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U.S. Army Research, Development and Engineering Command

MANPRINT In the Acquisition Process: Evolving to Meet Changing Needs

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Chair: Pam Savage-Knepshield
Panelists: Cheryl Burns, Rob Clark, Dave Harrah Lamar Garrett, Rick Kozycki, Belinda Lutas-Spencer, Diane Mitchell, Leticia Pacheco, John Reinhart, and Rick Tauson

26 September 2012 • MANPRINT PRACTITIONERS WORKSHOP

Panel Overview

- Brief introduction to ARL HRED MANPRINT support
  - What we do
  - Who we are
  - Who we support
  - Challenges
  - Acquisition processes
  - Moving MANPRINT to the Left (MML)

- Panelist introductions

- Open floor Q&A

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Soldier-Centered Design & Research

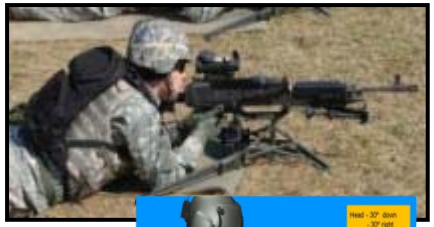
Laboratory & Field Experimentation

Conduct Soldier research with target end-users to find definitive and comprehensive answers to specific system design questions, verify that systems meet critical mission needs, and ensure that systems are easy to use, train, maintain, and sustain.

Human-System Interaction Assessment & Evaluation

Provide the Army and ARL with human factors leadership to ensure Soldier performance requirements are adequately considered in technology development and system design
Systematically consider the impact of materiel design on Soldiers throughout the system development & design process

- **Optimize total system performance**
- **Reduce life cycle costs**
- **Minimize risk of Soldier loss or injury**



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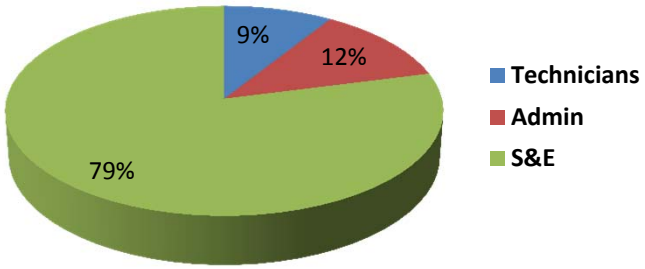
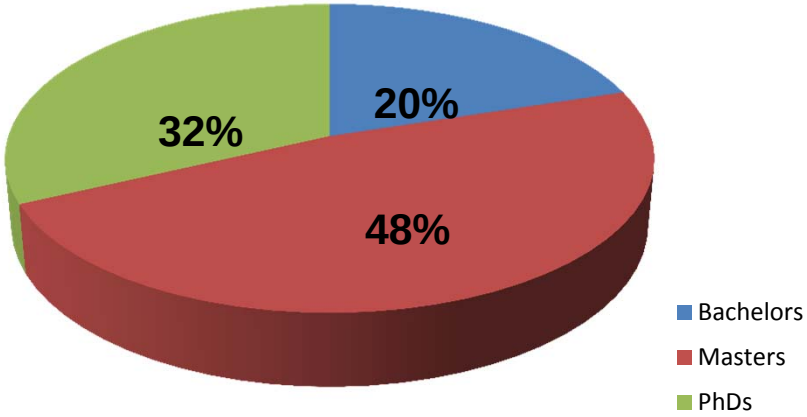
IMPRINT (Improved Performance Research Integration Tool MANPRINT (Manpower & Personnel Integration)

ARL HRED Workforce





Disciplines

- Research & Engineering Psychology
- Human Factors Engineering
- Cognitive Science
- Neuroscience
- Biomechanics & Kinesiology
- Computer Science
- Research Audiology
- Operations Research Analysis
- Industrial/Mechanical/Electronics Engineering
- Physics
- Mathematics/Statistics

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ARL HRED MANPRINT System Support

Support design and development of materiel solutions that meet mission needs and are easy to learn to use, operate, train, maintain, and sustain

