



**46th Annual Gun and Missile
Systems Conference**

**Considerations for Performing
a Portfolio Analysis**

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Jon People

April 12, 2011

Agenda

■ **Conducting a Portfolio Analysis**

- What are they
- Goal Programming Models

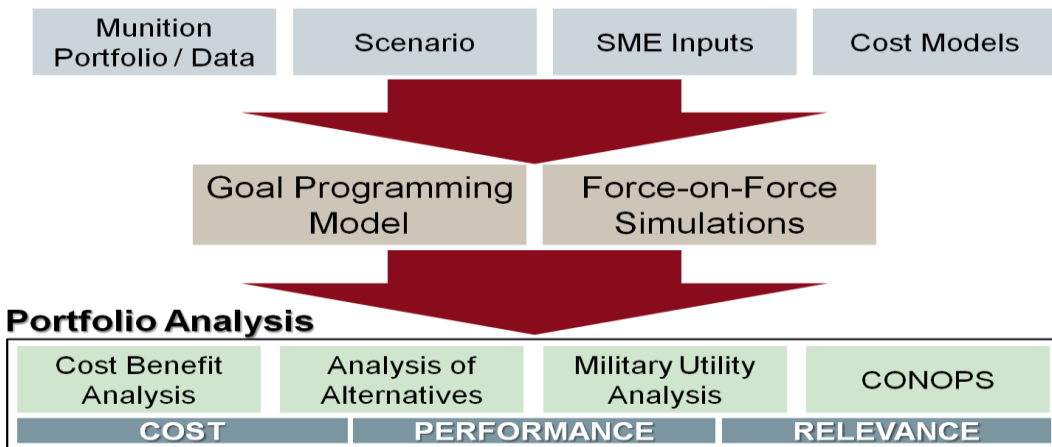
■ **Sample Portfolio Analysis**

- Scenario and Munition Mix
- Results

■ **Conclusions**

Portfolio Analyses

- **Supports SecDef and VCSA memorandums on efficiency, cost-benefit analysis, and buying power**
 - Identify redundancies and gaps in portfolios of munitions, force-structure, and/or equipment
 - Cost-benefit analysis from a portfolio viewpoint
 - Develop efficiencies and eliminate non-essential programs
- **Comprehensive portfolio analysis includes both goal-programming and force-on-force modeling with approved scenarios**
 - Cost, Performance, and Relevance
 - Cost Benefit Analysis, Analysis of Alternatives, Military Utility Analysis, CONOPS



Providing Incentive Greater Efficiency in

- **LEVERAGING REAL COMPETITION:** Avoid blanket buys and other techniques that limit options and contribute to a lack of competitive environment.
- **USING PROPER CONTRACT TYPE FOR DEVELOPMENT AND PRODUCTION:** Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job.
- **USING PROPER CONTRACT TYPE FOR SERVICES:** Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job.
- **ALIGNING POLICY ON PROFIT AND FEE TO CIRCUMSTANCES:** Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job. Use the right contract type for the job.

OFFICE OF THE UNDER SECRETARY OF DEFENSE
 MEMORANDUM TO THE DEFENSE INDUSTRIAL BASE 11 July 2010
 FROM: Brent B. Lankford, Director, Industrial Policy
 SUBJECT: Industry Participation for the Sec Def Ground USD (LATA) Efficiency Initiative

The Department is committed to working with our industry partners as we move forward to control costs, bring greater efficiencies to our use of the taxpayer's money, and ensure we remain a robust and financially healthy industrial base, a critical part of our national power.

This document lays out the approach to be used to pursue both internally and externally the guiding principles of the initiative, the creation, and timely completion of a strategy to achieve the goals of the initiative.

General Process and Objectives

This Efficiency Initiative, authorized by the Secretary of Defense in the memorandum to the Under Secretary of Defense on 11 July 2010, is intended to ensure that the Department and the nation's industrial base are a more efficient and effective partner in the defense of the United States.

