

## Sixen

# “Quest for Effectiveness in countering IED, lacking a Silver Bullet\*”

\*something that acts as a magical weapon; *especially* : one that instantly solves a long-standing problem (def. M-W)

- ☑ IED vast employment have changed the tactical game in ground routine operations, both for:
  - ➔ Mounted
  - ➔ Dismounted
- ☑ IED have plagued peace enforcement missions:
  - ➔ Routine (convogli)
  - ➔ Urban/Suburban patrolling
- ☑ IEDs turn out to be extremely efficient
  - ➔ Attrition is not an option
  - ➔ Technology available to anybody
  - ➔ Effectiveness relies on creativity and tactical innovation
  - ➔ Only 50% of IED are detected in advance (data from specialized sites)
- ☑ Counter IED equipment are the pivotal assets in peace enforcing missions for armed force expeditionary model

- ☑ A single solution, effective in all situation and environment, has not been identified till now:
  - ➔ Insurgents change tactics every two-three weeks after having measured the effectiveness and the preparedness of the «blue» side. It's a sort of anti-doping game
  - ➔ Counter measures are theatre-dependent

The goal is to find an efficient solution that can be flexibly planned to the the threat and to the mission

□ Sixen solution is an overarching approach focused on three main goals:

⇒ Architecture definition of a multisensor counter IED payload .

⇒ Algorithm Definition and Development of multisensor threat signal detection

⇒ Design and Definition of a proving ground and a system to establish a metric

The goal is the detection of danger signals, the activation of the right counter measure(s) and the validation on a case by case basis

