Technology Work Session for the South African Army; Hosted by the CSIR

Session 3

Soldier Systems

Presented by
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Darin Michael (CSIR)

Date: 19 April 2012

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Air Support

UAVs

Objective

Command Centre

Soldier System

Soldier System

Soldier System

Soldier System

Soldier System

Soldier System

Soldier System

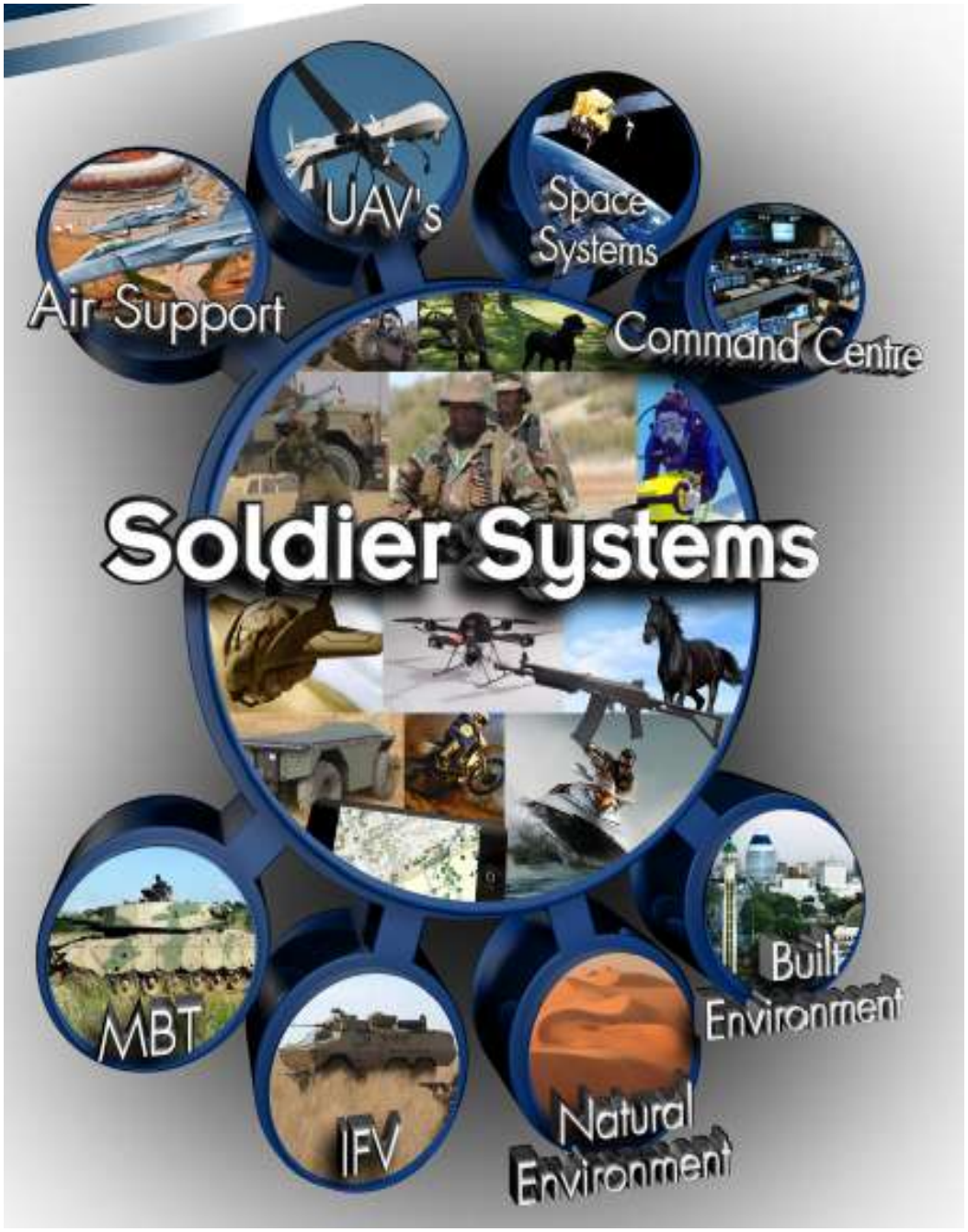
Artillery

IFV

Natural Environment

Built Environment

C4I
Survivability
Sustainability
Lethality
Mobility
Human Factors


UAV's
Space Systems
Air Support
Command Centre
Soldier Systems
MBT
IFV
Natural Environment
Built Environment

Important technologies or disciplines

- Nano technology
- Microelectromechanical systems
- Bio technology
- Cognitive science
- Sports science

