Welcome to Technology/Equipment to Clear Minefields and Other Explosive Remnants of War

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Speaker:
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Technology and Equipment to Clear Minefields and other Explosive Remnants of War (ERW)
Objectives

- Discuss survey methods, location/detection and mapping equipment, associated capabilities and limitations
- Mechanical Systems/Mechanized Heavy Equipment (MHE) and uses in industry
- A brief introduction to advanced geophysics capabilities
- Overview of International Mine Action Standards (IMAS)
- Review international standards for training/certification of EOD/UXO technicians, explosive/mine detection canines and handlers
Explosive Remnants of War (ERW) Threats; including Landmines and Improvised Explosive Devices (IED)

Conflict zones in today's asymmetric warfare environment not only are contaminated with typical unexploded ordnance (UXO) hazard threats but also include landmines manufactured by recognized states for military operations and IEDs manufactured and deployed by non-state actors.
The ability to accurately detect and locate UXO is essential when clearing sites containing ERW, buried or submerged ordnance, and landmines.
Electromagnetic (EM) instruments use electromagnetic transmitters and receivers to detect subsurface metal and lateral and vertical variations in electrical conductivity.

EM instruments used to detect all metals including ‘minimum-metal’ mines.
Magnetic Instruments

- Magnetometers measure the intensity of Earth's magnetic field regardless of direction (total field magnetometers), or intensity in a certain direction (fluxgate magnetometers)
Common Uses

- Magnetometers used to detect munitions or hazards containing ferrous metal
- EM instruments used to detect all metals including minimum metal mines
- Continuous Wave EM systems are capable of detecting non-conductive materials in IEDs
Considerations

• UXO and Mine Action Organizations use an array of handheld metal detection equipment for surveys, manual clearance, and battle area clearance (BAC)
Aerial Systems

Current surface-based technologies are generally labor intensive, slow, and expensive. Significant cost savings can be achieved using advanced airborne methods over large tracts of land.
Aerial Vehicles Supporting Mapping and Detection

• Airborne magnetic and electromagnetic systems have been very effective over the years for mineral prospecting and petroleum exploration.

• Now, with improvements in technology, conventional towed-bird systems operating at sensor altitudes (30-50m) have been used in support of environmental investigations.
Developments in Aerial Survey, Mapping and Detection

- UAVs (drones) are now used in war-torn countries to identify locations likely to be riddled with unexploded bombs from past wars, i.e., Vietnam
Underwater UXO hasn’t garnered the attention or notoriety of UXO on land areas, because it has remained largely out of sight. Increasingly, it is not just commercial fishermen who come in contact with underwater munitions and explosives of concern (MEC)
Marine Vehicles Supporting Mapping and Detection

- As with aerial systems, numerous companies have developed new and improved technologies for mapping and detection in underwater environments.
Marine Vehicles Supporting Mapping and Detection
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Advanced Digital Geophysical Mapping

• Digital Geophysical Mapping (DGM) is a critical part of the remediation process for sites containing MEC

• Implementation of Electromagnetic Induction (EMI) sensor surveys has proved to be effective method for identifying potential UXO or MEC

• Such contaminants often contain significant amounts of metal that produce electromagnetic anomalies in DGM survey data
Significant improvements in EMI technology continue to emerge, further demonstrating the ability to provide high spatial and temporal resolution data that can be used to effectively discriminate clutter from UXO/MEC.
Mechanical Systems

- Mechanical systems such as armored plows, flails, rollers, and tillers used to prepare ground for survey and clearance by removing obstacles and hazards that present a high risk to personnel or impeded efficient work.
Mechanical Systems Con’t

- Machines such as rotary and hopper fed screening plants and rock crushing equipment may be used to process excavated materials to screen out UXO items from debris and soil.
International Mine Action Standards (IMAS)

- International compliance standards for ERW survey and clearance (including landmines and IEDs)
- Currently incorporated in USACE, DoD, and DoS landmine clearance programs worldwide.
5 Guiding Principles

• The right of national governments to apply national standards to national programs
• The standards should protect those most at risk
• Emphasis on building a national capacity to develop, maintain and apply appropriate standards for mine action
• To maintain consistency with other international norms and standards
• Compliance with international conventions and treaties
Developed in line with the recommendations and processes contained within ISO Quality Management systems (ISO 9001:2008) and ISO Risk Management system (ISO Guide 51)
IMAS Legal Requirements

• **Important:** IMAS have no legal standing except where adopted by national authority or where IMAS is specified in contract or other legal instrument

• To obtain accreditation and license to work in most conflict zone nations, an organization must apply for accreditation and commit to IMAS compliance
IMAS Training and Certification

IMAS standard 09.30 provides specifications and guidelines for safe conduct of Explosive Ordnance Disposal (EOD) operations as part of a mine action program and applies to disposal of mines and ERW, including unexploded sub-munitions.
EOD can be carried out at many levels - from neutralization of large bombs and missiles to destruction of grenades and submunitions.

EOD qualifications should be appropriate to the hazard and the munitions most likely to be found.
Certification

• At every level of EOD competency, training organization or authority that certifies an individual should, within certification, explicitly list disciplines on which individual has been trained

• To complement certification, individuals are encouraged to maintain logs of their application of training to demonstrate their operational experience
Canine Services

• Under the right conditions, canines are efficient and cost-effective for mine action operations

• Canines help locate minimum metal mines in ground with high metallic content
IMAS Specific to Canine Operations

- IMAS 09.40 is a guide to application of IMAS 09.4 series of standards on general use of canines

- Introductory document of IMAS 09.4 series of standards, addressing most aspects of canine operations and, unlike many general IMAS, should be viewed as both technical standards and guidelines
Canines are a commonly used mine and ERW detection ‘technology’:

- If implemented correctly, detection by canines can be faster and more cost-effective than manual demining using detection by metal detectors and excavation.

- Canines can detect mines and ERW with low-metal and no-metal content, and mines and ERW in areas with high metal contamination or background, such as on railway lines.
Canines can be used in many different roles, however they are best at working in areas where there are low concentrations of mines and/or ERW.
Limitations

Canines cannot be used successfully under all circumstances.

• In dense/thorny vegetation, canine search patterns may be restricted, resulting in un-searched areas

• It is not appropriate to use canines where there is a high concentration of mines or ERW as the number of indications could make these operations inefficient and there are safety implications
Questions
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