

COMBATXXI: Usage and Analysis at TACOM

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TACOM COST & SYSTEMS ANALYSIS



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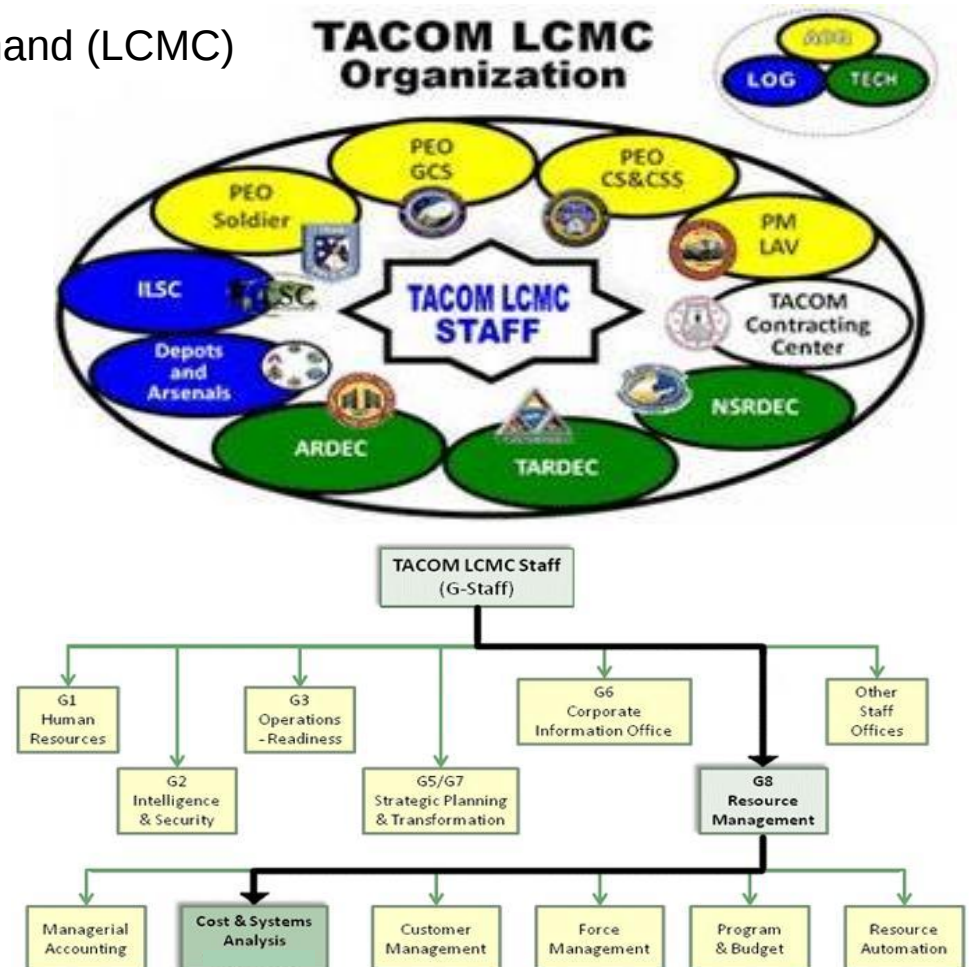
- **Who We Are**
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Who We Are

- TACOM Life Cycle Management Command (LCMC)
- Cost & Systems Analysis Office
- Capability developed in 1991
- Ten full time analysts
- Dedicated secure facilities





COMBATXXI Computing Power

➤ **C&SA Capabilities**

- 7 - 64 bit Linux servers - 56 addressable processors (COMBATXXI)
- 14 TB storage (local disk and NAS)
- Additional 20TB storage on order

➤ **TARDEC Capabilities**

- 256 - 64 bit blade servers - 512 addressable processors (COMBATXXI)
- 168 TB storage (NAS)
- 4 TB addressable memory (RAM)
- 1.3 PB (1300 TB) tape library

Working the technical and accreditation issues to connect the two networks.



- PEO Ground Combat Systems (GCS)
 - PM Heavy Brigade Combat Team (HBCT)
 - Abrams
 - Bradley
 - Fire Support Platforms
 - PM Stryker
- MRAP – Mine Resistant Ambush Protected
- JLTV – Joint Light Tactical Vehicle
- TARDEC - Tank-Automotive Research, Development and Engineering Center



Model Overview

- Combined Arms Analysis Tool for the 21st Century (COMBATXXI) - Developed jointly by TRAC- White Sands Missile Range (WSMR) and Marine Corps Combat Development Command (MCCDC)
- Successor to CASTFOREM
- Utilized to measure the operational effectiveness of weapon systems in a simulated combat scenario.
- Types of Studies:
 - Trade Studies (Armor #1 vs. Armor #2)
 - Parametric (Knee-in-Curve) Analysis (Signature Management)
 - CDD Requirements Validation
 - Optimization Analysis (Suites of Technologies)

Army's Premier Force on
Force Analysis Tool

Model Description:

- Force on Force Brigade and Below Combat Model
- Multi-sided Simulation
- Closed form, event-driven stochastic (randomized) simulation
- Objected oriented programming (JAVA)