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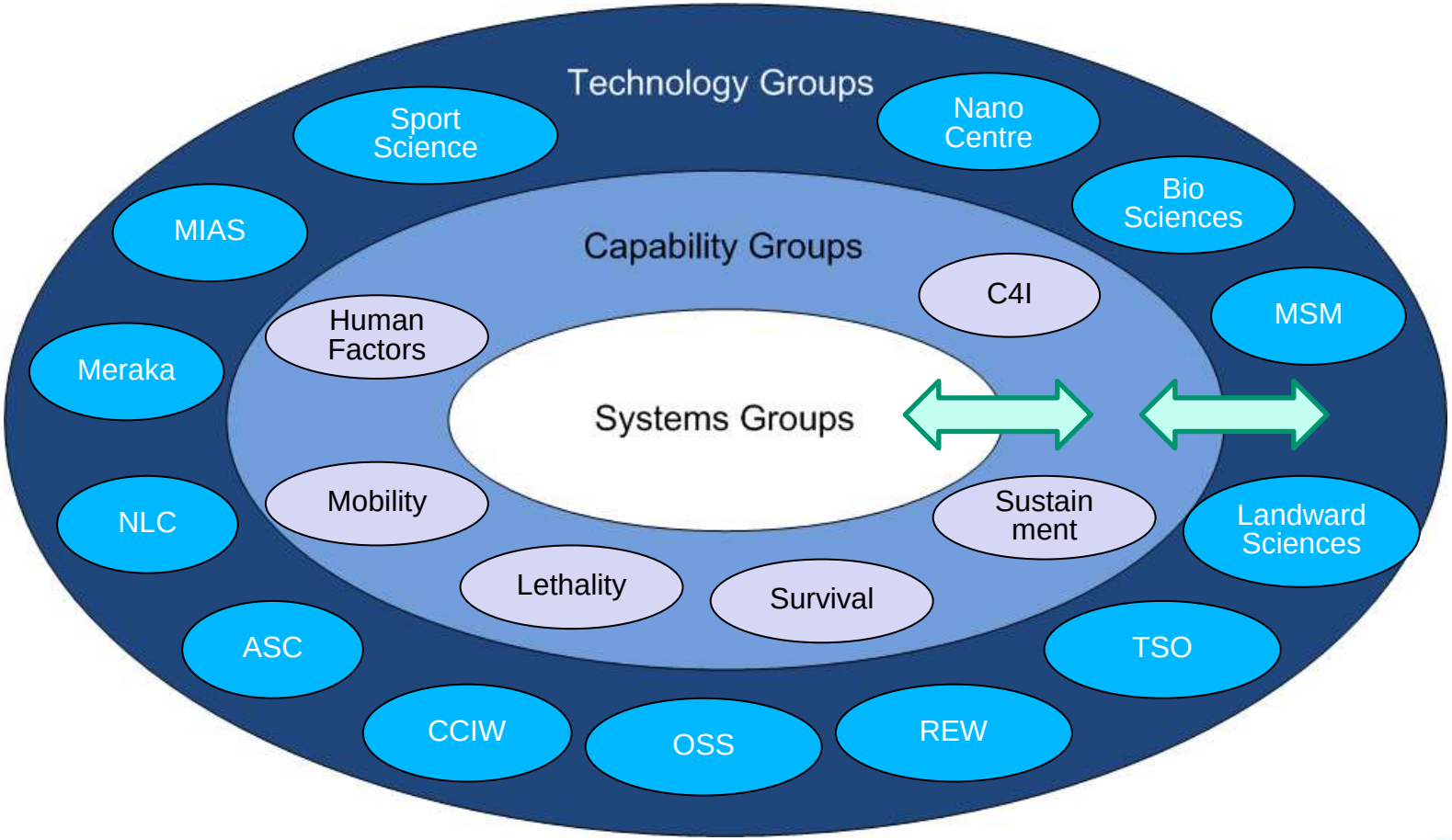
Top down and bottom up approach



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Technology and Systems

- Presented under the six functional areas
  - C4I
  - Survivability
  - Sustainability
  - Lethality
  - Mobility
  - Human factors
- Cut across the six functional areas
- Additional area of modelling and simulation

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Technology and Systems

- Operational context
  - Border safeguarding
  - Peace keeping
  - Law enforcement
  - Humanitarian aid and PCDR
  - FIBUA

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C4I, Man-portable UAVs or Drones

Maveric

Crow

- Fixed wing
- Back-packable
- Hand launched
- Stabilized day or night vision
- Tablet drag and drop interface
- Smart phone interface

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C4I, Man-portable UAVs or Drones

