Making Affordability Work

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Customer Success Is Our Mission

The Army's Home for Lethality

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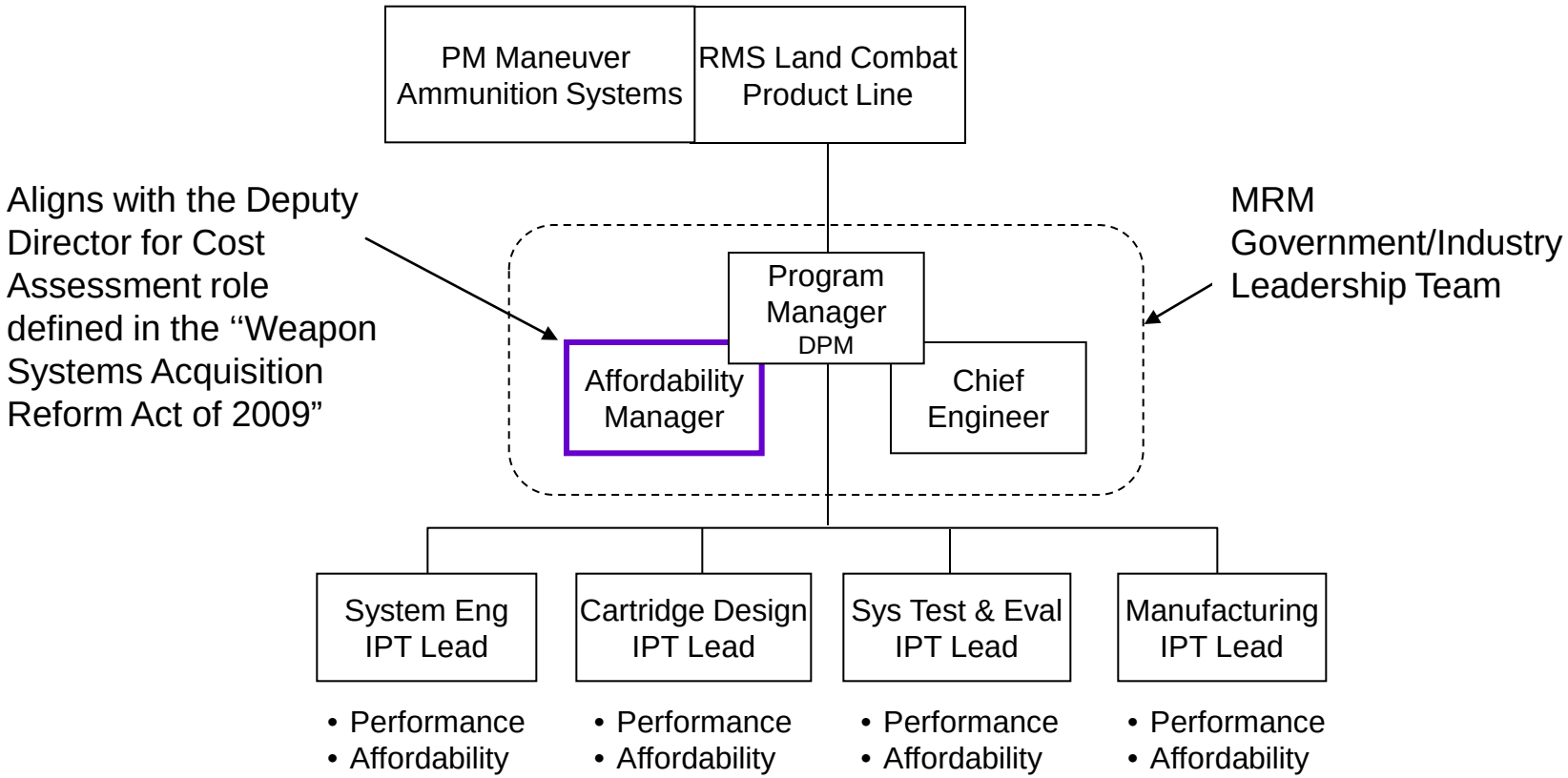
Storyline