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Goal Programming Model Overview

■ Allows for quick-turn Analysis of Alternatives and Cost Benefit Analysis

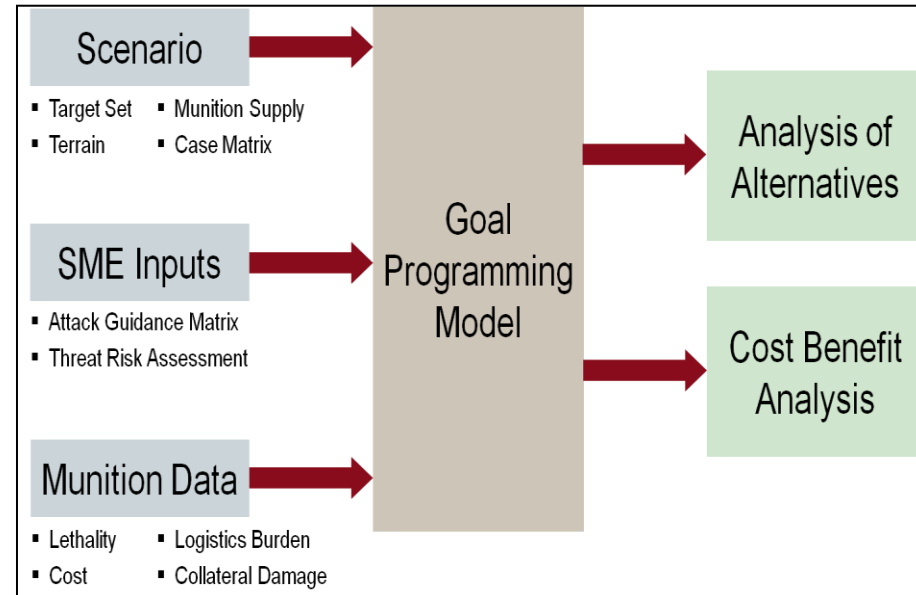
- Model analyzes alternatives based on a set of weighted goals and constraints
 - *Cost, lethality, SME preference, collateral damage, logistics, etc.*
- Scenario definitions are flexible and easily modified to represent different conditions
 - *Eliminate as many targets as possible while adhering to defined goals and constraints*

■ Benefits of GP Model

- Quick turn-around for fast reaction to events
- Ability to analyze large case matrices and munition mix variants

■ Limitations of GP Model

- Not able to quantify benefits to Warfighter effectiveness and survivability
- Output is only valid if chosen scenario and goals reflect real-world situations and intent



Goal-Programming results in different “optimal” solutions based on the user-defined goals and constraints

Major Considerations for an Analysis

■ Munition Mix:

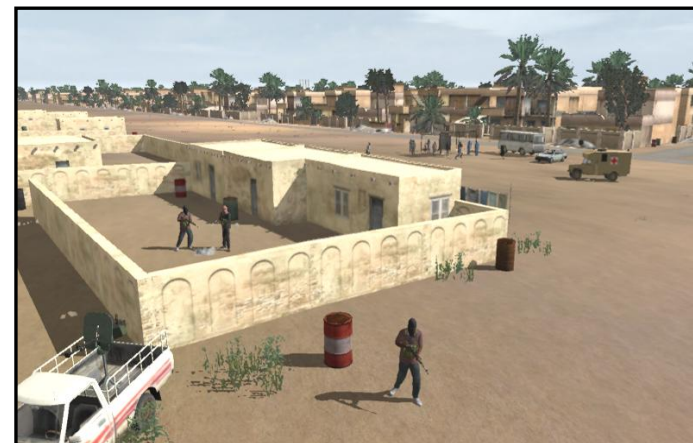
- Entire portfolio must be represented

■ Scenario(s):

- Scenario determines supply of munitions, range to targets, and the target set
- Need to choose a scenario with a target set that fully exercises the entire set of munitions in the mix

■ Goals and Constraints:

- Importance (i.e. weight) given to each goal can have large consequences on final outcome of the analysis
- Need to ensure that model inputs reflect real-world priorities and intent
 - What is the most important goal?
 - Cost? Reduction of Collateral Damage? Logistics? Other?
- Need to ensure that all critical considerations are represented by goals



