C-IED
Operational tools

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<table>
<thead>
<tr>
<th>Project Name</th>
<th>Status</th>
<th>Contact Information</th>
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<tr>
<td>Remotely Controlled Metal Detector Array for Quality Assurance (RMA, Belgium-Vallon, Germany)(Close-in-Direction)</td>
<td>Operational</td>
<td><a href="mailto:Markus.sautter@vallon.de">Markus.sautter@vallon.de</a>&lt;br&gt;<a href="mailto:Geert.de.cubber@rma.ac.be">Geert.de.cubber@rma.ac.be</a></td>
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<td>TR-LAUNCHER (RMA, Belgium–HOTZONESOLUTIONS N.V., The Netherlands) Protective Equipment (ICI, Belgium)(Personal Protection Equipment)</td>
<td>Operational</td>
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<td>APT (UNIGE, Italy) (C-IED)</td>
<td>Operational, prototype</td>
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<td>MINERVA (IDS, Italy) (C-IED)</td>
<td>Operational, prototype</td>
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<td>BILLY GOAT RADIO (Snail Aid, Italy) (risk education)</td>
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<td>Hyperspectral Techniques for IED detection</td>
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<td>Operational (free)</td>
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<td>HOTZONESOLUTIONS Toolbox</td>
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Area Preparation Tractor APT

The lead partner in the development of the CIED-APT is DIME at the University of Genova.

Contact: Dr Matteo Zoppi; Email: zoppi@dimec.unige.it; Telephone: +39 320 or his 438 2160, Research Associate who is also a demining specialist, Andy Smith; email: avs@nolandmines.com; Telephone: +44 1600 719993
APT C-IED

- The C-IED APT is designed for use when responding to IED threats in an urban environment.
- The C-IED platform can simply replace the area preparation tool on a demining APT or it can be fitted to a dedicated C-IED APT with upgraded (rifle resistant) armour and refined CBRN decontamination features.
- The C-IED platform includes a dozer blade, large manipulator arm, small manipulator arm with disrupters, winch and extra cameras.
C-IED utility

- The C-IED APT is able to:
  1. move rubble and obstructions aside (delicately when appropriate);
  2. conduct a rapid camera survey of an area, producing accurate map records;
  3. investigate suspicious objects either robustly or delicately;
  4. collect ordnance that may not be safe to move by hand;
  5. disrupt potential IEDs with a water charge, an EFP, or a solid projectile;
C-IED utility

6. place explosive charges to disrupt or destroy targets;

7. attach hooks and a winch cable to drag heavy items to another place;

8. deploy cutting equipment able to cut an entry into a vehicle/container;

9. deploy a freeze neutralising kit;

10. gain safe entry to a vehicle for internal camera inspection;

11. carry a multi-channel (selective) wireless signal jammer.
The background of the approach is a use of the hyperspectral (HS), the forward looking longwave infrared (FLIR), the forward looking ground penetrating radar (FLGPR), the harmonic radar for detection of non-linear components in non-explosive parts of IED (NLJD), the command line-wire detection (CLWD), the situational awareness decision support system for convoy. All considered follows: "forward detection is a must, and not when vehicle is on top of the IED".
MINERVA: a vehicle mounted ground penetrating radar system for IED and mine detection

Contact: Ms Luigia NUZZO (l.nuzzo@idscorporation.com)
MINERVA C-IED GPR: Specifications

- **Dimensions (1 antenna module)**: ~ 80x80x40 cm
- **Weight (1 antenna module)**: < 15 kg
- **Nominal Antenna stand off**: 40 cm
- **Targets**: IED laid on surface or buried down to 30-50 cm
- **Detection width transversal to track**: 80 cm each module (max. 4 modules = 320 cm)
- **Typical Speed**: > 15 kph
MINERVA C-IED GPR: Key features

- **High quality data** for improved clutter rejection
- **Low weight antenna array** reduces the overhang payload for the mechanical support, simplifying installation and mobility issues

- **Closely packed antenna array**

- **Flexible architecture** to configure the system depending on the specific platform (manned or unmanned) and mission profile

- **Optimal performance with variable stand off**

- **Radar performances is guaranteed with variable antenna stand off from ground**;
- This allows **greater mobility** without the need to mechanically adjust the antenna height to track the ground surface

- **Modular architecture**

- **Based on automatic extraction of the object geometry and electromagnetic signature**
- **Target database for training** can be improved by the operator

- **Automatic target classification**

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MINERVA C-IED GPR: User Interface

- The user interface provides intuitive and reliable information during real time acquisition ("RUN" mode)
- "PAUSE" mode allows deeper analysis of data to confirm automatically generated alarms