- **Application of an Government/Industry affordability approach on one program**
  - Mid-Range Munition – PM MAS
  - Contracting Agency – ARDEC
    - Picatinny Arsenal, NJ
  - Prime Contractor – Raytheon
    - Missile Systems, Tucson, AZ
  - Teammate – General Dynamics
    - Healdsburg, CA
    - Niceville, FL
    - Red Lion, PA
  - Integrated Product Team Approach
- **Creating an environment for success**
  - Program infrastructure
  - Cost model helps identify what drives cost
  - Defining Cost Reduction Opportunities (CROs)
- **Examples of success**
- **Impediments to implementation**

Lean Innovation Played a Big Role in Success

Government/Industry Affordability Leadership



Entire Structure Consists Of Government/Industry Counterparts

New Role Drives Accountability To AUPP

Definitions

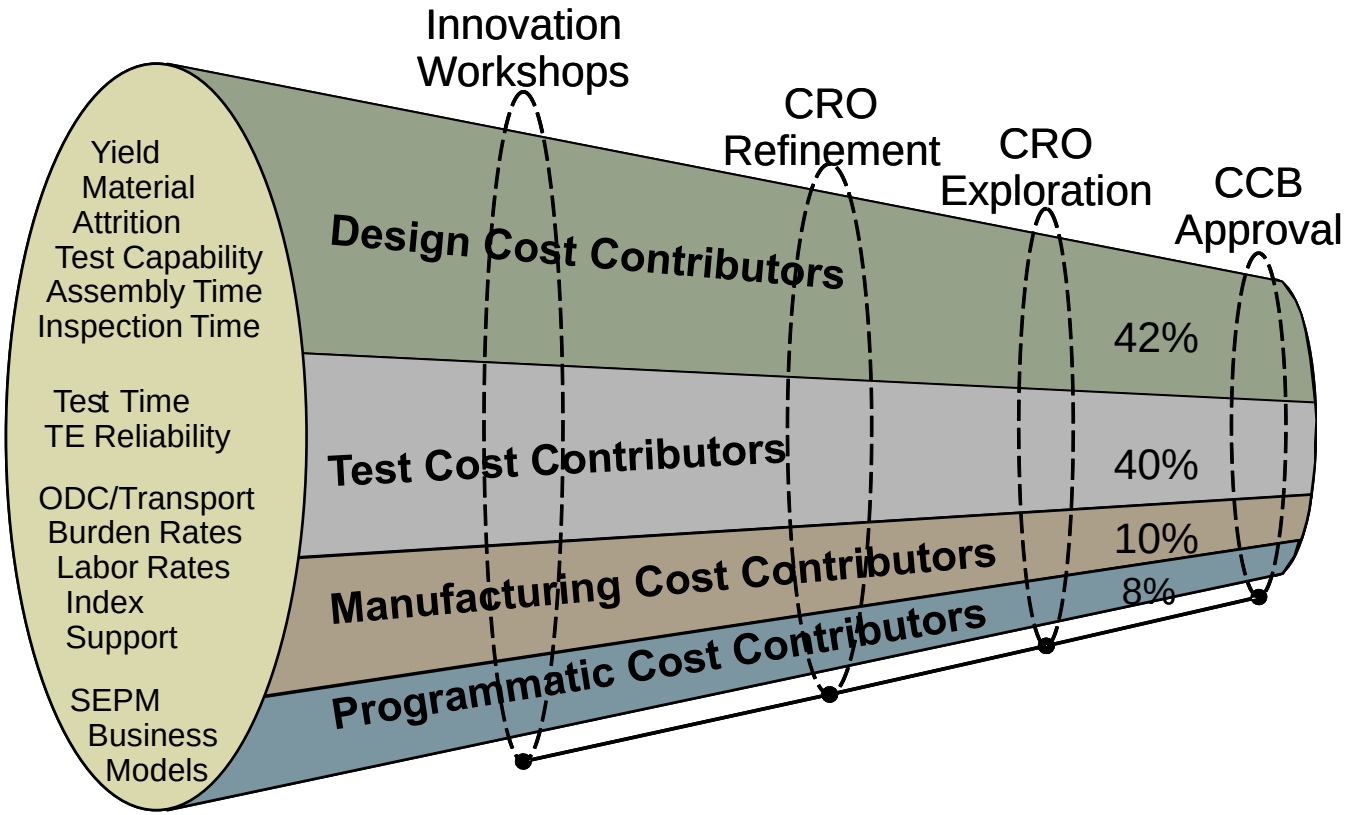
- **Program Affordability Management**
  - **Supervises and structures activities that drive the cost requirement**
  - **Integrates traditionally siloed activities**
    - **Systems Design**
    - **Design Engineering**
    - **Systems Test**
    - **Operations**
    - **Supply Chain**
    - **Life Cycle Engineering**
    - **Program Office**
    - **Knowledge Management**
    - **Cost Estimation**