Inputs into Goal Programming model must reflect real-world intent for Portfolio Analysis to be instructive

Scenario Description

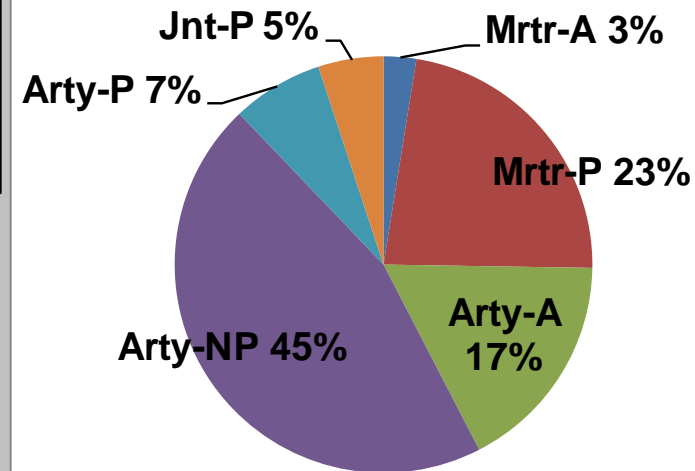
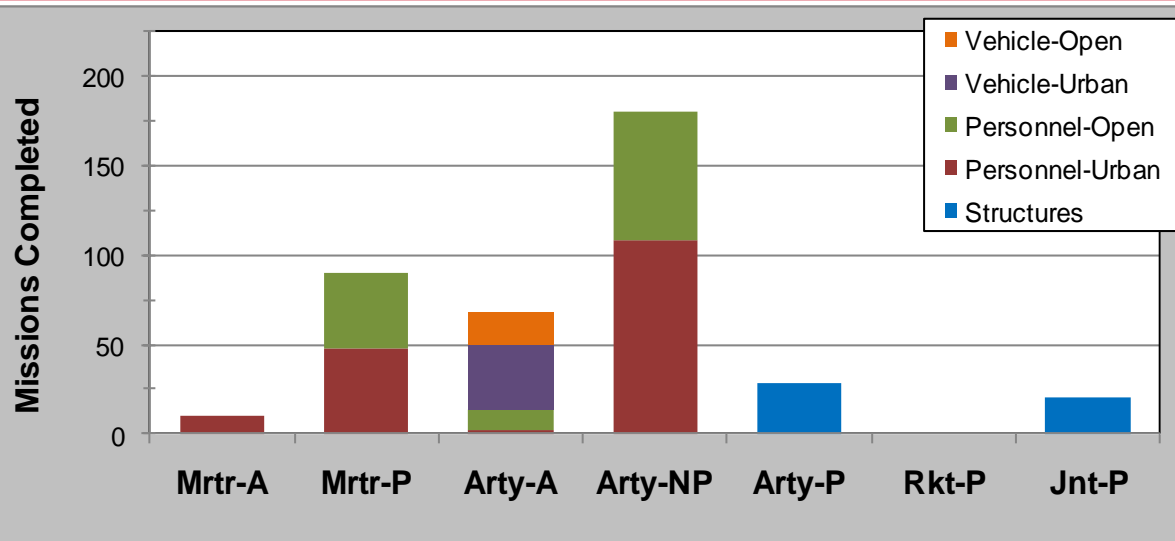
- Based on customer-defined OEF Vignette
- **Blue Forces:**
 - IBCT(-) establishes and maintains Operating Areas to limit enemy’s ability to influence Friendly operations and set condition for long term stability
 - Collateral Damage must be minimized in urban areas
 - Fires Support:
 - Division General Support: 8 155mm Paladins, 4 227mm M270
 - IBCT Motorized RSTA Squadron: 4 120mm M120
 - Joint Air
 - All categories of precision and conventional indirect fires included in munition mix
- **Threat Forces:**
 - Insurgent cells located along mountainsides and urban areas
 - Mix of IEDs, mortars, small-arms fires, RPGs, and trucks
 - Threat uses protective features when possible (walls, rocks)
 - Totals:
 - 9 Personnel Target Types, 4 Physical Target Types
 - 84 Distinct Mission Demands; 396 Total Mission Demands

