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# Adapting Existing Cost Models to Estimate Section 804 Rapid Prototyping and Rapid Fielding Activities

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# Agenda

- Background – Section 804
- Challenge
- “Best Case” Solutions
- Pragmatic Solution
- Actual Example
- Results
- Summary



# Background – What is Section 804?

- Middle Tier Acquisition (MTA) (Section 804) is an rapid acquisition approach that focuses on delivering capability in a period of 2-5 years
- The interim approach was granted by Congress in the FY16 National Defense Authorization Act (NDAA) Section 804 and is not be subject to the Joint Capabilities Integration Development System (JCIDS) and DOD Directive 5000.01 “Defense Acquisition System” but expires Sep 2019 unless extended
- MTA (Section 804) strives to achieve rapid acquisition by streamlining the testing and deployment of prototypes or by upgrading existing systems with proven technologies
- The implementation approach consists of using two acquisition pathways; MTA Rapid Prototyping and MTA Rapid Fielding.

FY16 NDAA Section 804  
SEC. 804. MIDDLE TIER OF ACQUISITION FOR RAPID PROTOTYPING AND RAPID FIELDING.

(a) GUIDANCE REQUIRED. Not later than 180 days after the date of the enactment of this Act, the Under Secretary of Defense for Acquisition, Technology, and Logistics, in consultation with the Comptroller of the Department of Defense and the Vice Chairman of the Joint Chiefs of Staff, shall establish guidance for a “middle tier” of acquisition programs that are intended to be completed in a period of two to five years.

(b) ACQUISITION PATHWAYS. The guidance required by subsection (a) shall cover the following two acquisition pathways:

(1) RAPID PROTOTYPING. The rapid prototyping pathway shall provide for the use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs. The objective of an acquisition program under this pathway shall be to field a prototype that can be demonstrated in an operational environment and provide for a residual operational capability within five years of the development of an approved requirement.

(2) RAPID FIELDING. The rapid fielding pathway shall provide for the use of proven technologies to field production quantities of new or upgraded systems with minimal development required. The objective of an acquisition program under this pathway shall be to begin production within six months and complete fielding within five years of the development of an approved requirement.

(c) EXPEDITED PROCESS.

(1) IN GENERAL. The guidance required by subsection (a) shall provide for a streamlined and coordinated requirements, budget, and acquisition process that results in the development of an approved requirement for each program in a period of not more than six months from the time that the process is initiated. Programs that are subject to the guidance shall not be subject to the Joint Capabilities Integration and Development System Manual and Department of Defense Directive 5000.01, except to the extent specifically provided in the guidance.

(2) RAPID PROTOTYPING. With respect to the rapid prototyping pathway, the guidance shall include—

(A) a merit-based process for the consideration of innovative technologies and new capabilities to meet needs communicated by the Joint Chiefs of Staff and the combatant commanders;

(B) a process for developing and implementing acquisition and funding strategies for the program;

(C) a process for coordinating with the military departments on rapid prototype projects, to ensure an appropriate commitment to the success of such projects;

(D) a process for demonstrating and evaluating the performance of fieldable prototypes developed pursuant to the program in an operational environment; and

(E) a process for transitioning successful prototypes to new or existing acquisition programs for production and fielding under the rapid fielding pathway or the traditional acquisition system.

Reference: FY16 NDAA Section 804 “Middle Tier Acquisition”



# Background – What is Section 804?

## Rapid Prototyping

Use innovative technology to rapidly develop fieldable prototypes to demonstrate new capabilities, meet emerging military needs

### Objectives

- Field a prototype that can be demonstrated in an operational environment
- Provide for residual operational capability within 5 years of an approved requirement

## Rapid Fielding

Use proven technologies or off-the-shelf capability to field production quantities of new or upgraded systems with minimal development required

### Objectives

- Begin production within 6 months
- Complete fielding within 5 years of an approved requirement