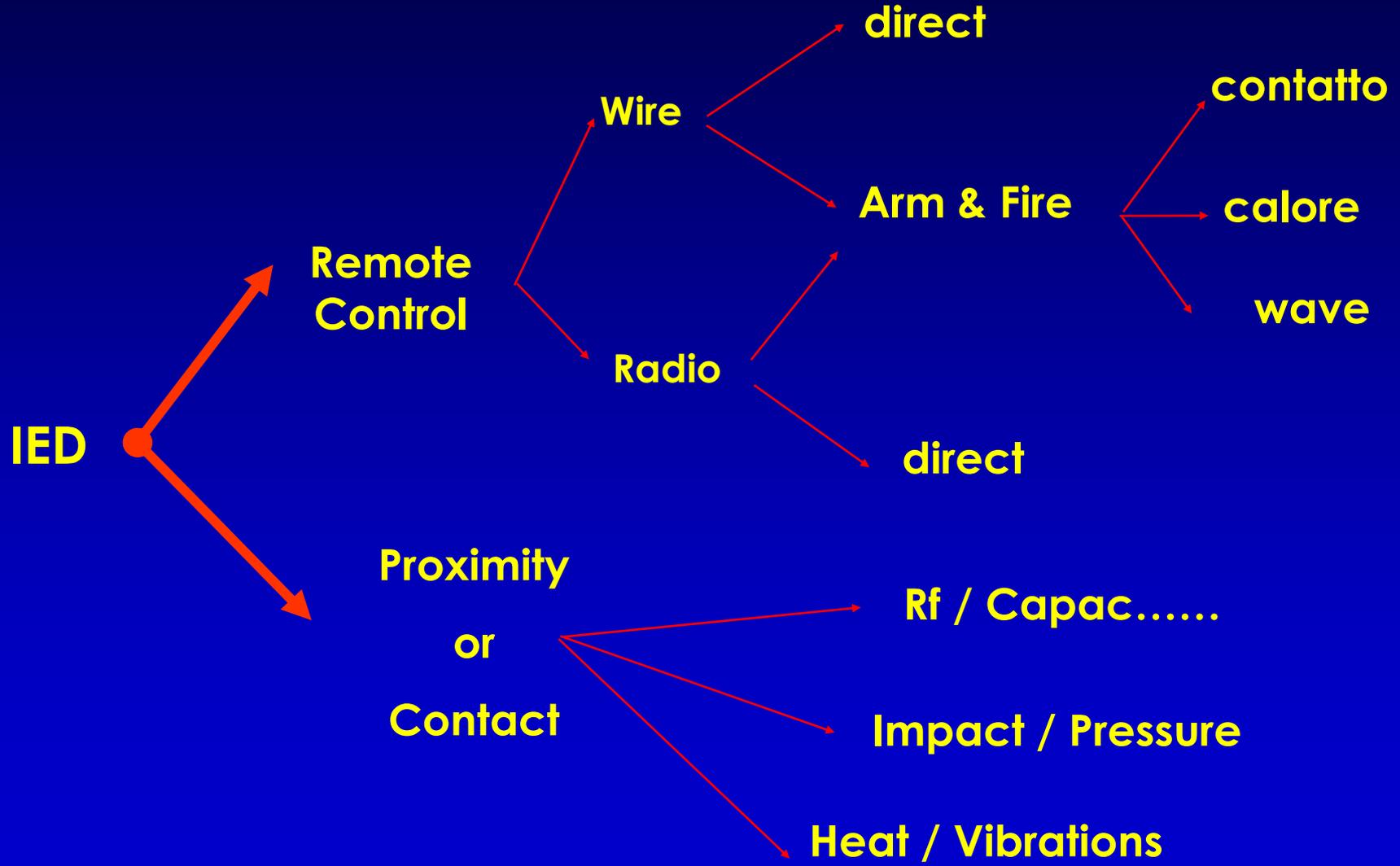
# The tactical game

- ✓ More than 100 IED(2012) devices have been classified.
- ✓ Tactics and techniques are updated every 2-3 weeks
- ✓ Platforms used for carrying threats are to a certain extent part of the feature of the operational theatre
- ✓ Categorization of threats and tactics help reduce degrees of freedom identify homogeneous solution domains.

# Categories of platforms(coarse)



# Categorization by technique(coarse)



# Preliminary Results

- ☑ Insurgents (red) have several tactical advantage, such as:
  - ➔ Surprise
  - ➔ Assess the effectiveness of response and its limits
  - ➔ No limit or constraint in establishing the tactics
  - ➔ Set the rule of the next challenge (same struggle against doping)
  
- ☑ Good guys (blue) have just one :
  - ➔ Engage an information battle to preempt insurgent's tactics, leveraging the overwhelming technological superiority. Reaction to red's moves is no longer the unique option.

☑ Preempt the tactic implies mastering process dynamics

⇒ Dominance of the dynamics of the operation theatre

➤ Intelligence

✦ Intelligence is mandatory for directing “focused sensing”

✦ Everything can not be controlled

➤ Detection

✦ Relevant knowledge for activating “focused sensing”

➤ Surveillance

✦ Monitoring the theatre dynamics

✦ Identification of anomalies

➤ Denial

✦ Threat defusing

✦ Reduce degrees of freedom of red's tactics

☑ Preempt the tactics forces the “red” to operating on the ground where blue have an unparalleled advantage.

# Basic concept

- ⇒ “Sixen” approach :
  - does not call for the exact identification of the device
- ⇒ “Sixen” approach :
  - does not use brute force solution such as jammers that bring about unexpected flip side effect
- ⇒ “Sixen” approach :
  - focus on the detection of the threat signal in the shortest time (zero lag) (envelope
- ⇒ “Sixen” approach :
  - synthesizes information to activate the proper countermeasure to preempt insurgent’s tactics

# Silver Bullet ?

## ☑ Dominance implies:

- ➔ Intelligence
- ➔ Detection
- ➔ Surveillance and Reconnaissance
- ➔ Denial



## On a vast domain options regarding:

- Technology
- Environment
- Mission



- ☑ **One system / product / solution able to countering IED threat is not conceivable as the recent story has taught us.**

⇒ Develop a system capable of :

- ❑ Planning the mission for force protection
- ❑ Detecting threat signal using the most appropriate sensor combination
- ❑ Guaranteeing the highest Pd wrt other available solution
- ❑ Avoiding interference among maneuvering and protection
- ❑ Use the proper countermeasure
- ❑ Conducting intelligence “on the go” operations (crucial for “envelope change detection” and mission planning)

# Some Requirements

## ⇒ A combination of passive and active sensors:

- Passive Radio Sensors (PRS) to monitor EM spectrum
- Optical / IR / UV Sensors
- Ground Penetrating Radar
- Lidar