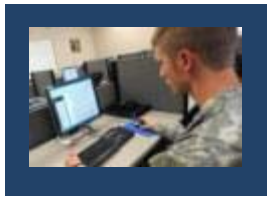
Ammunition

Aviation

Chemical & Biological Defense

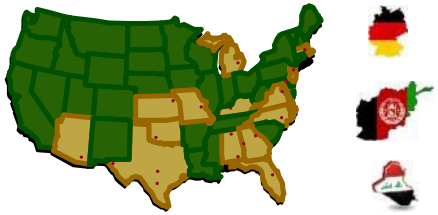
Combat Support & Combat Service Support

Strategically Located to Support ATEC, PEOs & PMs

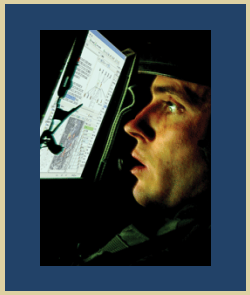


Enterprise Information Systems

Ground Combat Systems



Command, Control, Communications



Intelligence Electronic Warfare & Sensors

Missiles & Space

Simulation, Training, & Instrumentation

Soldier

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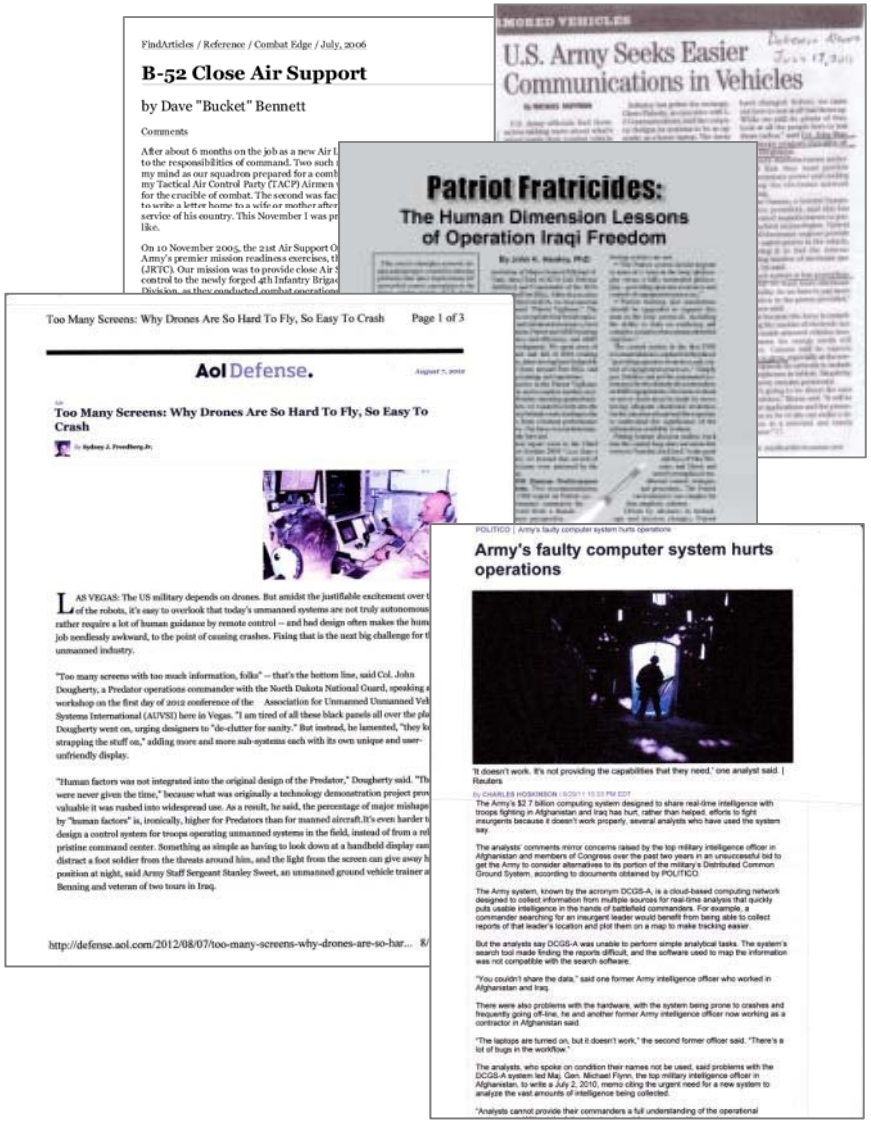
MANPRINT Challenges