Reference: FY16 NDAA Section 804 “Middle Tier Acquisition”



# Background – Summary of Section 804

	<b>Rapid Prototyping</b>	<b>Rapid Fielding</b>
<b>Purpose</b>	Provide for the use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs	Provide for the use of proven technologies to field production quantities of new or upgraded systems with minimal development required.
<b>Objective</b>	Field a prototype that can be demonstrated in an operational environment and provide for a residual operational capability within five years of the development of an approved requirement.	Begin production within six months and complete fielding within five years of the development of an approved requirement.
<b>Starts with</b>	A merit-based process for the consideration of innovative technologies and new capabilities to meet needs communicated by the Joint Chiefs of Staff and the combatant commanders.	A merit-based process for the consideration of existing products and proven technologies to meet needs communicated by the Joint Chiefs of Staff and the combatant commanders
<b>Includes</b>	<ul style="list-style-type: none"> <li>▪ Developing and implementing acquisition and funding strategies</li> <li>▪ Process for demonstrating and evaluating the performance of fieldable prototypes developed pursuant to the program in an operational environment</li> <li>▪ Transitioning successful prototypes to new or existing acquisition programs for production and fielding under the rapid fielding pathway or the traditional acquisition system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Demonstrating performance and evaluating for current operational purposes the proposed products and technologies</li> <li>▪ Developing and implementing acquisition and funding strategies for the program</li> <li>▪ Considering lifecycle costs and addressing issues of logistics support and system interoperability</li> <li>▪ Opportunities to reduce total ownership costs</li> </ul>
Not subject to the Joint Capabilities Integration and Development System Manual and Department of Defense Directive 5000.01, except to the extent specifically provided in guidance		
Term "major defense acquisition program" does not include an acquisition program or project that is carried out using the rapid fielding or rapid prototyping acquisition pathway (FY18 NDAA Sec 831)		

Reference: AcqNotes.com, Middle Tier Acquisitions



# Challenge

- Readily available data doesn't exist that is consistent with Rapid Prototyping and Rapid Fielding, as defined in Section 804
  
- Further Difficulties
  - Analogous, individual program data may exist, but are owned by an external organization
    - Non-Disclosure Agreement (NDA) may be required
    - Data may belong to a competitor
  - The development of prototype specific cost databases is a lengthy process
    - Identifying, Collecting, Normalizing
  
- For support contractors, our immediate Cost Estimating needs must address estimating prototype satellites using readily available cost models

# “Best Case” Solutions

- Program attributes vector away from using existing USCM CERs and metrics
- Mid-to-Long Term Solution
  - Identify and collect analogous, individual program data points
  - Perform individual adjustments to model specific program attributes
- Longer Term Solution
  - Develop a prototype-specific cost database
  - Lengthy, labor intensive process





