

# COUNTERING EXPLOSIVE THREATS



**TNO** innovation  
for life

Countering Explosive Threats (CET) is a product team within TNO's Energetic Materials department. The multidisciplinary CET team is specialized in the detection of explosive materials, including home-made explosives, and committed to innovation in security through the smart application of explosives detection solutions. It has all the necessary resources and qualifications to assist governments, end-users (e.g. airports), as well as companies in the security industry. The high-quality results will enable your organization to innovate in the field of explosive detection and stay ahead of the threat.

The facilities of the Energetic Materials (EM) department, which include test banks, laboratories and bunkers for (gas) explosions, are designed for the synthesis, analysis and handling of energetic materials. In the decades of experience working with explosive and toxic materials such as pyrotechnics, organic peroxides, ammonium nitrate fertilizers, self-reactive and self-heating substances and flammable gases, solids and liquids, the EM-department built a considerable expertise while maintaining a safe track record. Its global customer base, ranging from SMEs to multinationals and governments, values the rapid response, independence and effort to go that extra mile. After every project you will receive the results and findings, including a thorough interpretation and analysis. In this report, the EM team will never lose track of that one question: what does this actually mean for your business?

## FROM THREAT TO DETECTION

Explosives can be divided into three categories: military, commercial and home-made. It is the last category that is particularly challenging for authorities. Some Home-Made Explosives (HMEs) can be made with limited knowledge and skills using ordinary household chemicals, but they come with a high risk of being unstable, toxic and/or sensitive to shocks. The CET group at TNO studies these explosives to help counter the threat that they pose to society both on a national and international level. What sets CET apart is the combination of extensive knowledge about the chemistry and physical properties of these energetic materials and dedicated facilities for detection tests with real energetic materials. As a result, TNO is one of the few places in Europe where HMEs can be studied, synthesized, but also tried out and used for the evaluation of detection

technologies without the need for simulant explosives. This makes TNO an attractive partner in small and large scale trials for both companies and governments.

**Case study:** A client wanted to test their new scanner for airport security. The machine was based on a new concept of operation and they needed a partner to test it reliably and quickly, using real explosives and weapons. The CET team was able to help them because it has access to virtually all required threats (or, in the case of HMEs, is able to synthesize them), as well as the facilities to test the scanner with the desired substances. In addition, the CET team went beyond the bare technicalities of detection and also considered the operational environment, which helped the client in actually implementing the detection technology.

#### TEST STANDARDIZATION

To establish whether a detection system complies with regulatory requirements, it is imperative that accepted verification standards and requirements are available. Many groups are creating these standards and the CET team offers its expertise to several of those international committees. For example, they are part of the ECAC (European Civil Aviation Conference) Technical Task Force and Study Groups, NATO Science and Technology Technical Groups and the Dutch National Council on Home Made Explosives. The CET experts advise on how to determine the actual performance of a detection system, while assuring that all reasonable aspects have been considered. For ECAC specifically, TNO is a Test Centre appointed by the appropriate Dutch authorities, which can work with real explosives to evaluate various detectors for bulk or trace detection in aviation security. Finally, the CET team assists the Dutch government in advancing policy and regulations for civil security in a European context, to counter ever-changing terrorist threats.

Besides this role as consultant, the CET team also develops techniques for vapor detection testing and, for example, the printing of explosive particles to evaluate the performance of optical detection systems. These techniques can be used by the military in order to find IEDs under all kinds of circumstances—preferably remotely. By aligning itself with an

extensive network of test facilities in Europe and the US, the CET team keeps up to date with best practices that assist, for instance, the Dutch Ministry of Defense in countering asymmetric threats.

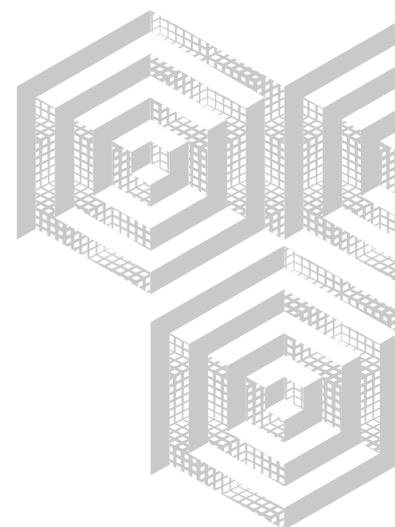
**Case study:** HECTOS is a European project that aims to establish a harmonized evaluation and certification scheme for physical security products. As part of this study, the CET team developed and applied a general test method for person screening. This contributed to a certification scheme for explosives and weapons detection products and recommendations on how to implement such a scheme.

#### MORE SAFETY THROUGH BETTER SECURITY

The detection of explosives in airports and other vulnerable public spaces is imperative, but it is also at the end of the terroristic plot timeline. Therefore, the CET team aims to connect to upstream countermeasures in order to prevent incidences at an earlier stage. For example, their thorough knowledge of chemicals and energetic materials allows the CET experts to think about ways to alter the potential ingredients for HMEs so that they become unusable. This forces the would-be bomb-maker to shift to compounds that are more obvious to authorities.

Together with universities and forensic institutes, CET also establishes dedicated methods for forensic investigations. This cooperation led, amongst others, to an analysis for explosives or their residues that will uncover the origin of the ingredients from which it was prepared.

**Case study:** Despite the ongoing arms race with terrorists, airports and other public hubs are pushing for security checks that are less invasive to passengers. The CET team participated in a study commissioned by NATO, called STANDEX, which investigated how well explosives can be detected from a distance without noticeably scanning people. The project was successful and created opportunities for improved and more subtle explosives detection in public areas.



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#### DEFENCE, SAFETY AND SECURITY

The independent Netherlands Organisation for applied scientific research (TNO) supports the Dutch comprehensive protection model. Our work in Defence, Safety & Security focuses on technological and behavioural innovations.

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