- **Affordability versus Producibility**
  - **Affordability - Delivery of the desired number of production units at the required cost**
  - **Producibility – The most effective and efficient manufacturing process**

Affordability Instruction Provides Structured Approach

Cost Contributions Identified Across Disciplines

- **Emphasis on system performance does not support cost requirement**
- **System Architecture Defines System Cost**



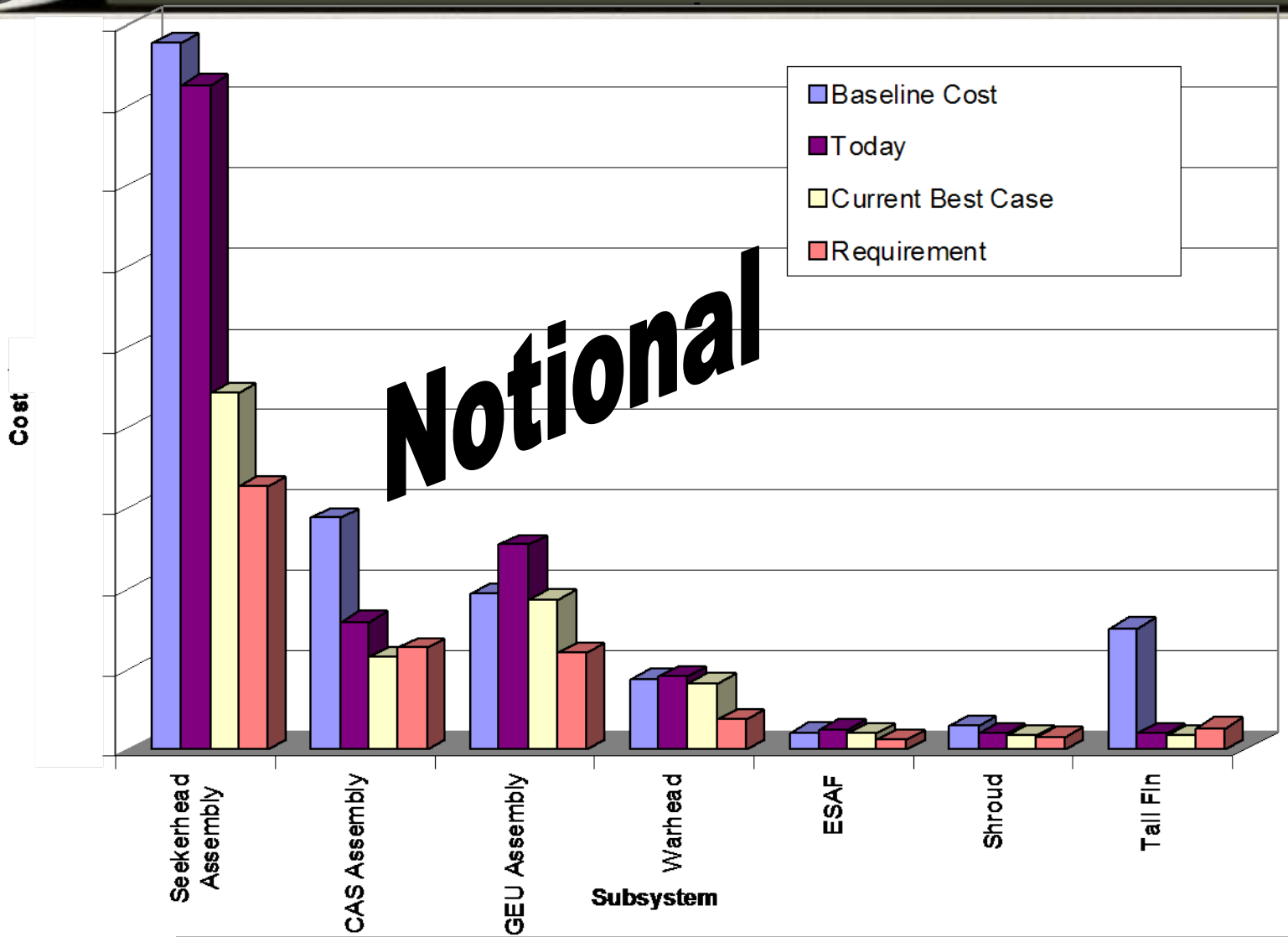
Requirement Trades Guide Cost Reduction Opportunity (CRO)