# Non-Traditional Government Program Attributes

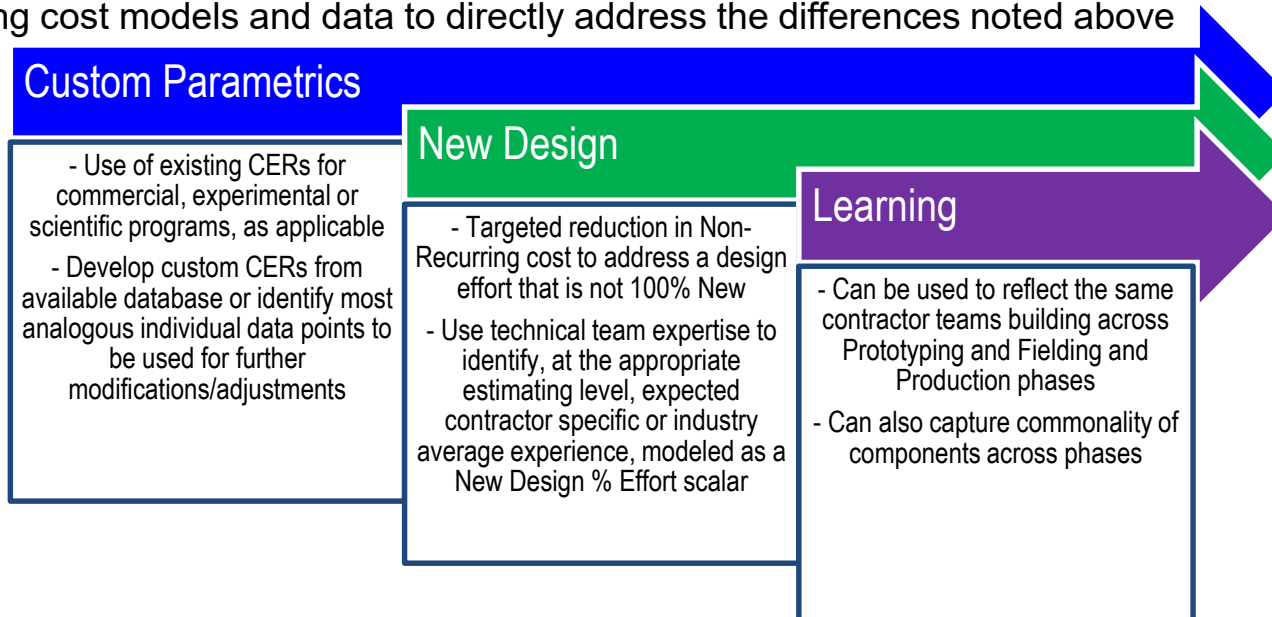
- Multi-phase program approach
  - Contractors will be chosen based on commonality of components from across Prototyping and Fielding Phases
  - The same contractor builds Rapid Prototype 1, Rapid Prototype 2 and Fielding units with the same workforce
- High leverage of commercial SATCOM technology
- Mission assurance approaches for commercial SATCOM components with limited adaptation for unique use
- Payload and Bus make significant use of commercial and government off-the-shelf components
- Industry has experience with mission specific processing algorithms from 2 separate efforts
- Brass board space hardware exists
- Form, fit, function ground hardware exists
- Market research supported designs with significant use of common components
- Government Reference Architecture had many components common to each payload and satellite evolution





# Pragmatic Solution

- Our immediate Cost Estimating needs must address estimating prototype satellites using readily available cost models
- Summary surveys of past research (AFCAA, NRO, etc.) identified that quantifiable program differences exist between Prototypes and Commercial and Govt satellites in areas such as Required New Design, Required Testing (IA&T), Program Oversight, Allowable Mission Risk, SWaP\*, Redundancy\*, and more
- With our SMC customer, MCR has developed an evolving process that develops explicit adjustments to existing cost models and data to directly address the differences noted above



\* The effect of reduced redundancy and scalable payload components in prototypes will likely be captured by the technical teams in the SWaP provided to the cost analyst



# Developing Adjustments

- Custom Parametrics
  - Use of existing CERs for commercial, experimental or scientific programs, as applicable
  - Develop custom CERs from available database or identify most analogous individual data points to be used for further modifications/adjustments
- New Design and Heritage
  - Targeted reduction in Non-Recurring cost to address a design effort that is not 100% New
  - Use technical team expertise to identify, at the appropriate estimating level, expected contractor specific or industry average experience, modeled as a New Design % Effort scalar
- Learning
  - Can be used to reflect the same contractor teams building across Prototyping and Fielding and Production phases
  - Can also capture commonality of components across phases