- Not involved early enough in the acquisition process
- Current process does not provide funding until MSB
- Even then, not all PMs understand the value
- Belief that what we do
  - is “common sense”
  - is too expensive
  - will slow down the process



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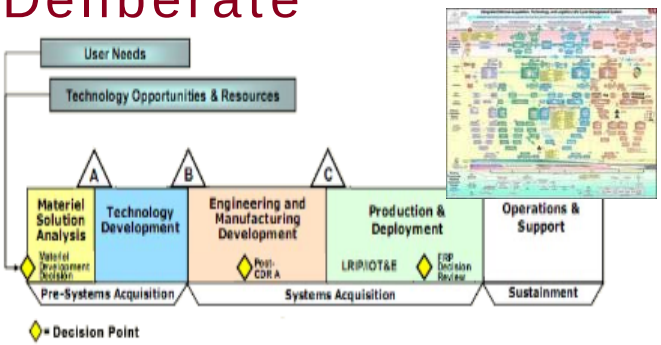
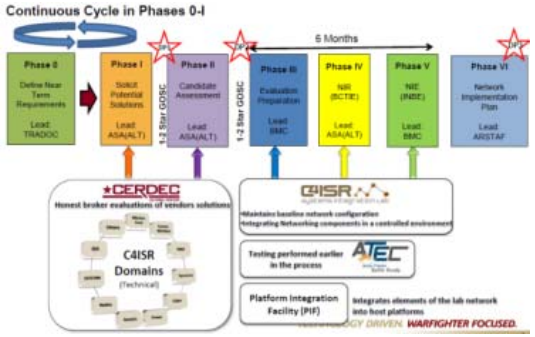
MANPRINT Support in the Acquisition Process

RFI – Request for Information
ONS – Operational Need Statement
JUONS – Joint Urgent Operational Need Statement

Deliberate

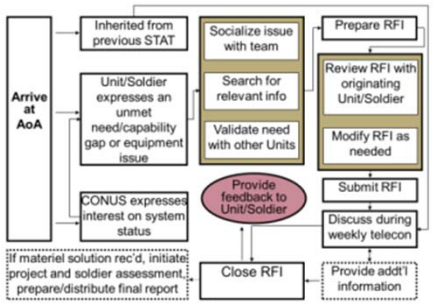


NIE Agile

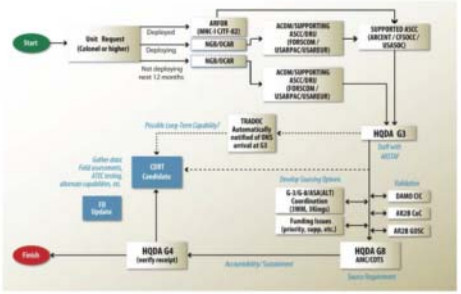


Current Ops

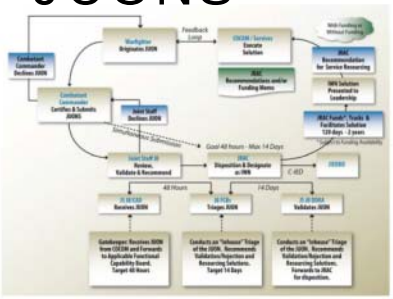
RFI



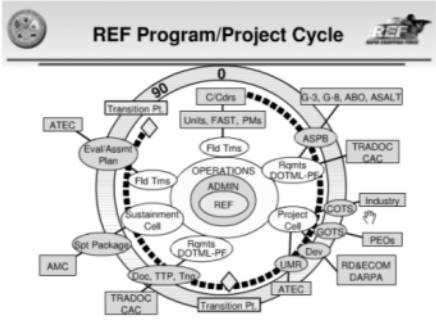
ONS



JUONS



Rapid Equipping Force



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Moving MANPRINT to the Left (MML) Background