| | Area 50 – 200m CEP | Near-Precision ≤ 50m CEP | Precision ≤ 10m CEP |
|-----------|--|--------------------------------|----------------------------------|
| Mortar | 120mm (252 / \$750 / 44 lb) | | 120mm (141 / \$15k / 44 lb) |
| Artillery | 105mm (1368 / \$500 / 66 lb) 155mm (1368 / \$1k / 110 lb) | 155mm (450 / \$4k / 110 lb) | 155mm (450 / \$40k / 176 lb) |
| Rocket | | | 227mm (144 / \$100k / 770 lb) |
| Joint | | | 500lb (20 / \$30k / 550 lb) |



Irregular Warfare scenario presents IBCT with a wide variety of targets and missions

Single Goal Consideration: Munition Cost*



■ GP Model Settings

- Minimize Munition Cost is the only goal
- 100% Mission Effectiveness enforced

■ Chart shows the number of missions completed by each munition

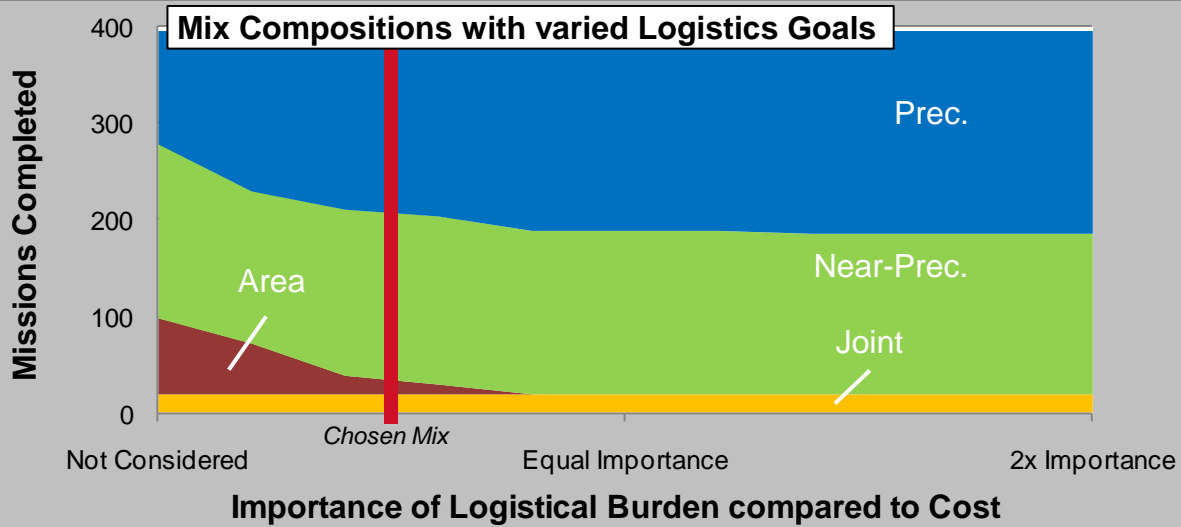
- Color-coding details the type of target eliminated during that mission