# Example: Custom Parametrics

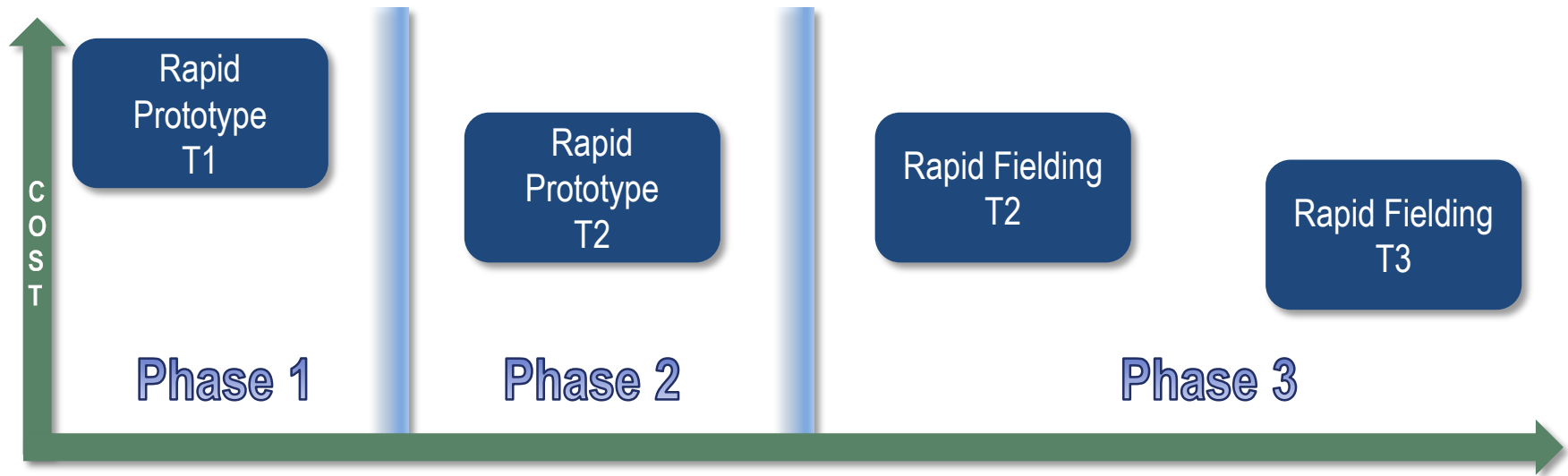
Program Strategy/Attribute	Adjustment(s)
<ul style="list-style-type: none"><li>• High leverage of commercial SATCOM technology</li><li>• Mission assurance approaches for commercial SATCOM components with limited adaptation for unique use</li></ul>	<ul style="list-style-type: none"><li>• Use USCM Commercial CERs to Model Commercial-Like Programs; Rapid Prototype and Rapid Fielding programs not typical government programs</li><li>• Developed custom CERs for components, where data was available and applicable</li></ul>



# Example: New Design & Heritage

Program Strategy/Attribute	Adjustment(s)
<ul style="list-style-type: none"> <li>• Payload and Bus make significant use of commercial and government off-the-shelf components</li> </ul>	<ul style="list-style-type: none"> <li>• Targeted reduction in Non-Recurring cost to address a design effort that is not 100% New</li> <li>• Program Office technical team identified, by component type, average or expected industry experience as a New Design % Effort scalar</li> <li>• New Design % Effort scalar was applied to existing cost model's Non-Recurring Cost Methodology to account for the difference in activities like design engineering, EDU build and test, qualification, and tooling and test equipment, use of off-the-shelf parts, benefit from past performance and prior test experience</li> </ul>
<ul style="list-style-type: none"> <li>• Industry has experience with mission specific processing algorithms from 2 separate efforts</li> <li>• Brass board space hardware exists</li> <li>• Form, fit, function ground hardware exists</li> </ul>	

