Billions of dollars have been spent by the US Department of Homeland Security (DHS) and Department of Defense (DoD) to create "enforcement zones" that include the construction of new walls (designed to be difficult to climb or penetrate), as well as lighting, cameras, detection technologies, and roads.

Eyes in the sky

According to DHS, the US Customs and Border Protection (CBP) deploys a number of what it calls Border Surveillance Systems (BSS) that "provide comprehensive situational awareness" along the US border, along with traditional sensor technologies such as fixed-position cameras. Newer technologies deployed by the CBP include aerostats, radars, and tunnel and ground detection systems.

The CBP operates a fleet of eight large aerostats known as the Tethered Aerostat Radar System (TARS) along the US-Mexico border. TARS, which is based on the Lockheed Martin 420K Aerostat System, is equipped with the L88 wide area surveillance radar and provides persistent aerial surveillance for the CBP, detecting aircraft up to 200 miles away. Radar data is transmitted to the Air and Marine Operations Center (AMOC) in California and fused with data from other sensor feeds. Unidentified aircraft flying into the US average less than 10 per year, according to the CBP.

The DHS and CBP have also deployed smaller tactical aerostats to provide surveillance coverage on the southern border. A number of these aerostats, which can carry surveillance payloads, were transferred from the DoD after operations in Afghanistan and Iraq. This family of aerostats includes the Persistent Threat Detection System (PTDS), the Persistent Ground Surveillance System (PGSS), and the Rapid Aerostat Initial Deployment (RAID) system.

The PGSS and RAID – developed by Maryland-based TCOM – can be equipped with EO, radar, and acoustic (gunshot) monitoring devices and have a history of providing around-the-clock perimeter

security for forward operating bases in Iraq and Afghanistan. These aerostats also have a communication relay capability, boosting communication ranges and reducing areas with poor reception.

Israeli security forces also rely on aerostats and have deployed several systems along its borders, particularly around the Gaza Strip area. A source told *Jane's* there are 8-10 systems deployed around Gaza to provide overlapping coverage. These are supplied by Israel's RT, which has developed a family of aerostats known as Skystar, and it is believed that most are equipped with day-night EO/IR payloads supplied by Controp Precision Technologies.

[Continued in full version…]

(687 of 3281 words)

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