Enabling An Affordable Solution

- **Know your cost requirements and understand your cost drivers**
- **Aggressively identify cost reduction opportunities**
  - **Identify requirements that drive cost and flow it back to systems engineering**
- **Incorporate Critical Parameter Management to match manufacturing process capability**
- **Make affordability part of individual development goals**
  - **Co-develop an affordability incentive program with the customer**

Making Affordability Work

What Drives Cost?



Close Gap Between Current and Future State

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Best Case = 100% Of CRO Savings Realized

MRM
MID RANGE MUNITION

Identify Cost Reduction Opportunities

Targets/ Tactics	Functions (Purposes)	Sub-Systems (Parts)	Material (Infrastructure)	Processes (Things to Do)	People
Eliminate	Can we eliminate a function? 15	Can we eliminate any parts? 18	Can we eliminate any costly materials? 20	Can we eliminate any process steps? 44	Can we eliminate the need for special skills? 12
Reduce	Reduce functional performance? 13	Reduce parts by combining functions? 12	Reduce amount of materials needed? 9	Reduce complex processes? 20	Reduce number of people required for service? 9
Substitute	Substitute a new function for an old one? 8	Substitute an off-the-shelf parts? 19	Substitute a more easily obtained material? 21	Substitute a known process for a new one? 10	Substitute lower skilled people? 6
Separate	Separate functions to improve use? 5	Modularize parts to make them easier ot service? 3	Separate insert molded parts for easier re-cycling? 2	Separate automated processes from manual ones? 3	Separate dangerous materials from humans? 2
Integrate	Integrate functions to make it easier to use? 8	Connect two parts to deliver more value? 11	Integrate two materials into one part? 8	Integrate several process steps into one? 7	Integrate human tasks into automatic ones? 7
Re-Use	Re-use a previous functional solution? 10	Re-use previously proven design solutions? 9	Re-use well known materials for less risk? 4	Re-use conventional manufacturing processes? 5	Re-use same pople for similar tasks for better quality? 5
Standardize	Specify a standard functional process? 4	Use standard, off-the-shelf high production parts? 9	Use readily available low cost materials? 12	Specify standard service processes? 11	Design product for standard skills and techniques? 5
Increase	Add a function to improve overall value? 16	Add greater value to existing parts? 15	Add materials to deliver more performance? 10	Add processes to assure quality? 12	Add people to provide better, faster service? 6
Total Idea Count: 425					