- Feb 2010: Dr. Drillings, HQDA G-1 Director for MANPRINT, and LTG Michael A. Vane, DCG TRADOC and Director ARCIC, met and agreed that MANPRINT activities should be initiated earlier and later in 2010 signed a memorandum supporting a pilot program to incorporate MANPRINT analysis & assessment during JCIDS Process pre MS A
- Jul 2010 – Hawley & Mares complete an in-depth retrospective analysis of three air defense systems to illustrate benefits of MANPRINT earlier in the JCIDS process by identifying
  - Acquisition problems attributable to MANPRINT-related issues
  - Causal factors leading to identifiable deficiencies
  - Decision points where deficiencies could have been recognized & corrected
- Dec 2010 – Dr. Beverly Knapp briefed "Moving MANPRINT to the Left" to the TRADOC Capabilities Integration Enterprise Forum
- Jul 2011 – Army Acquisition Policy updated: "MANPRINT & HSI must be fully addressed throughout the system acquisition process" & "conducted as an integral part of the systems engineering process to ensure that MANPRINT and HSI requirements are integrated into the system design"

IAMD

THAAD

JLENS

IAMD = Integrated Air and Missile Defense
THAAD = Terminal High Altitude Area Defense
JLENS = Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System

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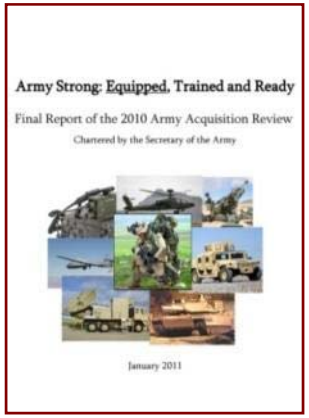
MML Background



Meanwhile, a completely separate analysis was underway…

Jan 2011: The Decker-Wagner Army Acquisition Review, "Army Strong: Equipped, Trained and Ready, Final Report of the 2010 Army Acquisition Review,"

- "Problems noted included insufficient training, poor control and display layout and location, and inadequate contractor testing."
- "Required modifications resulted in program schedule slips and cost growth."
- Acquisition reform recommended that G-1 MANPRINT & ARL HRED
  - develop human performance requirements and MANPRINT metrics for the Systems Engineering Plan (SEP)
  - participate on the Integrated Capabilities Development Team (ICDT) to ensure MANPRINT factors are included in the SEP
  - provide MANPRINT considerations for inclusion in the Analysis of Alternatives (AoA)