**RUN mode**
- Data acquisition mode on the run
- Automatic detection and alarm generation

**PAUSE mode**
- Activated automatically when the vehicle stops (returns to RUN mode when the vehicle moves off)
- The acquisition systems are active but when the vehicle stops, no data are acquired
- Useful to analyze data in potentially hazardous situations
MINERVA C-IED GPR: Examples
C-IED Protection

- EASY TO USE - Field ruggedized
- COMPREHENSIVE MATERIAL EVALUATION AND IDENTIFICATION
- PROVIDES THE CRITICAL SAFETY INFORMATION

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Billy Goat Radio
an innovative tool for risk education

Contact: Dr. Emanuela Elisa Cepolina
patfordemining@gmail.com
Billy Goat radio is a Risk Education (RE) tool allowing operators living in mine and other explosive affected areas to produce short educational serial dramas which will be broadcast by radio and performed live by a team of local actors travelling through the interested region.
Billy Goat Radio: key points

Tested successfully together with local NMAAs in two very different contexts: the Sahrawi refugee camps in south-west Algeria and in Pailin region, Cambodia.

Cost-efficient system, based on educational entertainment theory

Adaptable to different contexts and risks, including IEDs, landmines and UXOs. Easily adaptable to other risks

Designed to promote sustained behavioural change

Embedding impact assessment
Information Management in mine action

“It all starts in the field”

Focus: Using mobile technology in field data collection

Contact: Torsten Vikström, founder of SITE. He was project manager for the T-IMS development within the European Union’s TIRAMISU-project. Torsten@sitesandinavia.se
T-IMS – SITE Information Management System

- Operationally validated by HCR-CTRO (CROMAC-CTDT)
- User-friendly and intuitive field data collection tool built on touch technology, no need for a keyboard or a mouse
- Full compliance with international standards for land release (IMAS 7.11)
- Adaptable input forms for easy customization
- Runs with Esri map engine and supports all well established map formats and layering of data
- For use in the early stages of non-technical surveys through the phases of technical survey and mine clearance as well as quality assurance/quality control, reporting and analyses
- Any type of attachment – such as georeferenced photos, images, documents and voice recordings – can be attached to any activity
- Communicates with IMSMA NG and is a part of the new “IMSMA Core Eco-system”
- Optionally equipped with JMU's ordnance database – CORD, giving access to approximately 5 000 ordnance objects in T-IMS off-line
- Operates on Windows platform (tablet, laptop etc), with internal or external GPS connected
- Ability to use a rangefinder for positioning of objects in the map directly in the field situation
- Runs with 100% functionality off-line and does not require internet or WiFi connection
- Hosts a user and support program
Experiences from the field, Battambang Province in Cambodia

- Case study of T-IMS together with GICHHD and the Cambodian Mine Action and Victim Assistance Authority (CMAA) at three (3) minefields where the Cambodian Mine Action Centre (CMAC) were conducting clearance operations.
- Non-technical survey (NTS), technical survey (TS), quality assurance (QA) and quality control (QC).
- SHA, CHA, turning points, safe routes, benchmark, area cleared, findings (landmines), videos captured, photos taken, GPS-tracking made etc.
- Reports created.
The complete documentation was made directly in the field, without any additional office work afterwards. Average time spent on reporting was between 15 and 30 minutes.

T-IMS, fundamentals
T-IMS, GIS based
The map module in focus

Map data & layers
[Esri ArcGIS Pro]
.TPK, .MMPK

Ordnance database
[CORD (~5 000 objects)]
.XML

UAV/UAS
Geotiff

GPS Tracker
[Qstarz]

GPS (unless built-in)

Laser Rangefinder
[Truepulse 360(R), Vector]

SMART Dog vest
maXML

Videos
Photos
Voice recordings
Attachment of any type
T-IMS, share your data!

- T-IMS
- T-IMS Core (iOS/Android)
- T-IMS
- T-IMS Central Web Service
- TIZ (XML), DOCX, PDF, XPS
- TIZ (XML), CSV, SQL
- KML/KMZ
- Analyses
  - Typical area cancelled, reduced and cleared

Applications:
- Google Earth
- Google Maps
- T-IMS app (iOS/Android)
- Forms and reports
Hazardous Substances Management Solutions

CBRNE SOLUTIONS

- Live CBR Agents Training and Validation Testing
- Sea Based Radiation Early Warning System
- Mobile Analytical Laboratory
- Invasive Technologies for Identification and Disposal of CBRN/EOD/IED
- Field Categorization of Unknown Substances and Identification of Explosives
- Raman Spectroscopy with Unique HZS CW Database
- Preparedness & Incident Command
- Knowledge and Capacity Building
- Decontamination & Remediation
- Fragmentation Protection System
- Plasma Hazardous Treatment System
- First Responder Operations
- Forensics
- Aerial Radiation Detection and Identification
- Emergency Medical Response
- Mobile CBRN Scanners and VIP Protection Vehicles
- Sampling and Identification
- Business Continuity
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