Systems Innovation for Soldier System Weapon Design

37th Annual Guns & Ammo Symposium
National Defense Industrial Association
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History repeats itself

➤ The most powerful nation in the world
➤ The most powerful army in the world
➤ A small band of revolutionaries

What harm can they cause?
Then

1775 British Army: Unpredictable Time & Place For Land Combat

Now

2002 US Army: Unpredictable Time & Place For Land Combat
Implications of Today’s Operational Environment

- **Physical Environment**
  - Prescribes type forces that fight & manner conducted
  - Urban areas growing 3X faster than population:
    - *Urban warfare virtually assured*

- **Emergence of “fighters” vs. soldiers**
  - Non-traditional organization
  - Emergence of a “Warrior Class”
  - In fight for the “long haul”

- **Implications:**
  - Limited range, close quarters battle (CQB) predominates
  - Manpower vs. “platform” centric
  - Restrictions mounted/dismounted maneuverability
  - Degrades technological and platform based superiority
  - Physical & mental strain

- **Implications:**
  - Unconstrained ROE vs. constrained US ROE
  - High intensity, “crude” combat
  - Brutal, lethal engagements
Areas of Operation

**URBAN**
- Manpower Intensive Operations
- Limits Platform-based, System Advantages

Open, Rolling - Arid
- Optimal Terrain Conditions for Platform-based Capabilities

Mixed, Open, Rolling - Vegetated
- Constrained Employment of Platform-based Capabilities
- Demands Characteristics of ALL Maneuver Forces

Dense, Complex, Restricted
- Severely Degrades Platform-based Capabilities
- Primarily Non-platform based Operations

Primarily Mounted Actions (Rolling, Mixed Terrain)

Mounted Actions Supported by Dismounted Actions (Defiles, Danger Areas, Obstacles)

Primarily Dismounted Actions
Operations on Urban Terrain
(Dismounted supported by Mounted)

CRITICAL MISSIONS & TASKS:
- Attack/Defend
- Cordon & Search
- Ambush
  - Conduct Reconnaissance
    - Breach Obstacles
    - Assault Building
      - Enter a Building
      - Clear Room
- Coordinated Operations w/Armor
- Fire From Enclosures
  - Destroy Armor
  - Create Entry Points
  - Defeat Bunkers/Strong Points
- C² Operations
  - Digital Voice & Data
  - Through Buildings &
    - Subterranean
- Employ Snipers
CURRENT SOLDIER TOOLS DEVELOPMENT PROCESS

CHALLENGES:
INTEGRATION AND ANALYSIS OF REQUIREMENTS TO MAXIMIZE SOLDIER CAPABILITY
BALANCING PERFORMANCE POWER WEIGHT VOLUME INTEGRATION COST TRAINING

M4MWS
JAVELIN
TWS
AN/PVS7/14
AN/PEQ4C
INTERCEPTOR
MOLLE
AN/PRC126

FUTURE METRIC SSDT / ICT ASSESSMENT AND INTEGRATION

INTEGRATED SYSTEMS
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Question: How to create soldier systems integration?
The Solution Integrator pulls together the best team possible to meet the soldiers needs.
Role of Solution Integrator

Pull the best possible talent together to provide:

Soldier Requirements
- Effectiveness & Protection
- Concept Studies
- Technical Papers
- Requirements Analysis
- Modeling & Simulation
- Proposals

System Development
- Project Management
- Systems Engineering
- Design & Analysis
- Modeling & Simulation
- Logistics
- Producibility
- Reviews & Reports
- Integration & Test

System Support
- Supply Chain Support
- Field Support
- Product Improvements
- Logistics Support
- Material Review Board
- Quality Assurance
- Cost Reduction Program

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System Modeling, Simulation & Analysis Requirements

- Effectiveness Analysis
- Ballistic Analysis
- Systems Analysis
- Threat Characterization
- Combustion Simulation, Analysis and Test
- Mechanical System Modeling
- Reliability and Testability Analysis
- Material Distribution System Analysis
- System Simulation Modeling
- Life Cycle Management Support
- System Design Solution

Soldier Effectiveness & Protection

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Armament System’s approach to meeting the need for soldier system integration
Build a Strong Integration Management Team

- Program Management
- Master Planning
- Value Network Partners
- Systems Engineers
- Design & Analysis Engineers
- Software Engineers
- Value Network Management
- Field Service
- Contract Management
Armament Systems - Systems Integrator

Build a Solid Design, Production and Support Value Network

Operations Analysis
R&D Shop
Design and analysis
Composite Design & Analysis
Logistics
MS&A, Trades Requirements Development
Requirements Management
Interior/Exterior Ballistics Modeling

Build a Solid Design, Production and Support Value Network
Armament Systems - Systems Integrator

Integrate the right tools across the Value Network

Mechanical System Modeling

Solid Model Generation
- Mass Properties of Assemblies and Components
- Space Claim, Interference Checking
- Used for future simulation efforts
- Detail Drawings

Mechanism Design and Simulation (Rigid Body)
- Kinematic
- Dynamic

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Essential Analysis Tool
- Requirements development, design trades, concept exploration
- Operational planning, operational improvement

Variable Model Scope
- Detailed micro analysis of single unit to entire theater
- Track materials from ammunition to all battlefield consumables

Variable Tactics
- Network control & resource management
- Supply & demand coordination

Advanced Analytical Techniques
- Statistically correlated sensitivity
- Multi-variable optimization

Discrete Event Simulation Modeling

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Integrate design tools across the Value Network

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Utilize the tools to produce and analyze the optimum solution
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Deliver the Solution the Soldier Needs . . .

Then Make it Better!

MK47
AS
Crane
NAMMO
GD Canada Ltd.

XM-307 (OCSW)
AS
JSSAP, FCS LSI
GD-OTS
Raytheon

GENERAL DYNAMICS
Armament Systems
Now back to where we started:

Then...

Now...
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