



Army Research Office

Workshop on Nanoscience for the Soldier

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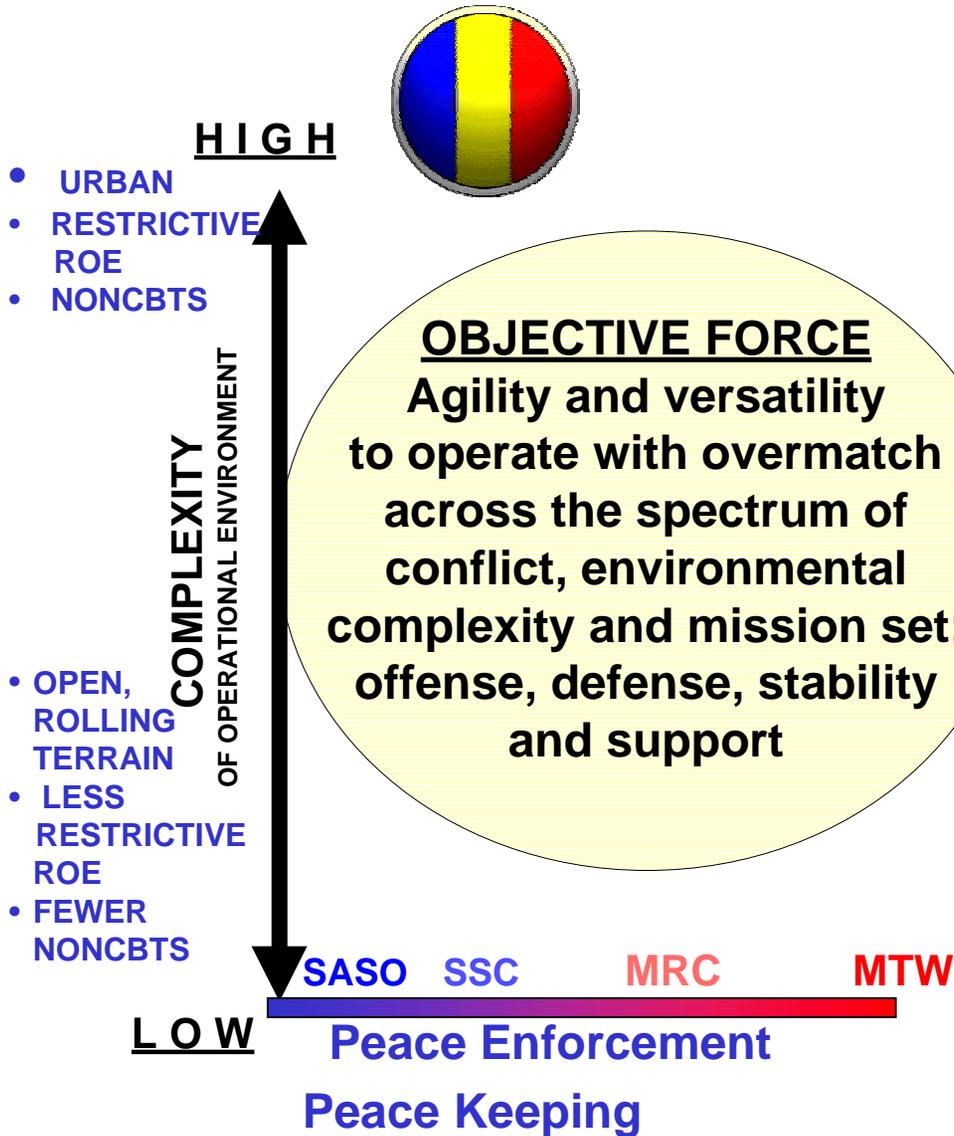
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OBJECTIVE FORCE WARFIGHTER TECHNOLOGY ASSESSMENT

