AN INTRODUCTION

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What is TIRAMISU?

- A R&D project funded by the European Commission (2012–2015)
- An answer to a call for a “comprehensive toolbox”
- An attempt to help the mine action community by enhancing “tools”
- A team of 24 partners (universities, private companies, etc.)
- An End-user Board and a Project Advisory Board
What are the tools?

- Management of mine action
- Detection
- Robotic platforms
- Protection and disposal
- Training and mine risk education
- Standards (CWA)

Tools will be validated in mined countries

Management of mine action

- Use of expert knowledge
- Acquisition of field information
- Use of airborne and satellite data (including aerial platform)
- Mapping
- Setting priorities

- Support of BE UAV Escadron, BE MoD (HUNTER UAV and C130 and sensor POD)
- Support of Croatian MoD (Mi-8 with sensor POD)
Close-in detection

- Explosives vapour detector
- GPR array for anti-personnel mines
- Improvement in metal detector array
- Improvement in hand-held dual sensor
- Honey bees

Robotic platforms

- Based on agricultural machines
- Use of Unmanned Aerial vehicles
- Combination aerial platform/ground platform
**Protection and disposal**

- Disposing of RDX by non-explosive decomposition
- Dynamic database of selected ED
- AP mine neutralisation (explosion method and fire setting method)
- Dual-use (agricultural) ERW transport trailer

**Training and mine risk education**

- All tools available with training
- E-training
- MRE by local involvement (theater plays, etc.)
Validation

- All tools to be validated in mined countries
- ... in operational situations when needed and whenever possible
- Use of blind tests
- Several countries: including Croatia

Standards

- CEN Workshop agreement
- Improve old ones
  - shorter metal detector test protocol?
- Correct some
  - PPE
- Draft new ones
  - Dual sensor T&E? EOD competencies? Underwater demining?
Example #1: dealing with ammunition depots after an explosion 1/3

Explosion of ammunition depot in Croatia on 13 September 2011

Develop, test, evaluate and operationally validate technology for the airborne hyper spectral & high spatial resolution multisensor assessment of the UXO litter at and around ammunition depot

Example #1: dealing with ammunition depots after an explosion 2/3

Aerial oblique photography of the ammunition storage Padjene, acquired 5 days after the explosion.

UXO scattered within 3.5 km of the explosion (total area is 38,5 km²).
14 September 2011: Task Force of Croatian MoD started recovery action
11–15 June 2012: TIRAMISU airborne multi-sensor imagery acquisition
16–27 June 2012: ground based measurement
Example #1: dealing with ammunition depots after an explosion 3/3

Markers for spatial and radiometric calibration on the airborne and the ground-based images.

- Wavelengths calibration lamp
- Container of the cluster bomb BL-755
- The hyperspectral line scanner
- Grenade 100mm M69 P1

Example #2: use of unmanned aerial vehicles

- Advantage:
  - Access to hazardous areas
  - MAV vs. MALE

- Challenges
  - Small payload for MAV
  - Processing of sensor data
  - User acceptance
  - Regulations
Example #3: a land-release study

- **Objective:**
  - Study land release practices in Angola, Bosnia and Herzegovina, Cambodia, Croatia, Iraqi Kurdistan, Tajikistan

- **(Some) Findings:**
  - Every country uses different terminology and definition (IS, NTS, TS)
  - No systematic evaluation of performance of technical survey
  - No machine is expected to detonate or crush all mines
  - Choosing a machine: cost and frequency of maintenance + production rate + purchasing cost
  - Possible use of simpler and cheaper machines
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