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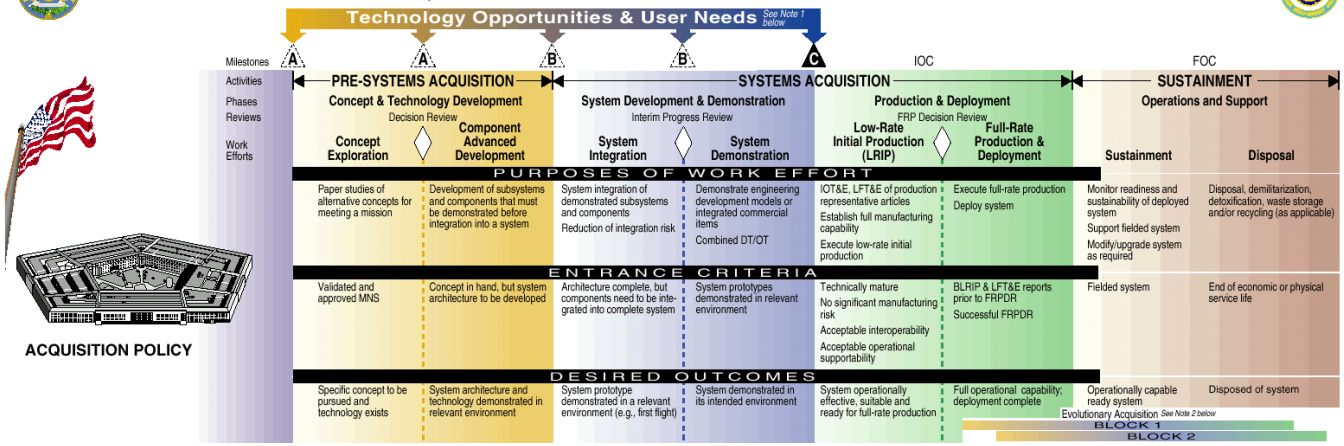
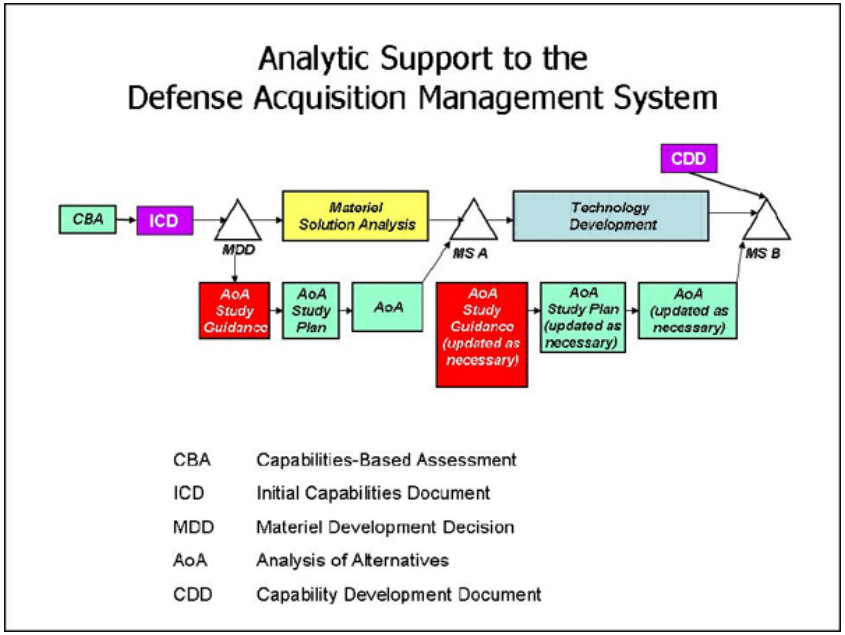
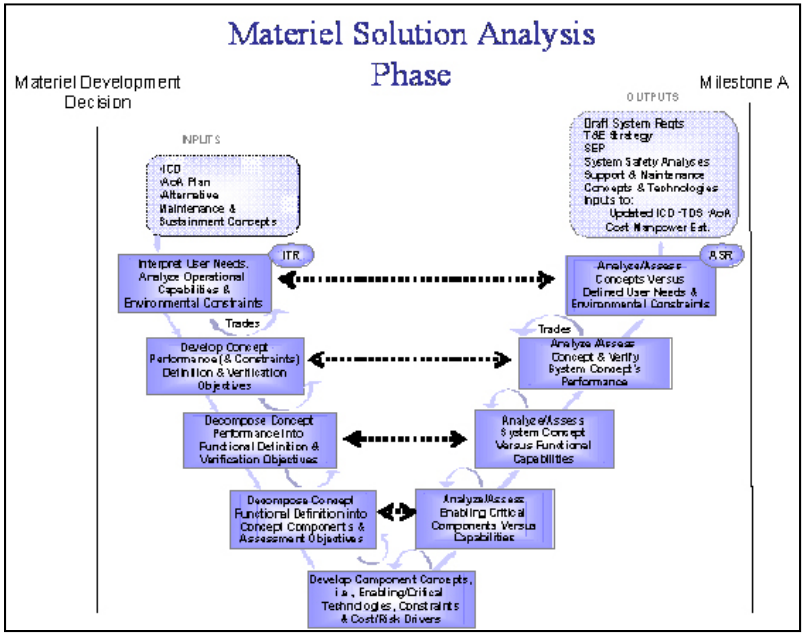
Deliberate Acquisition

DEFENSE ACQUISITION MANAGEMENT FRAMEWORK







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Soldier-Centered Design and Assessment*

Goal: Solve real-world problems for a specific group of end users & fill HF and HSI knowledge gaps

Understand

- *SME interviews*
- *Focus groups/user juries*
- *Literature reviews*
- *Previous MANPRINT assessments*
- *Product reviews/competitive analysis*
- *Reverse engineering*
- *Current ops input/feedback*
- *Task analyses (cognitive, heuristic, etc.)*
- *Opportunity-driven human factors research*

Visualize

- *Personas, scripted scenarios, & storyboards (use cases)*
- *Job aids*
- *Conceptual design(s)*
- *System architecture / "human view"*
- *Models/mock-ups (hardware & software)*
- *IMPRINT: workload modeling*
- *JACK: human figure modeling*

Evaluate

- *Participatory design techniques*
- *Integrated product team working groups*
- *Expert reviews/discount usability techniques*
- *Usability testing / Experimentation / Eye-tracking studies*
- *Comparative usability studies*
- *Unit training events*
- *Large-scale experiments (NIE, Empire Challenge, etc.)*
- *Formal test events (ATEC)*

* Savage-Knepshield, P.A., (2009). Applying a warfighter-centric system design process to a department of defense acquisition program. *Journal of Cognitive Engineering & Decision Making, 3*(1), 47-66.