Model Features:

- Improved IED/EFP support as well as APS playability
- Variety of Mission Profiles
- Pre-processor GUI
- Graphical Playback
- Ground, air, naval, and amphibious operations

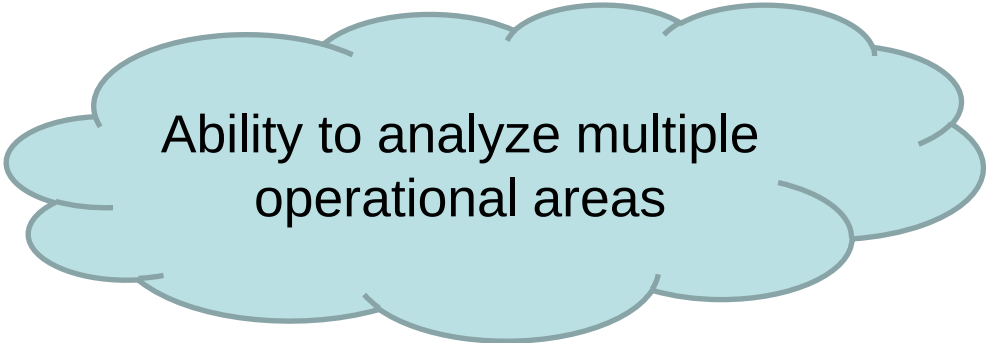


- Lack of Suitable Scenarios
 - TRAC had higher priorities than developing COMBATXXI scenarios for our customers.
 - Used customer reimbursable funding for TRAC to develop a BN+ MCO scenario.
- Database vs. flat file inputs
 - Required new skills for the team.
 - Configuration control for the databases.
 - .mdb vs. .odb – Running COMBATXXI in Linux requires .odb; yet .mdb are easier to edit.
- Upgrading equipment – Significant resources required to upgrade storage and servers.
- Crawling up the learning curve
 - Handling output – larger magnitude of output data.
 - Lack of documentation for the issues we deal with frequently.
- Issue Resolution
 - Didn't necessarily know if errors were data / model build / scenario / post processing issue.
 - Needed to develop new set of POCs to handle various issues. Mitigated by TRAC assigning a TACOM POC.



Inputs and Outputs

- Sample COMBATXXI Inputs:
 - Probably of Hit/Kill
 - Physical Dimensions
 - Signature Management (Contrast)
 - Weapon Systems
 - Active Protection Systems
 - Sensors
- Sample COMBATXXI Outputs:
 - Killer Victim Scoreboard
 - Shots/Hits/Kills
 - Observation Logs
 - # of rounds defeated by APS
 - Survivors Remaining
- Sample Measures of Effectiveness (MoEs):
 - Lethality – Effectiveness of a weapon system against threat forces
 - Survivability – Effectiveness of a vehicle's armor system against threat munitions
 - Force Protection – Effectiveness of a vehicle's armor system to protect the soldier