- VTOL aircraft
- In building surveillance

MicroDrone

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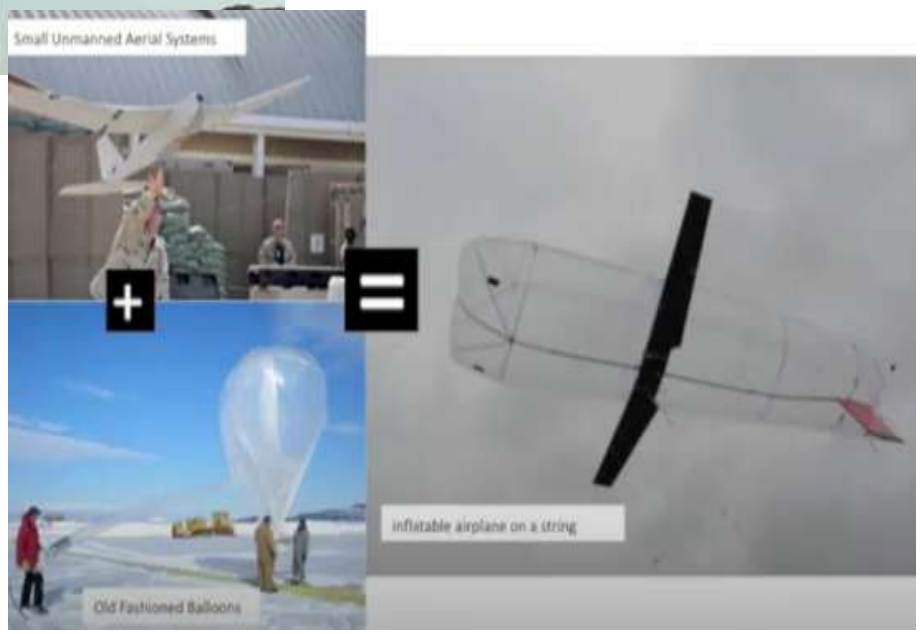
C4I, Man-portable UAVs or Drones

MAKO

- Tethered man-potable aerostats
- Day or night video surveillance
- Communications repeater capability



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C4I, Man-portable UAVs or Drones

- Flying sphere
- Vertical take-off
- Hovers
- Horizontal speeds up to 60km/hr
- Gyroscopic stability control
- Roll on the floor after landing
- In building surveillance

Flying Orb

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C4I, Perimeter warning

- Man portable ground surveillance radar
- Track a walker up to 1000m
- Day or night, all weather
- Integrates with Google Earth
- Can cue cameras

M600C man portable GSR

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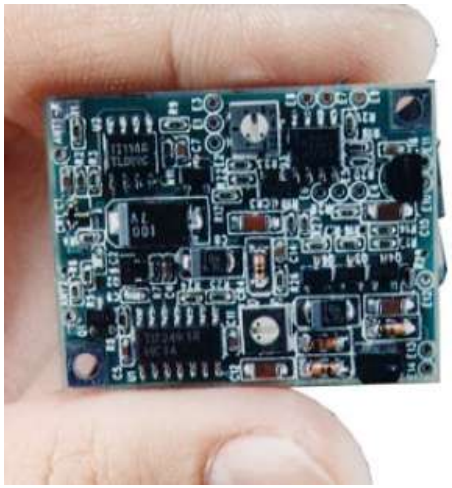
C4I, Perimeter warning



MIR

- Micro impulse radar
- Pocket size
- Radar “trip wire”
- Electronic trip line for border surveillance

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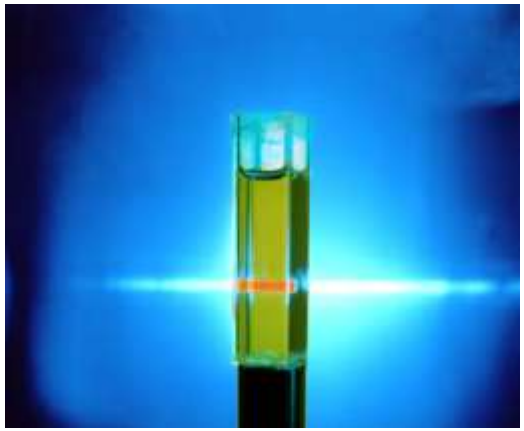
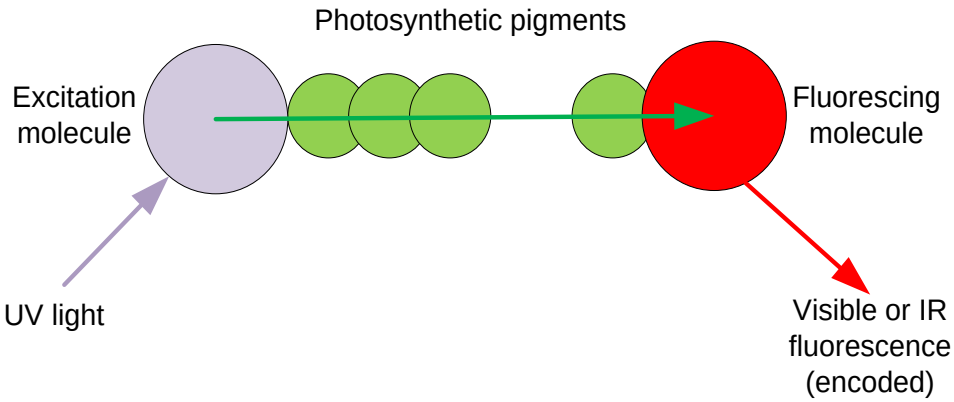
C4I, IFF