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Panelists

ARL HRED, HFID Field Elements

- Cheryl Burns, Fort Knox, KY
- Rob Clark, Fort Leonard Wood, MO
- Lamar Garrett, ECBC, MD
- Dave Harrah, CECOM, MD
- Belinda Lutas-Spencer, TACOM, MI
- Leticia Pacheco, Fort Bliss, TX
- John Reinhart, Fort Belvoir, VA

MANPRINT Methods & Analysis Branch, APG, MD

- Rick Kozycki
- Diane Mitchell
- Rick Tauson

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- **Domain: Combat Vehicles**
  - Pre-Milestone B, ACAT 1
    - Ground Combat Vehicle
    - Future Combat System
    - Stryker Family of Vehicles
    - Future Scout and Cavalry Vehicle
  - Post-Milestone B: Abrams Tank

Stryker MGS

- **Challenges**
  - Timing is everything
  - Inserting MANPRINT program and requirements at the beginning of program
  - Ensuring that MANPRINT requirements are addressed throughout the program
- **MANPRINT Thrust Areas**
  - Early trade space analyses during AoAs
  - Form, fit and function analyses during TD phase
  - IMPRINT workload modeling including Bradley baseline analysis in TD phase with iterative modeling as design matures
  - Human figure modeling & user juries to prove out conceptual designs

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- **Domain: Engineer Commercial Equipment**
  - Asphalt Mixing Plant (AMP)
  - Well Drilling Rig

Asphalt Mixing Plant

- **Challenge**

  PM's not providing funding for MANPRINT support for Engineer commercial off the shelf (COTS) systems

- **MANPRINT Thrust Areas**
  - Working with G-1 MANPRINT Directorate
  - Brief PEO's on MANPRINT requirements
    - Continue to educate and work with Material and Capability Developers regarding the importance of MANPRINT for COTS systems
    - Provide G-1 MANPRINT training for Material and Capability Developers

Well Drilling Rig

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- **Domain: Chem-Bio Defense & Surveillance Systems**
  - Hazard Mitigation, Materiel and Equipment Restoration (HaMMer)
  - Screening Obscuration Module (SOM); ACAT III
  - Base Expeditionary Targeting Surveillance Systems-Combined (BETSS-C)
- **Challenges**
  - Modeling and Simulations
  - GUI functionality using complex sequence
- **MANPRINT Thrust Areas**
  - Decision Analysis
  - Early User Evaluations/Assessments
    - Manpower Requirements
    - Anthropometric Measurements

HaMMer OP Demo, HI

SOM EUE, MD

BETSS-C, NIE 12.1, NM

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- **Domain: Brigade and Network Modernization**
  - Future Combat Systems
  - Brigade Combat Team Modernization
  - Network Integration Evaluation
- **Challenges**
  - Maintaining current focus while pushing state of art in technology
- **MANPRINT Thrust Areas**
  - Soldier skill sets
  - Brigade hybrid between Heavy and Light
  - Information overload
  - Vehicle crew sizes
  - Training baseline