**FINDINGS AND RECOMMENDATIONS OF THE IRT
17 NOVEMBER 2000**



Objective Force Warrior Challenge

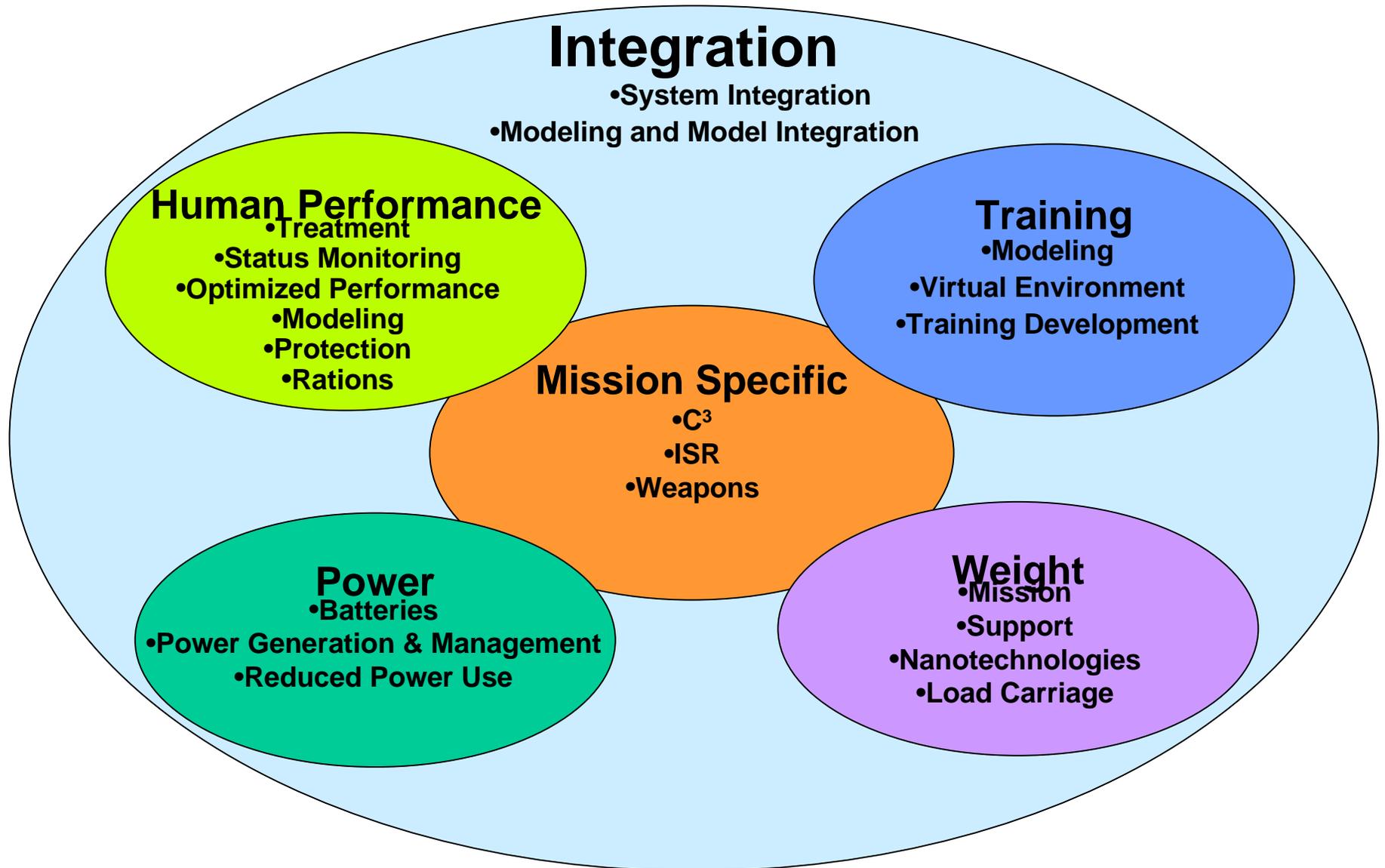


Enable Future Objective Force Warriors, within their unit of action, to achieve

- their full spectrum of tasks
- across a full spectrum of missions and environments
- against a full spectrum of threats



How the Warrior Technology Investment is Organized





Summary



- **Findings**

- The Objective Force Warrior vision cannot be realized within this decade on the current course
- More can be done, and more quickly, to enhance the capabilities of the Objective Force Warrior
- The S&T program can yield revolutionary soldier performance in this decade *if* the program is redefined/re-resourced