- Light harvesting transfer system
- Chain of biological molecules
- UV or IR excitation
- Emits encoded signature in the visible or IR spectrum
- Velcro attached visual IFF



Light harvesting transfer system

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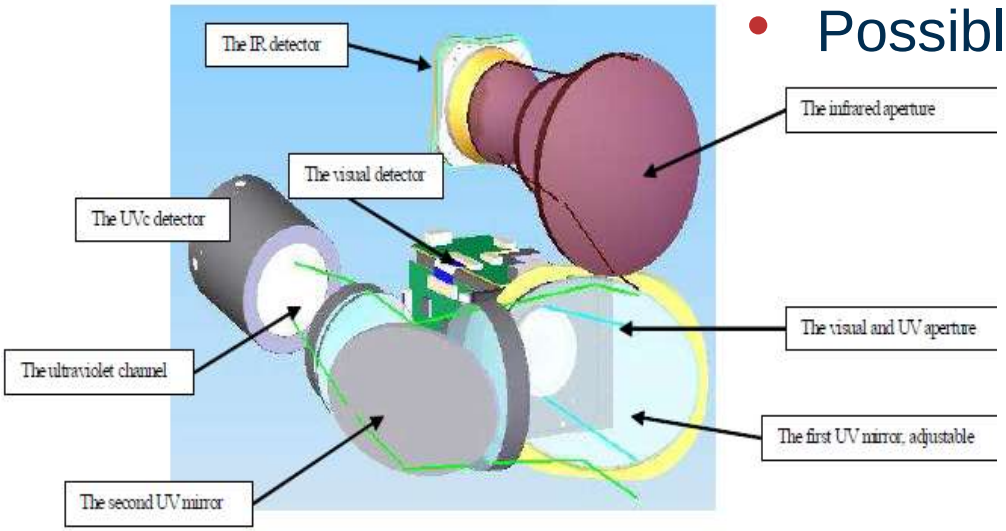
C4I, Multispectral vision



- 3 channels: UV, un-cooled thermal, visual
- High voltage transmission line inspection
- Multispectral recording capability for the dismounted soldier
- Possible flash detection

Hand held multispectral camera

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C4I, Through wall and clothing vision

- Terahertz waves penetrate clothing, paper, cardboard, wood, masonry, plastic
- Not water and metal
- Detect movement in a room
- Detect breathing under rubble
- Detect concealed weapons at safe stand off

CPR3 Hand held radar device

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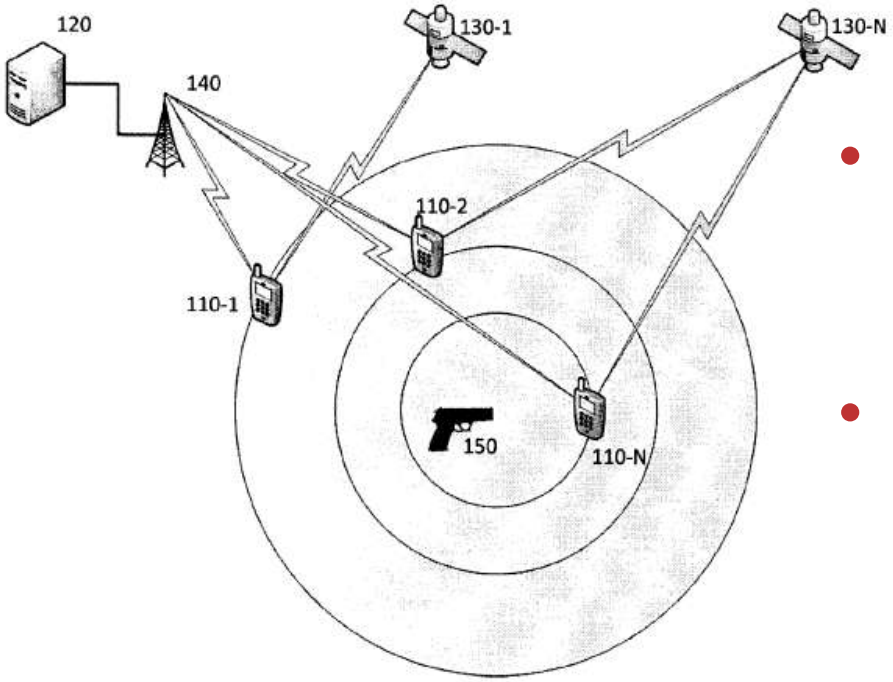
C4I, Sniper detection