## ⇒ and Several Countermeasures:

- Jammers/Dew
- Lasers

- ☑ A reconfigurable Payload implementing multiple solutions seems a promising approach

## Why a Payload ? (1/2)

☑ Concept borrowed from Spacecraft world: Platform system integrating several functionalities sharing some common features

➤ Open Architecture

➤ Multirole/Reconfigurable

✦ The right tool at the right moment

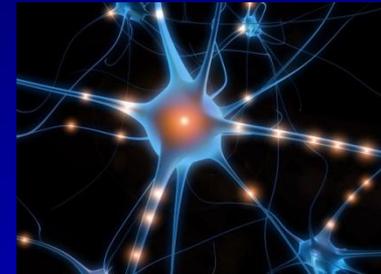
➤ User plan the mission

➤ Minimized required skills

✦ Simulation of scenarios and tactics

✦ Training (key point) on the proving ground

➤ Payload allows sharing of antennas, optics, RF front-end, computers, software, environmental control, interfaces, communications in a “netcentric” view.



☑ The Sixen core implementation is an «unattended system» capable of autonomous operations.

It is not a federated system. It is a “user defined” autonomous watchdog

## Why a Payload ? (2/2)

- ☑ Plug and play approach. P/L to be carried by escort vehicles as well as troop carrier
  - ⇒ Sensor integration and Multiplatform operations
    - Direct UAV(mini UAV) operations and Satellite data fusion
    - Correlate measurements with EM maps
      - ▲ Identify fusion correlation best approach
      - ★ Predict performance in termini di Pfa e Pd
  - ⇒ Data Correlation, Detection and Threat localization
    - Configure hardware for best Pfa and Pd
    - ▲ Briefing Capability
      - ★ Gathering of Intelligence for future missions
  - ⇒ Mission Plan Support to Operational Command
  - ⇒ Support to cloaking and defusing
- ☑ **Emphasis is now on planning and configuration tools for specific missions**

# Sixen paradigm shift

- ☑ **Emphasis is not on the quest for the «domsday device» but on building capabilities in the same reusable platform**
  - ⇒ **COTS <sensors in conditioned environments**
    - **Up front capital limited to a minimum**
      - ▲ **Use the best solution available and switch at «zero lag»**
        - ★ **The way sensors are managed is the added value**
    - **Interoperability**
      - ▲ **Reduced procurement time**
        - ★ **Reduced Logistic Support Costs**
    - **“Cutting-edge” solutions always available**
      - ▲ **Customer do not invest in development costs**
        - ★ **Support the identification of breakthrough enabling technologies**
- ☑ **Emphasis is now on Artificial Intelligence allowing expert system operations and not on hardware development**

# Platforms for Sixen

## ☑ Sixen exploits information superiority gained thru multiple platforms

### ➡ UAV/MALE

➤ Sensing visible, IR, UV, SAR, Comint (opzionale)

▲ Focused sensing,

### ➡ Helo (back up of TUAV)

➤ Sensing visibile, IR, (UV)spectrum , SAR, Comint

▲ same as TUAV improved flexibility / power

### ➡ Troop Carrier/dedicated ground platform

➤ Sensing visibile, IR, UV,spectrum, ESM, GPR, Comint

▲ System pivot; where processing capability resides

### ➡ Satellite

➤ Sensing visibile, SAR

▲ ubiquitous coverage, stand-off, all time

## ☑ Sixen as a System of Systems

# A look into the Future

- ✓ Asymmetric warfare caught everybody off guard
- ✓ Future doctrine is preempt insurgent tactics in low intensity conflicts
  - ➔ Fast deployment
  - ➔ Leverage the Network
  - ➔ Minimize human involvement
- ✓ Solution is one of the 10 ideas that will change the world
  - ➔ Expandable Wireless Autonomous micro – Sensor aka Mote Sensors
- ✓ A gap-filler is, a usual, required
- ✓ Satellite/TUAV/HELO integrate and leverage ground sensors for:
  - ➔ “envelope change detection”
- ✓ **Il Sixen is a step ahead toward future solution**

# Q&A and Farewell

## Thank You for your Attention

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