Aggressively Identify Ideas Through Innovation Workshops

Refining Cost Reduction Opportunities

1. Innovation Workshops

Definition of Trade Space & Cost Drivers

1 – 2 Day Focused Idea Generation

Cross Functional With Outside Thinking

2. Refinement Project

Opportunity Worksheet

Cost Model & Performance Model Analysis

IPT Schedule Insertion Roadmap

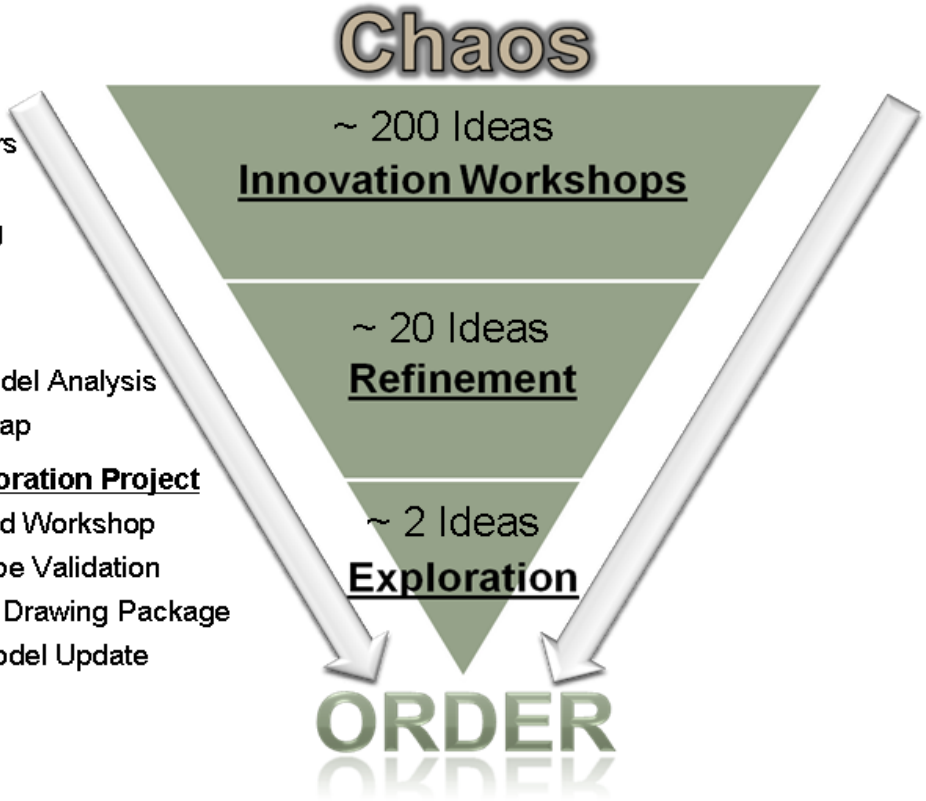
3. Exploration Project

Targeted Workshop

Prototype Validation

Update Drawing Package

Cost Model Update

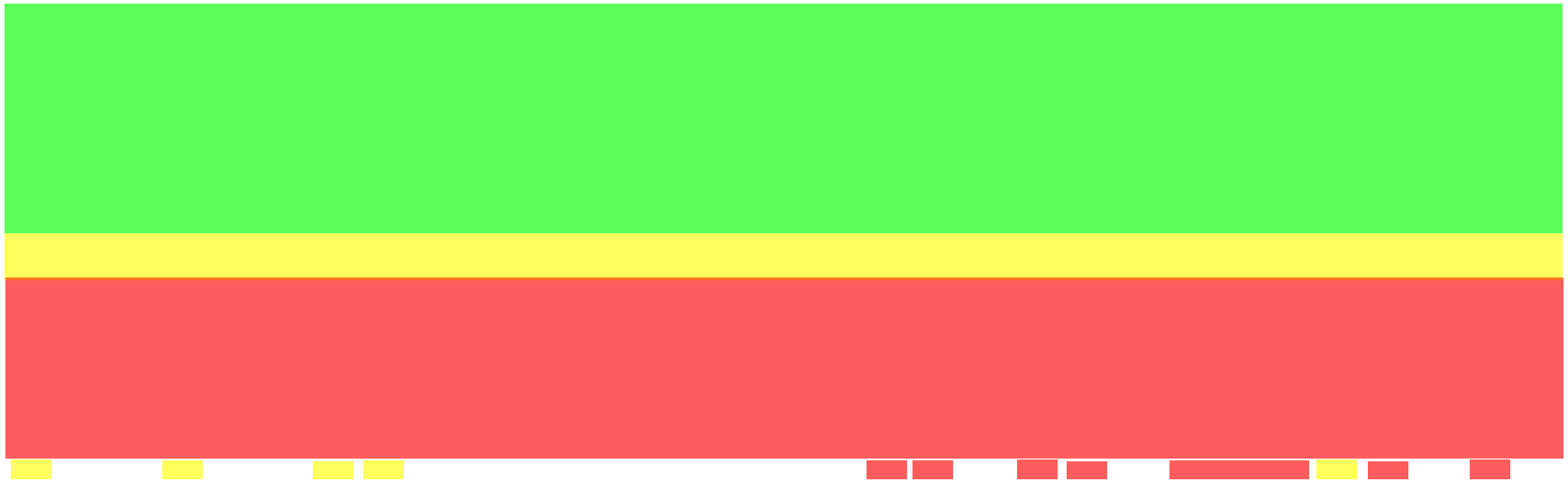


- **Fixed Budget is allocated to reduction activities**
  - **Benefit ratios determine feasibility**
  - **Benefit thresholds determine forward progress**
- **Benefit ratio becomes less efficient as program matures**

Funding Applied To Tiered Improvement Approach

Critical Parameter Management

- **Collects manufacturing variation data**
  - **Provides a quantitative way to focus on design and process capability interaction**
- **Combines design requirements with process capability**
  - **". . . Product variation has been called the "silent killer" on the manufacturing floor . . ." –** GAO Report, Capturing Design and Manufacturing Knowledge Early Improves Acquisition Outcomes



Understand Effects Of Manufacturing Process Capability On The Design

Success Stories

- **First year cost reduction of 40% is ahead of the burn down plan**
  - **Automated seeker test time reduction of 35%**
  - **Seeker design CROs identify a 14% cost reduction**
    - **Gimbal mapping reduction, alternate gimbal actuator**
    - **Injection molding the primary, secondary, and forward support**
  - **Control Actuation System (CAS) CRO insertions reduce material cost by 30%**
    - **Uni-core, low cost motors, machined aluminum canards, new deploy mechanism**