- Combination of acoustic, optical, and electro-optical sensors may be used
- Need not be wearable but accessible through the communication network
- A plurality of smart phones may also be used to form a network of sensors

Smart phone shot detection network

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C4I, Language translation

- Word Lens software application for the iPhone
- Spanish and French translation to English

Word Lens

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C4I ,CIMIC

- PCDR and disaster response
- Access to information is a force multiplier
- Web map service
- Web access from a smart phone

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C4I, Smart phones

Smart phone video streaming

- Control of drones
- Non-GPS navigation
- Shot detection
- Language translation
- CIMIC enabler
- License plate and facial recognition
- Augmented reality
- Electronic diary
- Make calls

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Survivability, Blood clotting

- Commercially available Quikclot
- Stop bleeding within 5 minutes
- Clotting promoted by inert mineral called kaolin
- Temporary topical use
- Used by the US military

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Survivability, CB

- Future developments
  - Gas mask and carbon filter canister improvements
    - Comfort
    - Speech
    - Field of vision
    - Heat build up
    - Water drinking
    - Smaller filters

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Survivability, CB

- Skin protection
  - Gloves
    - Improved dexterity
    - Thinner
    - Lighter
    - New materials like neoprene
  - Over boots, similar

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Survivability, CB

- Skin protection (...continued)
  - Suites
    - Lighter and cooler
    - Combined CB protection and standard combat clothing
    - New textiles

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Survivability, IED jammer

STORM-H
from Thales

- Personal ECM devices
- Jam activation of RCIEDs
- Individual protective bubbles
- But, remain vigilant

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Sustainability, Water purification

Lifesaver®

- Lifesaver® water purification device
- Configurations:
  - Jerrycan,18.5L
  - Shoulder pack, 3L
  - Bottle, 750ml
- 15 nanometre ultra filtration membranes
- Remove most viruses, bacteria, fungi, parasites, and cysts
- Activated carbon filter

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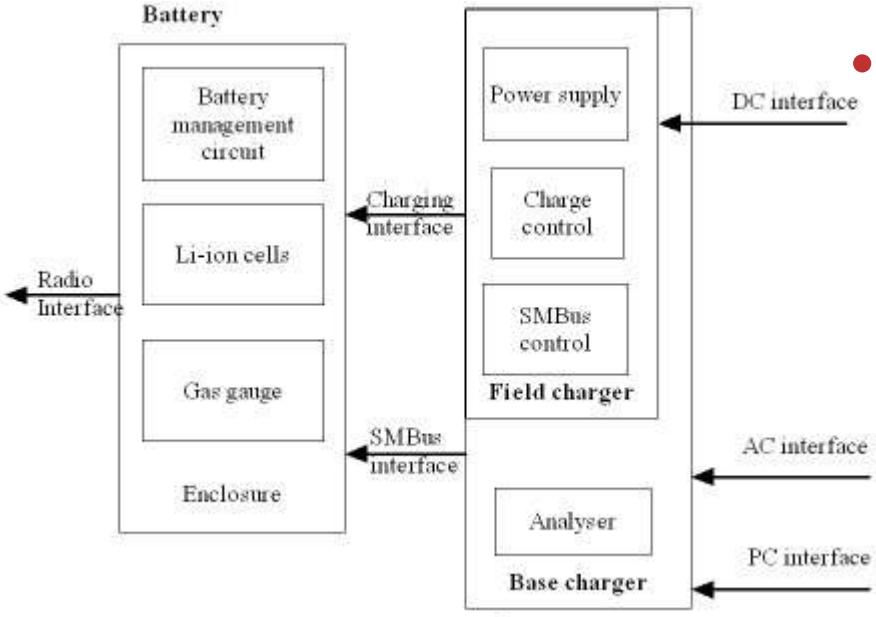
Sustainability, Power



- Flexible and wearable solar cells
- Organic pigments
- Kinetic energy harvesting
- Electromagnetic harvesting
- Energy efficient communication protocols
- Lithium iron batteries and battery management

