UNSEEN THREATS

Picture credit: US Dept Defense

PD Turner *examines the importance of extending the TSCM Role above and beyond the call of duty*

The technical security role extends well-beyond the modern-day corporate boardroom and push the industry norms; the mark of a true spectrum warrior. The ability to deploy not only radio-frequency (RF) dimensional geo-location heat mapping; analytical traffic analysis, signal localisation and Direction-Finding (DF) and venturing into Signals Intelligence (SIGINT) applications are certainly areas of primary focus for the future of the TSCM role. However, a platform utilising both operator-assisted and autonomous unmanned air, sea and land robotic sensor-based platforms is emerging and converging at a fantastic rate with significant new TSCM roles with each technology jump.

Airborne and marine sensor packages provide new opportunities for the safety, security and protection of first responder assets for law-enforcement, EOD, deployed military and commercial seaborne marine vessels by extending the protective security zone around high-value assets – providing not only early warning, but a clear opportunity for pre-emptive threat neutralisation countermeasures.

Air assets, in combination with sea-going sensor packages, can be deployed 360° around difficult to protect assets, while providing real-time actionable intelligence. For example, UAV technology can now be deployed to provide 24-hour continuous coverage with wireless power transmission and real-time asset recharging, without the need for out-of-service gaps in protection – as previously needed to swap out battery packs *etc*. UAV and roving unmanned marine assets with multiple-sensor platforms can be deployed not only for radio-frequency spectrum analysis, but also for CBRNe, enhanced ECM coverage and new emerging SIGINT roles.

Land-based TSCM assets, fixed and mobile, can also be exploited as an early warning intelligence resource for quicker response, preventing and/or minimising damage, saving lives, response targeting specific threats and engaging hostile threat actors. But what does all this have to do with TSCM or TSEC in general?

There are common links between law-enforcement, military missions and protective operations, public and private. Whether it is cyber-security, technical surveillance countermeasures, life-safety or simply a technical security responsibility, everyone shares the risk, defines the mission and determines the appropriate response.

UAV technology can now be deployed to provide 24-hour continuous coverage

Radio-frequency (RF) dimensional geo-location heat mapping is the golden standard across the RF, optical, acoustic and powerline domains from an advanced TSCM perspective. The ability to expand the range of protective activities simply requires the deployment of autonomous mobile or airborne assets with specialised sensor packages that talk to the same software-defined radio resources.

Thermal, visual, acoustic, radio-frequency, optical (photonic), CBRNe, LIDAR, RADAR, ECM (jammers) and IMSI catchers all share the same common user-interface with differing display parameters and the rendered output. As an example, consider an EOD role with a robot down range in response to an RCIED incident. First, even the best robot has only a limited sensor package, but exceeds expectations in manipulation and safety for EOD personnel.

ECM might be deployed, but is generally invisible to EOD operators and it is difficult to fully determine whether the ECM resource is optimally positioned, set up correctly or will be effective against any particular RCIED. In short, the robot and ECM take a significant coordinated effort, but with a degree of uncertainty of the big picture.

Adding TSCM to the ECM equation is a layer of additional protection beyond ECM alone. ECM is not effective against optical power transmission. ECM will be less effective should a repeater-based UAV or locally placed device be deployed overhead or in the vicinity, within a null region of the ECM antenna package. The same facility-level principles of TSCM deployment apply to a wide range of mission-critical deployment opportunities and are limited only by the imagination of the technical operator or first responder.

A robot deployed fiber-optic; tethered UAV can provide powerful actional-intelligence in real-time.

Cross ITU-Region technology, such as device origin might be realised across ITU-Regions and can evade ECM effectiveness designed for example North America versus Europe or South East Asia.

The electro-magnetic radio-frequency spectrum is considered to be the working environment of RCIED devices and the TSCM operator alike. The RC environment is not the only possibility in emerging TSCM threat technology and is fast becoming a concern within the EOD role. Of particular concern, optical (laser) wireless power transfer is an emerging technology that can easily be deployed to overcome existing RF ECM coverage, to enable and even provide power to an IED at a considerable stand-off distance!

Unfortunately, many in the industry only resolve to 6GHz bandwidth and address simplistic RC technology in training. We need to be familiar with and prepared to address threats within a modern and very complex spectrum environment.

The spectrum below and above 9kHz to 40GHz extends down to 3Hz and up to 300GHz as emerging threat spectrum that cannot be over-looked. Drones have been used as criminal and terrorism weapons; for the delivery of threat devices and as surveillance platforms. EOD equipped drones can be used for real-time, multiple sensor-based platforms, for proactive and reactive capture, localisation and extended area monitoring;

CBRNe sensors, visual surveillance cameras, thermal imaging, airborne Radio-Frequency (RF) traffic analysis-based intelligence-gathering; confirm and strengthen ECM effectiveness. Real-time event tracking and alerting is simply due-diligence; active threat identification provides motivation and confidence across the TSCM spectrum intelligence mission and EOD render-safe activities.

In a modern moving target threat model reality, there is always potential risk and, for the initiated few, opportunity! Field deployable omni-directional and directional antenna packages allow for spectrum analysis and airborne ECM coverage enhancement. Tactical UAV hardware can be deployed for mission-centric radio-frequency (RF) spectrum analysis and monitoring.

At a recent military event there were close to 100 vendors marketing drone technology and another 100 or so, sporting counter-drone technology. At the end of the row, there was a single vendor who was building custom radio packages well outside the majority of drone and counter-drone platforms, with promise of advanced anti-radio detection modulation schemes and anti-jamming capability. 200 vendors, but only one motivated vendor willing to apply critical thinking and not follow complacent industry competitive strategies.