Company Command Post Comms Equipment

Harris and JTRS Radios

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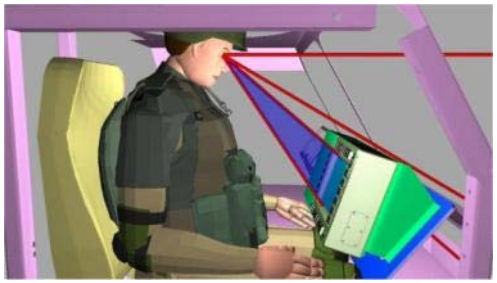
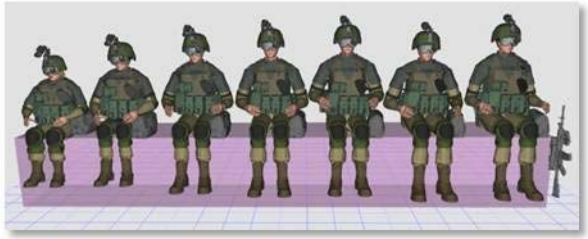
- **Domains: Tactical Ground Vehicle & Aviation Platforms, ACAT 1**
  - Future Combat Systems, Stryker, Ground Combat Vehicle
  - Comanche, UH 60, OH-58F, Joint Multi Role Helicopter
- **Challenges**
  - System CAD data
    - Format and level of detail compatibility
    - Range of motion for articulated components
- **MANPRINT Thrust Areas**
  - Early trade space analyses during AoAs
  - Form, fit and function analyses
    - Crew size & anthropometric requirements
    - Human figure modeling to prove out conceptual designs

Hatch Clearances



Display Viewing Angles



Boundary Manikins

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- **Domain: GROUND COMBAT**
  - Joint Light Tactical Vehicles (JLTV)
  - STRYKER Brigade Combat Vehicles (SBCT)
- **Challenges**
  - PMs knowledge regarding including and funding MANPRINT
  - Involvement at the beginning of the acquisition process (i.e., including MANPRINT in the POM)
  - Implementing MANPRINT on systems that have already been fielded and are being integrated, up-armored, or reconfigured
  - Manpower
- **MANPRINT Thrust Area**
  - MANPRINT requirements included in JLTV EMD phase requirements documents

Joint Light Tactical Vehicle

STRYKER

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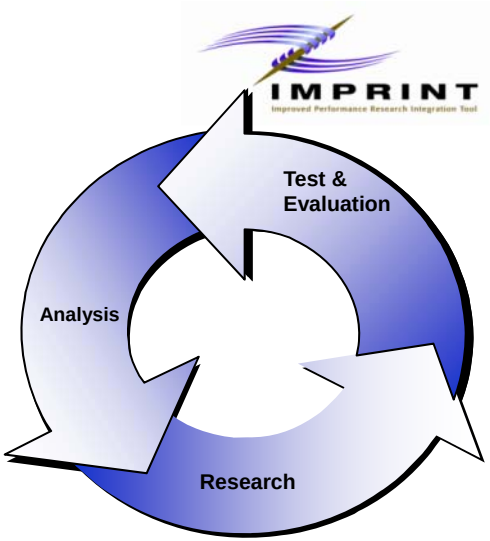
- **Domain: Soldier-Centered Analysis**
  - Early AoAs of system design and Soldier workload
  - Crew size and function allocation

- **Challenge**: Identifying, locating, & interviewing Soldiers who are representative users of the system under development to develop a detailed mission and task analysis with IMPRINT

- **MANPRINT Thrust Areas**
  - Quantifying risks to Soldiers' performance associated with conceptual system designs
  - Systems designs influenced
    - Non-line-of-sight Cannon (NLOS-C)
    - Mounted Combat System (MCS)
    - Ground Combat Vehicle (GCV)



John Reinhart

- **Domain: Soldier Systems, Countermine**
  - Nett Warrior, ACAT II
  - Husky Mounted Detection System, ACAT III

- **Challenge**: PM acting as system integrator

- **Major Thrust Area(s) or Accomplishment(s):**
  - Reducing system weight and keeping it low
    - Lighten the Soldier's load
    - Improve mobility
  - Keeping up with rapidly changing technology
    - Hardware
    - Software

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- **Domain: Network Integration Experiment**
  - MANPRINT Support to AEC for numerous Systems Under Evaluation
- **Challenges**
  - Developing MANPRINT role in Agile Acquisition Process
  - Training: too much, too early
  - Manpower & Personnel: Skills & Workload Creep (25-U)
  - HFE: Assessing the right thing
    - Capability Sets vs. Individual Systems
    - Operator/Maintainer vs. Decision Maker
- **MANPRINT Thrust Areas**
  - Defining MANPRINT role in TRADOC run event
  - Developing workload models to identify key MANPRINT areas in Bde

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Open Floor

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