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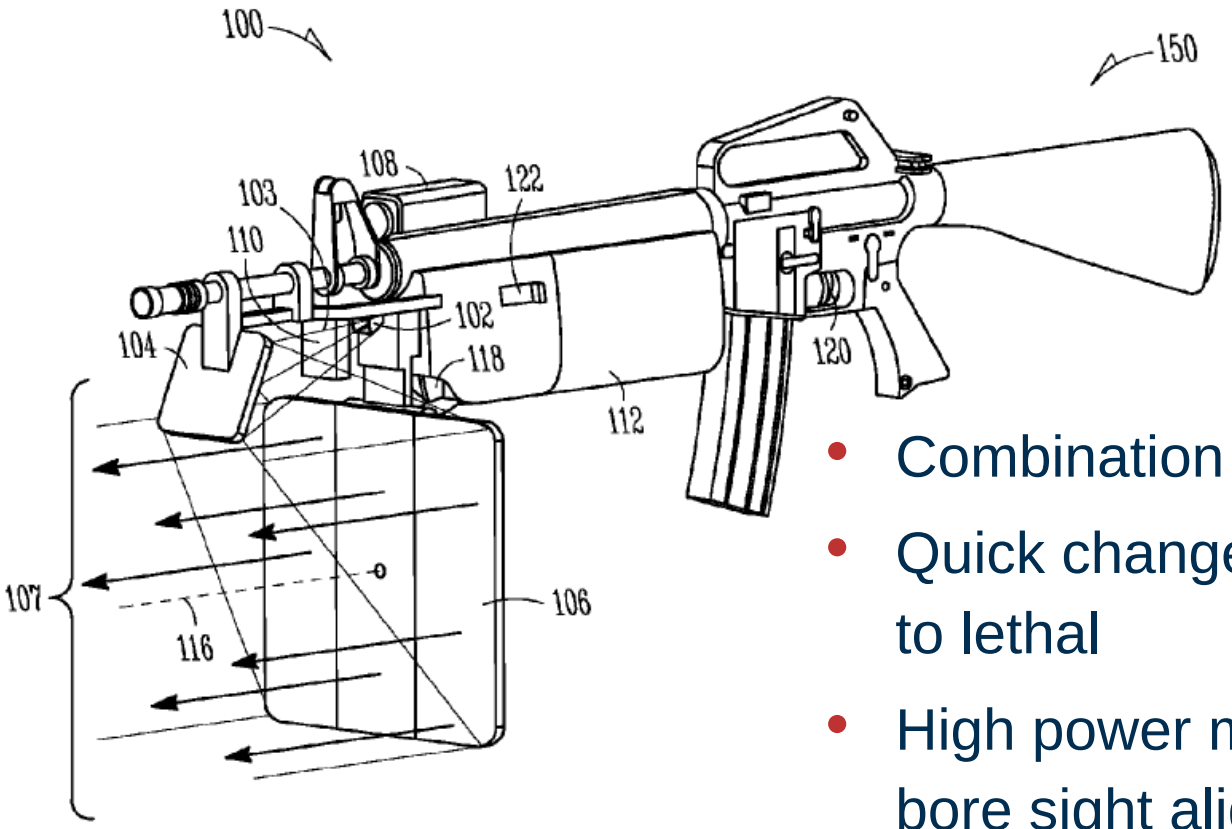
Lethality, Non lethal weapons



- Combination weapons
- Quick change over from non lethal to lethal
- High power millimetre wave in bore sight alignment with main weapon

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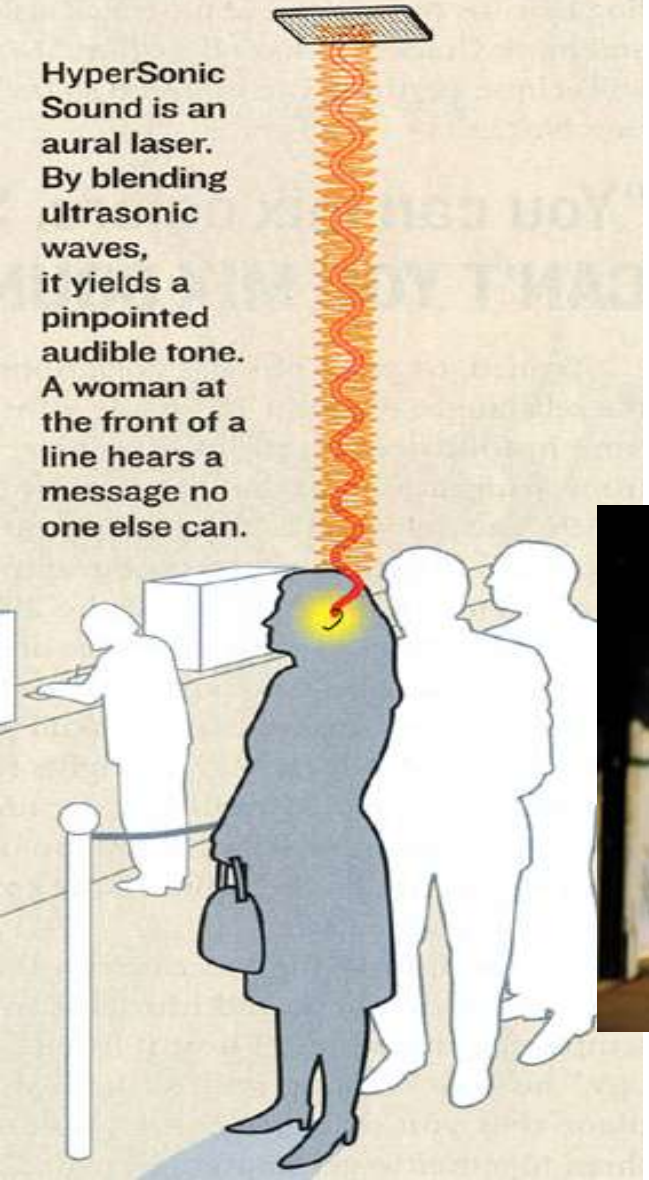
Lethality, Non lethal weapons