# Example: Learning



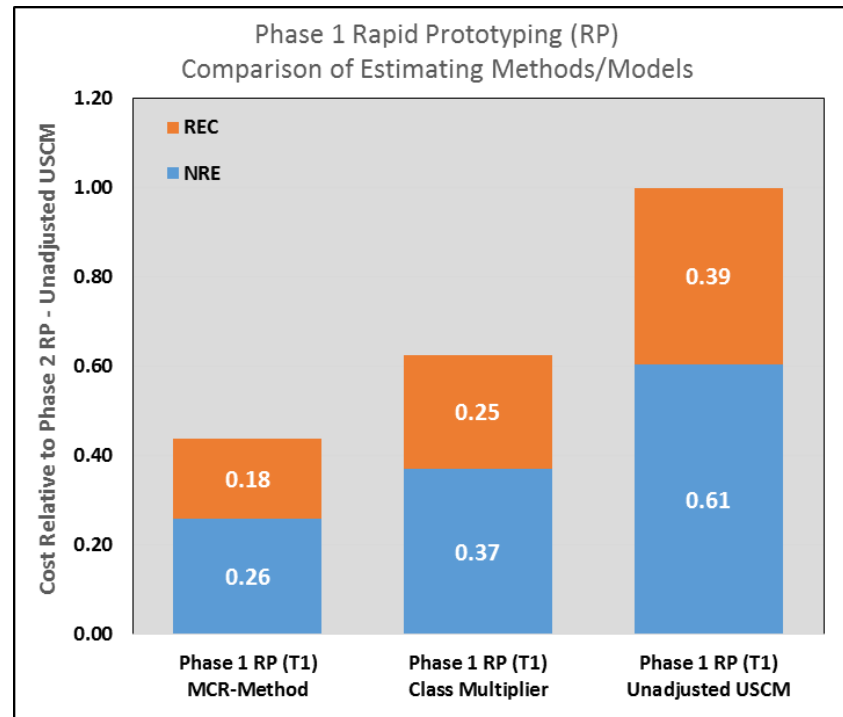
- Market research supported designs with significant use of common components
- Contractors will be chosen based on commonality of components from across Prototyping and Fielding Phases
- The same contractor builds Rapid Prototype 1, Rapid Prototype 2 and Fielding units with the same workforce
- Government Reference Architecture had many components common to each payload and satellite evolution



# Results



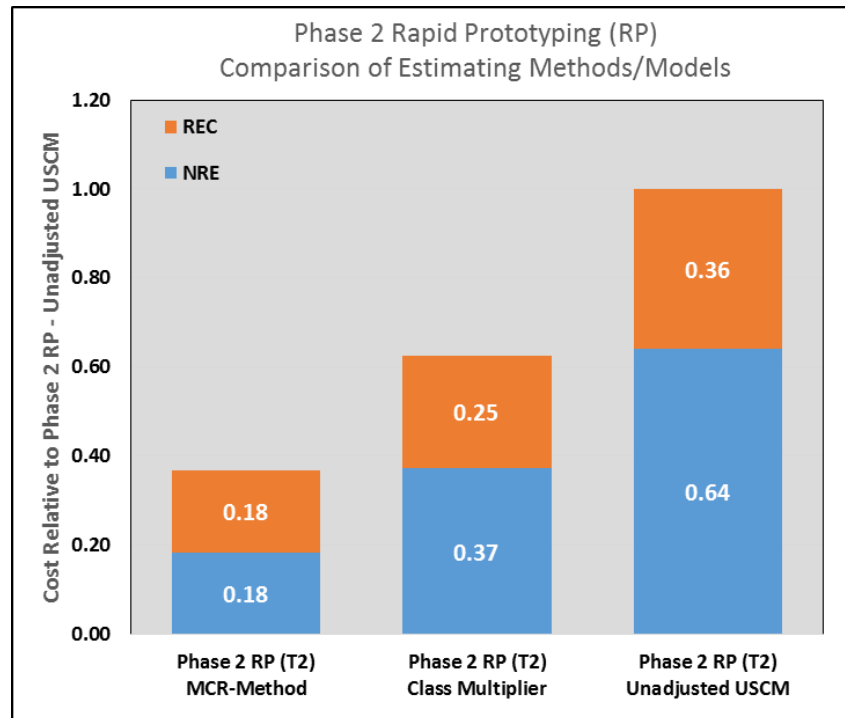
# Results – Phase 1 Spacecraft



- Compared to using unadjusted USCM military system CERs, our method results in:
  - NRE costs 43% lower
  - REC costs 45% lower
  - Phase 1 space vehicle costs 44% lower