- **Trades resulted in relaxation of secondary seeker mirror requirements**
  - **Design, tolerance, or manufacturing process parameter modifications resulted in significant Cpk improvement**

Affordability Successes Breed Additional Success

Co-developed Incentive Program

- **Industry Incentives**
  - **Dinner and a movie awards**
  - **Peer recognition**
  - **Merit ranking and rating impact**
- **Government Incentives**
  - **Unit Production Cost (UPC) is a significant percentage of the Award Fee throughout the program**
  - **MRM SOW defines unique requirements that drive a change in methodology**
    - **“Provide data & models to assess Life Cycle Cost”**
    - **“Continuously assess each component to identify & reduce cost drivers without compromising KPPs”**
    - **“Summary of Producibility ideas incorporated & estimate of savings”**
    - **“Summary of ideas investigated but not incorporated and why”**

Program Leadership Fosters a Culture Uniquely Aligned On Affordability

Impediments to Implementation

- **Culture**
  - Changing the mindset to make affordability everyone's responsibility
  - Not-invented Here (NIH) – at first there was a reluctance to change from doing things the way we always did them
  - "If you don't do things differently, you will always get the same result"
- **Performance Requirements**
  - All design attributes seem to be equally weighted
- **Broke the cost requirement into manageable lanes (slide 7)**
  - Design team has no bearing on transportation cost
- **Affordability manager controls the budget**
  - Funds dedicated to affordability at the outset of the program – funds supplied by each IPT Lead

Consistent Message from Government/Contractor Counterparts kept the team on track

For Further Information

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