- Aural laser
- Modulated ultrasound
- HyperSonic sound device

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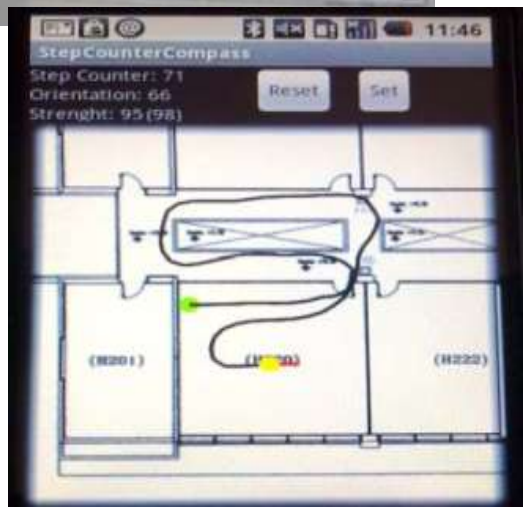
Mobility, Non GPS navigation



- MEMS and processing power of smart phones
- In building navigation

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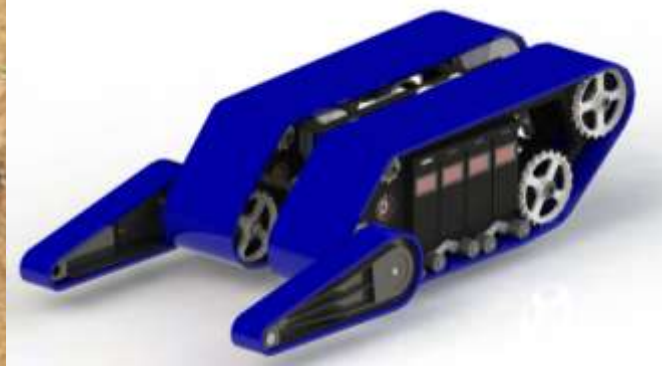
Mobility, Vehicles



- Small, light, and fast
- Integral to the dismounted soldier
- Mobility enhancer +
- Carts to autonomous mules

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Human factors, training

- Realistic training aids
  - Pneumatic IEDs, landmines, grenades
  - Firearm simulators
  - Scenario training
  - Immersive virtual environments

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Human factors, training

- International trend towards sport science
- Combining nutrition and diet, physiology, psychology, sports technology, and performance analysis

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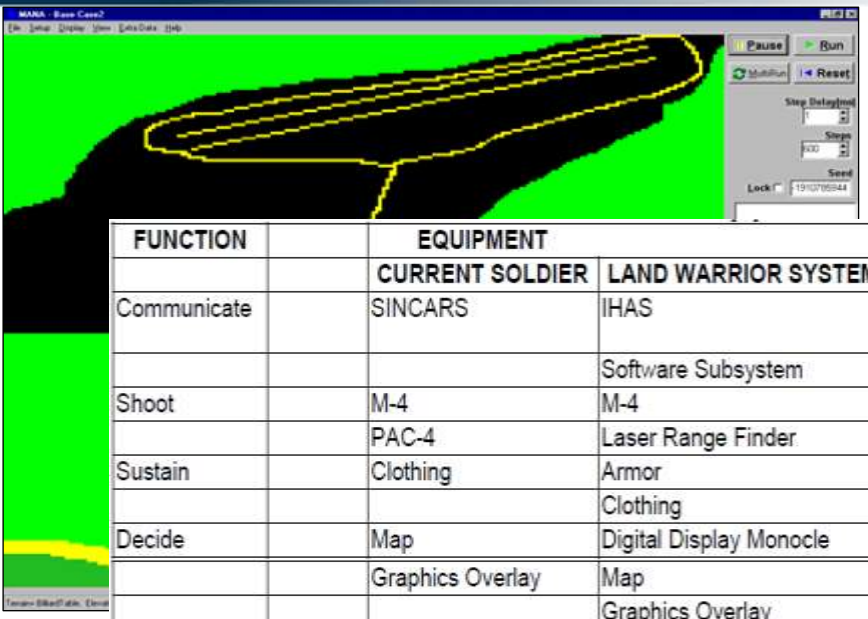
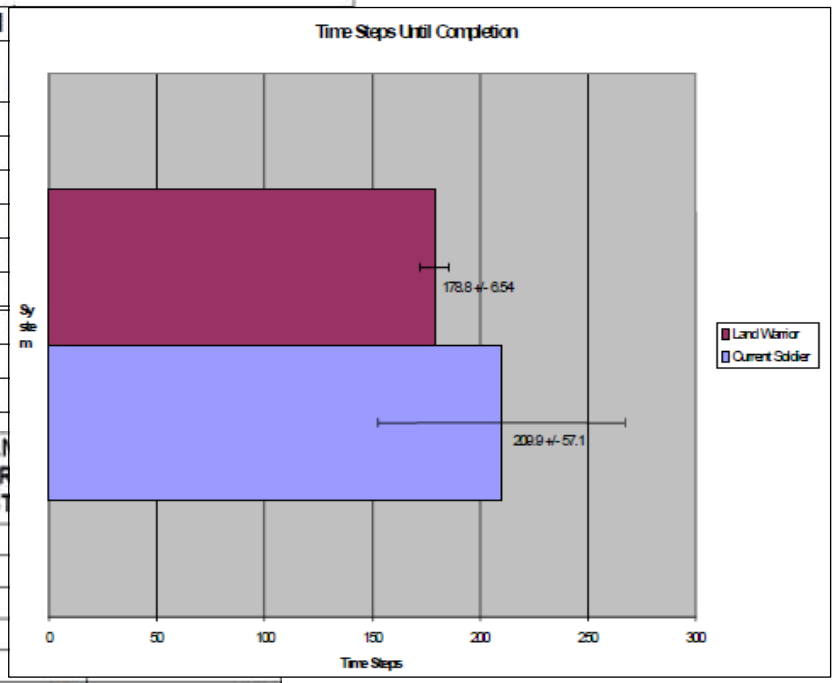
Modeling and simulation