■ Results

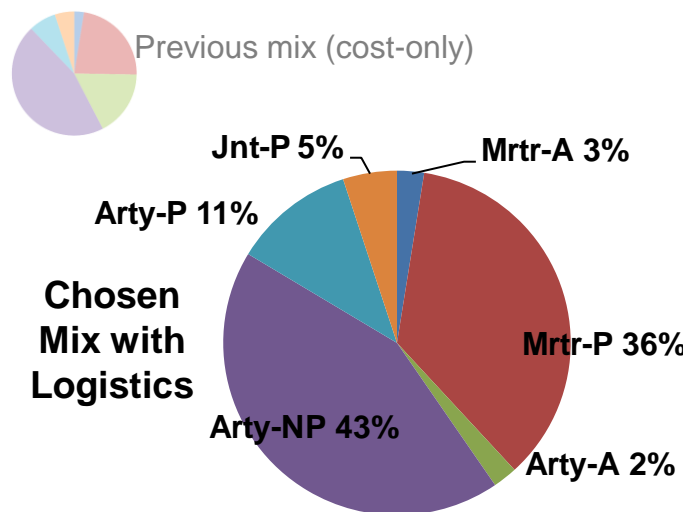
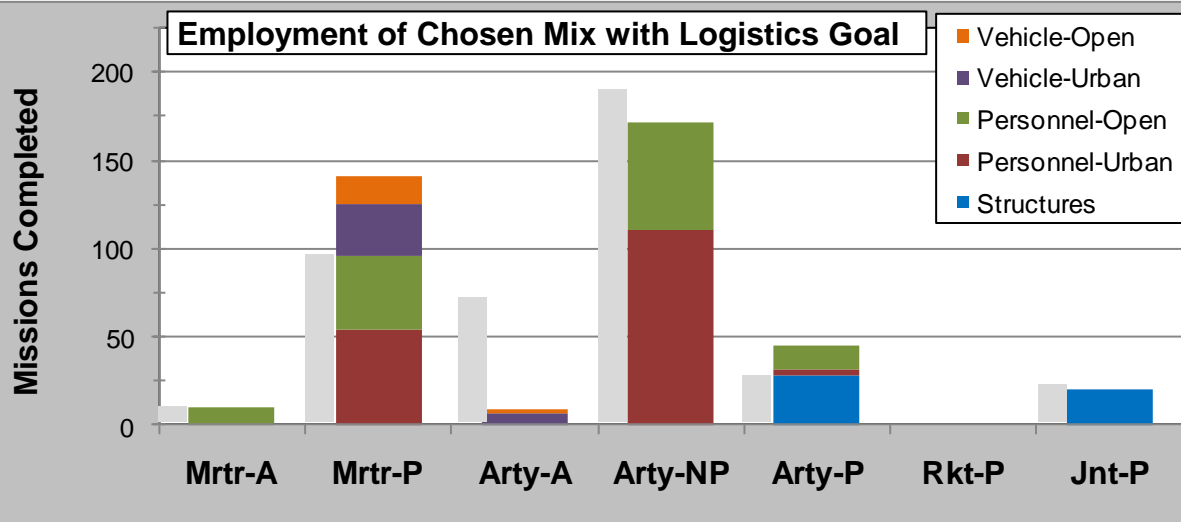
- If Cost is the only goal, large mix of munitions are chosen to complete the various missions
- Near-Precision munition widely used due to being less costly than precision/joint munitions and having increased performance over area munitions
- Precision artillery and joint munitions only used to destroy structure targets due to having higher munition cost

If cost is the only goal being considered, portfolio consists of a mix of conventional, near-precision and precision