THERE ARE ALWAYS LIKELY TO BE BLIND SPOTS THAT CANNOT BE PREDICTED OR FULLY DETERMINED

RF signal analytics is a powerful multi-functional technique, in support of the localisation of ambient vs hostile, intelligence-bearing signals; via Dimensional Geolocation Heat Mapping (DGLHM). The airborne deployment of IMSI catchers, LIDAR and 3D GIS rendering can be used to advantage emerging UAV capabilities, including operational communications, spectrum monitoring, airborne mesh network and repeater technology. The ability to detect and identify signal exceedance and signal loss (signal integrity), allows the operator to assess and adapt to changing conditions. There are many benefits; including enhanced personnel protection, real-time risk management and situational awareness. Counter-terrorism activities include the quick deployment of an airborne threat assessment survey.

Perhaps, of particular interest to Explosive Ordinance Disposal (EOD), is the recent advancement in enhanced airborne ECM directed energy (jamming) with the objective of building a more focused protective bubble to cover the always existing null coverage areas. After all, you cannot adapt to what you don't know about!

During post blast investigations, the UAV mission can be redefined to map the blast zone and locate potential evidence that otherwise might not easily be recovered. Enhanced airborne UAV deployment can provide an additional layer of protection by detecting Line-of-Sight (LOS) signals to counter incoming hostile drones and locate the drone operator (Controller) or repeater network hardware. This process can be accomplished relatively quickly using Total Energy Capture (TEC); focused Dimensional Geo-location Heat Mapping (DGLHM), both on the ground and as an airborne platform.

TSCM operational integrity can be demonstrated and determined during live deployment training exercises, to establish a working level of confidence for operators working blind in an invisible radio-frequency environment.

In a modern TSCM and ECM role, there are always blind spots that cannot be predicted or determined without a comprehensive working DGLHM assessment of the Ambient RF Spectrum Environment (ARFSE). Does your training come from the ECM manufacturer, or an independent organisation?

ECM capability is not universal and can shift with each deployment. Presets or previous settings do not guarantee equal coverage across multiple, wide area geo-graphical response locations, nor does ECM provide 100 percent coverage across the entire spectrum.

There is really only one way to determine the Ambient Radio-Frequency Spectrum Environment (ARFSE) via a Total Energy Capture (TEC) methodology. An airborne spectrum survey can surface potential ECM targeting frequencies that otherwise might not be identified, thus leading to a TSCM breach or dangerous ECM gap. Using a multiple mission capable payload, we can address radio-frequency, optical and many additional sensor-based inputs quickly across a single SDR environment.

ECM CAPABILITY IS NOT UNIVERSAL AND CAN SHIFT WITH EACH DEPLOYMENT

Specialised payloads allow for unique antenna packages to be deployed for active intelligence-gathering across the TSCM, SIGINT, ELINT and ECM spectrum. A TSCM-equipped UAV also allows the operator to deploy remote WPT and a stable communications repeater/relay for critical communications due to terrain and other factors. The TSCM operator can monitor the environment and alert the operator to spectrum changes, such as incoming hostile drones or airborne high-power media broadcast transmitters.

Just like facility-level operations, fast deployment and the capture of a Radio-Frequency (RF) Dimensional Geolocation Heat Map is critical. The operator is able to evaluate the status of ground-based ECM coverage in real-time, including other potentially problematic wireless sources; capture and map all active environmental RF emissions present and assess the risk.

TSCM Drone technology can be thought of as an extension of an EOD robot. Some of the same capability (visual and thermal cameras); and some differing roles for which a UAV is better suited; adding mission capability from a unique airborne perspective, such as:

- Deploy faster with eyes, not only on the immediate target
- Identify the best approach path
- Locate additional challenges and hazards that the robot cannot see, further a field.

A drone could be robot-deployed on a fiber-optic tether to provide a unique down-range airborne perspective; and there is no need for working frequencies outside of the ECM coverage as the UAV is controlled via a fiber-optic tether.

PRECISION

In this capacity, there is no requirement for UAV radio-frequency emissions, while offering a unique perspective and highly accurate evidence-based documentation process all in real-time.

IDENTIFICATION

High resolution sensor-based intelligence aids responders in determining the best response protocols.

LOCALIZATION

Identify potentially unseen hazards down-range, or within a wider area.

ENHANCED SITUATIONAL AWARENESS

Advances the responder's confidence, allowing faster and safer detection and neutralisation. A tactical UAV is always under the full operator-assisted control with incredible near-autonomous precision deployment as a wireless, optical or tethered asset ●

SUMMARY OF BENEFITS

- Detect and Neutralise TSCM Threats
- Support EOD response to RCIED threats
- Counter-Terrorism (CT) activities
- Provide Airborne ECM Directed Energy Deployment
- Assist in Post Blast Investigations
- Support the Critical Evidence Recovery and
- Provide Counter Drone and Operator/ Controller Detection.

Paul D Turner, TSS TSI is the President/ CEO of Professional Development TSCM Group Inc. and is a certified Technical Security Specialist (TSS) and Technical Security Instructor (TSI) with 45 years' experience in providing advanced operator certification training; delivery of TSCM services worldwide; developer of the Kestrel TSCM Professional Software and manages the Canadian Technical Security Conference (CTSC) under the operational umbrella of the TSB 2000 (Technical) Standard.

TSCM operational integrity can be demonstrated during live deployment training exercises, to establish confidence for operators