- Agent based modeling

FUNCTION		EQUIPMENT	
		CURRENT SOLDIER	LAND WARRIOR SYSTEM
Communicate		SINCARS	IHAS
			Software Subsystem
Shoot		M-4	M-4
		PAC-4	Laser Range Finder
Sustain		Clothing	Armor
			Clothing
Decide		Map	Digital Display Monocle
		Graphics Overlay	Map
			Graphics Overlay
Move		Traditional Compass	Digital Compass



FUNCTION	MANA PARAMETER	CURRENT SOLDIER	LAND WARR SYST	
COMMUNICATE	Comms Delay	20		
SHOOT	Fire Power	25		
	Max Targets per Step	33		
	Shot Radius	0		
MOVE	Stealth	10		
	Movement Speed	100	100	100
SUSTAIN	Number of Hits to Kill	2	2	2
DECIDE	Sensor Range	50	55	75
PROTECT THE FORCE	Armor	0	1	3

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Modeling and simulation

- Virtual soldier modeling
- Built from the inside out
- Artificial intelligence
- Test equipment in a virtual environment

SANTOS

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Conclusion

- Important technologies and systems
  - Man-portable UAVs
  - Small, light, high mobility vehicles
  - Biotechnology
  - MEMS
  - Nanotechnology
  - EMR, Terahertz
  - Smart phones and software applications
  - Realistic training

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Conclusion

- Important technologies and systems (...continued)
  - Sport Science
  - Modelling and simulation
- Technologies and systems cut across functional areas
- Treat as an integrated system
- Balanced approach
- Top down and bottom up
- Equip the man versus man the equipment

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Conclusion

- Enable command and control (not an island)
- Dynamic responsive R&D capability
  - Frequent technology demonstrator insertions
  - Central co ordination
  - Active requirements management
  - Traceability for impact
  - Quick turn around (skunk works)
  - COTS basis
- National soldier program

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Acknowledgements

The authors would like to acknowledge the contributions of the following persons:

Gen J D Malan, Col A Grundling, Col G Louw, Col D Swart, Col S Khumalo, Lt Col D Liebenberg, Col L van den Heever (SANDF)
Johan Strydom, Nivan Moodley, Roger Young, Duarte Goncalves, Braam Greef, Nick Rubin, Charl Harding, Chris Serfontein, Klaus Muller, Chris Botha, Inus Grobler, Stefan Kersop, Dave Engels, Pieter De Koker, Dave Roos, Deon Malherbe, Philip Roach, Theo van Dyk, Ernst Smit, David Reinecke, Frikkie Mostert, Erlank Pienaar, Andre Le Roux, Christo Cloete, Jacques Cilliers, Kevin Kloke, Cobus Venter, Herman Le Roux, Corné Smith, Francois Le Roux, Jaco Cronje, John Monk, Liesbeth Botha, Jeremy Wallis, Riaan Coetzee, Hein Swart, Neil Trollip, Mkhule Mathe, Kenneth Ozoemana, Lorinda Wu, Gerda Botha, Annelie Jacobs, Theresa Faleschini, Kobus Roux (CSIR)
Albert Owgen, Neels Fourie, Nico Ras, Henti van Rensburg, Andries van Wyk (Armscor)
Steve Matthews (Denel)

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Thank You

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