New Goal Consideration: Logistics*

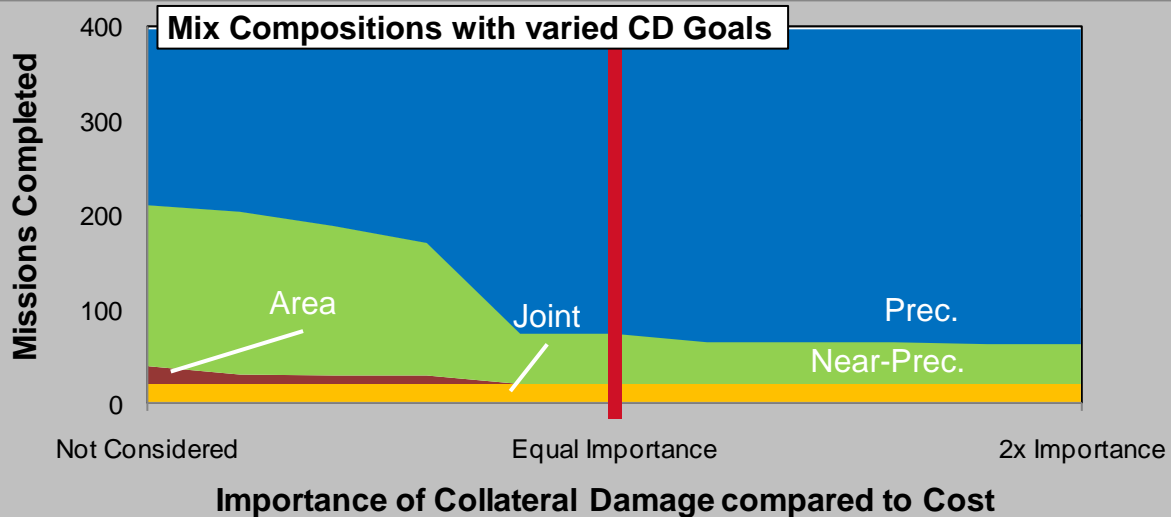


- GP Model Settings
 - Cost weighted at 100% importance
 - Logistic Goal being considered
 - 100% Mission Effectiveness
- Upper chart shows composition of portfolio as logistics goal is considered
- Reducing logistics can drastically reduce overall cost so we considered Logistics to be ½ as important as munition cost
- Weighting Logistics to be ½ as important as munition costs results in a shift from conventional munitions to more efficient and effective precision munitions

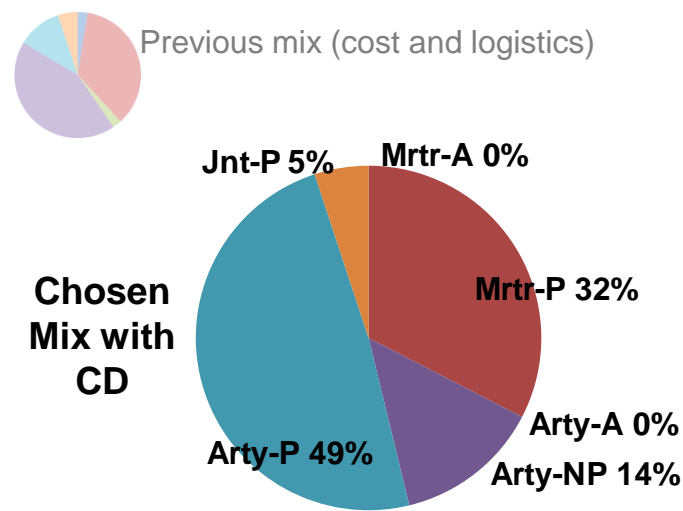
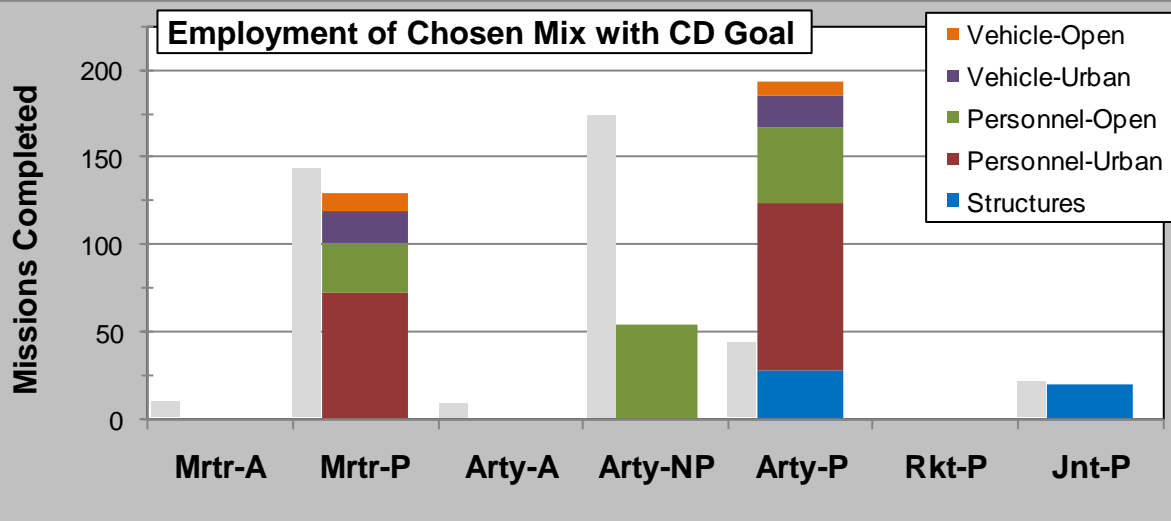