Revolutionary Soldier Performance Requires Aggressive, High Risk Actions

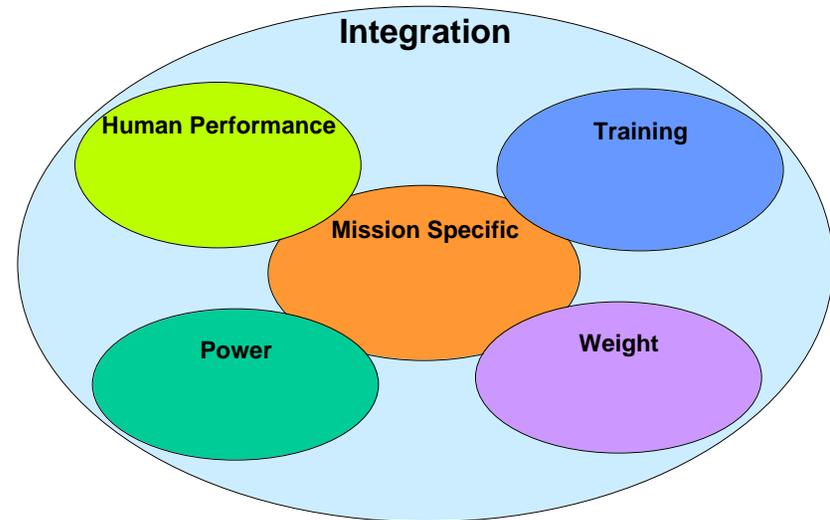


Where can Nanotechnology help?



- **Investment Areas**

- Power
- Weight
- Human Performance
- Mission Specific
- Integration



- **Nanoscience Research Opportunities**

- Power sources and energy distribution
- Materials and fabrics for protection and scaffolding
- Cooling
- Soldier status monitoring and modeling
- Displays, Detectors, and Antennas



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- **Purpose**
 - **Identify research requirements**
 - What must be done to respond to need/opportunity?
 - What are the fundamental limits?
 - **Identify opportunities provided by nanoscience for the soldier**
 - Specify DoD need
 - List opportunities for revolutionary impact





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- **Workshop Rules**
 - **General Rules**
 - Discuss problems, not solutions
 - Concentrate on the “needed”, not the “neat”
 - DoD application must be clear
 - Concentrate on current weaknesses and revolutionary opportunities
 - Nanoscience should be the solution
 - Nanoscience should be the only way or the best way
 - **Final Product: The written report!**





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- **Workshop Presentation Format**
 - **Speakers will give overview of field**
 - Discuss the state-of-the-art and rationale/justification
 - Identify need or opportunity for the soldier
 - Summarize seminal research findings
 - Speculate about research roadblocks
 - Stimulate working group discussions
 - **Attendees**
 - Part Army and part University
 - Audience should ask only clarifying questions
 - Dialogue should occur during working groups



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- **Working Group Charter**
 - **Four Parallel Working Groups**
 - Materials and fabrics for protection and scaffolding
 - Congressional Room
 - Power, Energy distribution, and Cooling
 - President's Room
 - Soldier status monitoring and Modeling
 - RTF Room
 - Displays, Detectors, and Antennas
 - Catalyst Room
 - **Participation**
 - Each attendee will participate in only one working group
 - University participants are nanoscience experts
 - Army participants are soldier experts
 - **Objective**
 - Identify critical **needs** for research to address
 - Identify critical **opportunities** from research that might benefit soldier
 - *Do not attempt to try to answer questions or solve problems!!*



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- **Working Group Discussion Format**
 - **Working Group**
 - E.g. Displays, detectors, and antennas
 - **Identify Area**
 - E.g. “Nanostructures for antennas”
 - **Identify Objective(s)**
 - Specify desired capability
 - E.g. “Conformal, low glint antenna for soldier communication”
 - **Identify Research Requirements**
 - List
 - Requirements for nanoscience to address
 - » E.g. “How do you prevent antenna drain when placed near the soldier?”
 - And/or nanoscience opportunities to exploit
 - » E.g. “Photonic crystals can shepherd electromagnetic radiation.”
 - Identify Key Proof-of-Concept Demonstrations
 - E.g. “Demonstrate a lightweight, conformal, broadband antenna ground plane that can be woven into uniform or molded inside helmet.”



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- **Workshop Worksheet**
 - Each working group will address two or three “Areas”:
 - Two
 - Materials / Fabrics for Protection and Scaffolding
 - Soldier Status Monitoring (including CBD) and Modeling
 - Three
 - Power, Energy Distribution, and Cooling
 - Displays, Detectors, and Antennas
 - Each “Area” will have several “Objectives”
 - One worksheet for each Objective
 - Each “Objective” will have many “Research Requirements”
 - Need-driven research
 - Opportunity-driven research
 - Critical proof-of-concept demonstrations

<u>Area</u>
<u>Objective</u>
<u>Research Requirements</u> <i>Need-driven research</i>
<i>Opportunity-driven research</i>
<i>Critical proof-of-concept demonstrations</i>



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- **Workshop Agenda**
 - **Presentations**
 - Thursday Morning
 - **Working Groups**
 - Thursday Afternoon
 - Complete list of “Objectives”
 - Begin list of “Research Requirements”
 - Friday Morning
 - Complete list of “Research Requirements”
 - Prepare summary presentation
 - Write final report