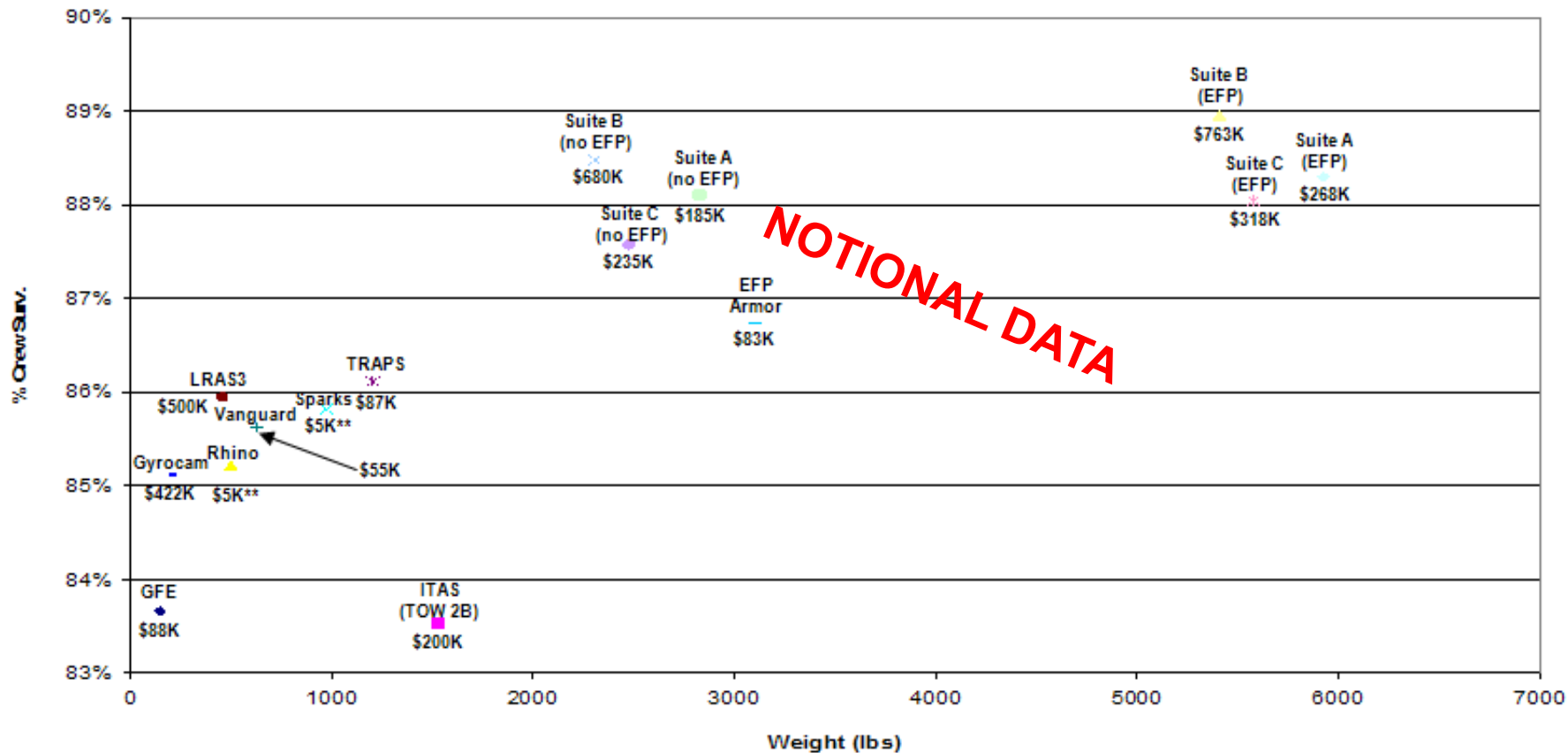


Ability to analyze multiple
operational areas



Sample Analysis Chart

RG-31A2 Trade Analysis
Cost v. Weight v. Performance





- Modeling emerging technologies presents unique challenges:
 - Technologies need to be implemented into the model.
 - Performance data often not readily available or reliable.
 - TTP's may be unknown or need to be developed.

- TACOM mitigates through:
 - Working with multiple sources to obtain realistic characterization data.
 - Teaming with TARDEC Soldier in the Loop (SIL) project to identify potential TTPs.
 - Working with TRAC-WSMR to develop the more complex model and scenario changes needed to implement the technologies.





➤ HBCT Modernization Study:

- Study Issue: Measure the performance of various HBCT systems with different suites of technology packages with regards to survivability, lethality, and force protection.
- Utilized HBCT BN+ scenario - Southwest Asia (SWA)110.1.
- Joint effort between TRAC-WSMR and TACOM to incorporate the range of technologies into the model.
- Customers: PM Abrams, PM Bradley, PM HBCT

➤ Tactical Wheeled Vehicle Survivability (TWVS) Army Technology Objective (ATO):

- Study Issue: Follow up study to the analysis done in CASTFOREM for the TWVS ATO.
- Utilized OIF and OEF like scenarios.
- Many of the technologies modeled in CASTFOREM had not yet been implemented into COMBATXXI.
- Had to integrate performance data as well as Techniques, Tactics, and Procedures (TTPs) for certain technologies.
- Further analysis still on going.
- Customer: TARDEC



➤ Formation-Based Integrated Survivability for TWVS (FIST):

- Study Issue: An offshoot of TWVS ATO, the focus of this study is determining how best to integrate the technologies of interest into a vehicle formation for optimal effectiveness.
- Utilizes Northeast Asia (NEA)-Like Security Patrol & Convoy Operations Vignette.
- Involves further integration of technologies into COMBATXXI.
- Spin-off study is analyzing the effectiveness of a MRAP RPG radar.
- Customers: TARDEC and PM MRAP

➤ Robotic Armed Mobile Platform (RAMP):

- Study Issue: Implement robotic vehicles in a patrol mission role.
- Utilizes Northeast Asia (NEA)-Like Security Patrol & Convoy Operations Vignette.
- Implements new behaviors and interactions such as:
 - Observing and reporting threat locations to control vehicle.
 - Engaging enemy by order of control vehicle.
 - Transferring control of robot to another vehicle if control vehicle is damaged.
- Customer: TARDEC



- Improve Support to Customer by increasing our internal capabilities to make database and scenario level changes:
 - Behavior Modeling:
 - One of the largest time drivers is the creation and modification of behaviors for new and emerging technologies.
 - Team members learning Python and Behavior Scripting Language (BSL) and spent time with developers to increase our coding knowledge base.
 - Database Changes:
 - Working towards increasing our ability to make small – medium level database changes without needing to rely on TRAC
 - Gaining a greater understanding of the interdependencies between tables in the database as well as any scenario changes that may be necessary
 - Post Processing
 - Current post processing methods (COMBATXXI GUI and IBM's Predictive Analytics Software (PASW)) take too long to effectively deal with larger BN+ sized scenarios.
 - Evaluating utilizing a combination of current tools, as well as Python scripts and MS Excel, to increase post processing efficiency and improve our analytic capabilities.

Increasing Internal Capabilities Reduces
Analysis Timeline and Schedule Risk



Questions?

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