When Logistics is considered with Munition Cost, portfolio begins to shift more towards more efficient and effective precision munitions

New Goal Consideration: Collateral Damage (CD)*

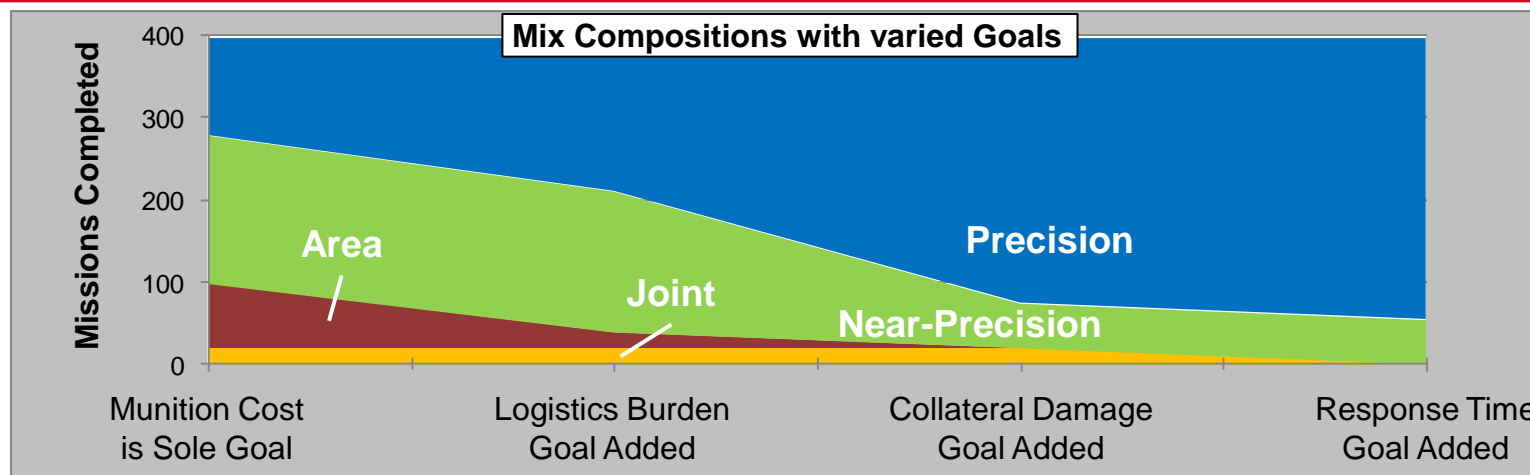


- GP Model Settings
 - Cost weighted at 100% importance
 - Logistics weighted at 50% of Cost
 - CD Goal being considered
 - 100% Mission Effectiveness
- Upper chart shows composition of portfolio as CD goal is considered
- Reducing CD is critically important to today's missions so we considered CD to be equally important as munition cost
- Adding CD to the GP Model results in a considerable shift towards precision munitions, especially for Urban targets



Adjusting the GP model to more closely represent the goals of real-world missions results in a considerably different munition mix with large shift to precision

Conclusions



- Analysis shows the importance/weight assigned to goals can greatly effect the portfolio
- Careful consideration must be given to ensure output of model matches mission intent
 - Must ensure that all important goals are represented in the model
 - *Cost, Logistics, Collateral Damage, Platform Response Time, Commander Intent / Attack Guidance Matrix, Mission Risk, Weather, Terrain, Etc.*
 - Must ensure that weighting of goals reflects real-world intent
 - Must ensure that scenario has a target set that exercises the entire portfolio under consideration
- Sample analysis only shows Goal-Programming model results. A full portfolio analysis should combine these with a force-on-force simulation
 - Force-on-force simulation provides the military utility of the portfolio; defines the Warfighter Benefit

When conducting a portfolio analysis, careful considerations must be given to the goals represented in the GP model to ensure that they reflect real-world intent

Questions?

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