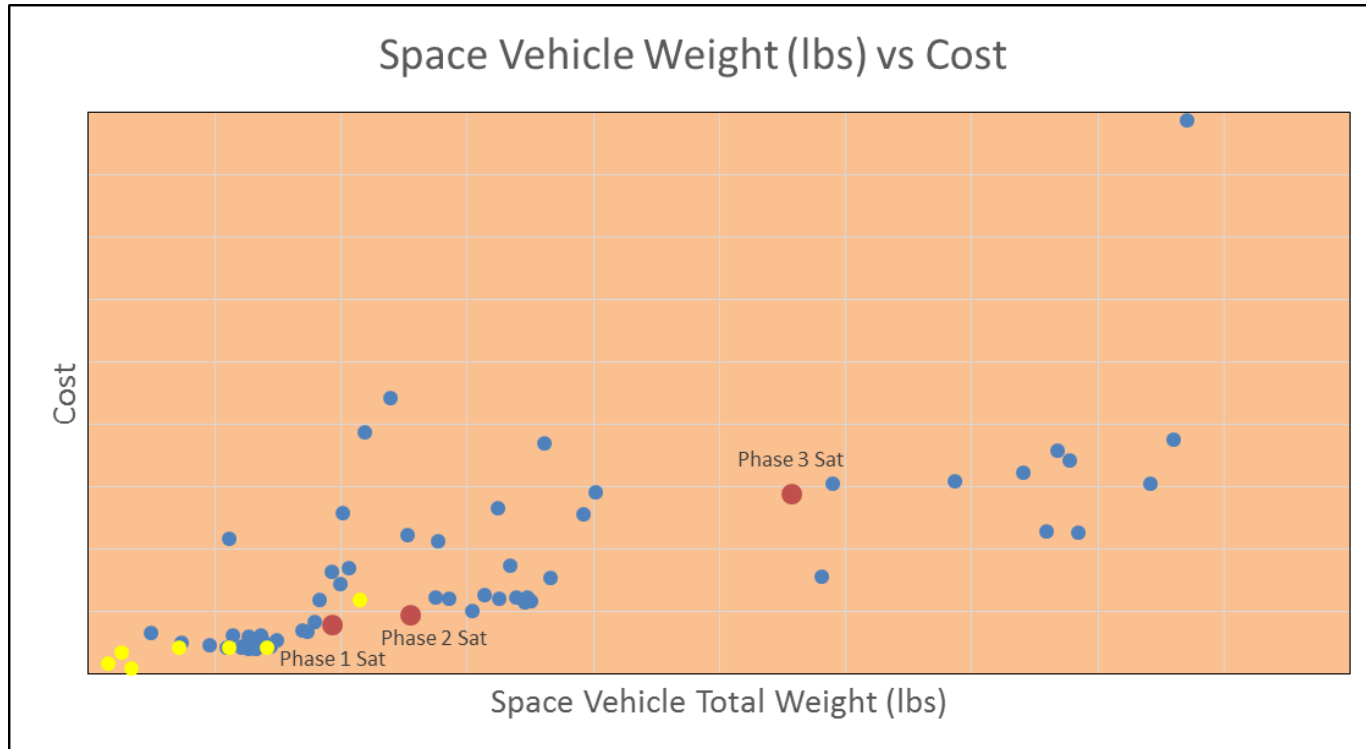
# Results – Phase 2 Spacecraft



- Compared to using unadjusted USCM military system CERs, our method results in:
  - NRE costs 29% lower
  - REC costs 51% lower
  - Phase 2 space vehicle costs 37% lower

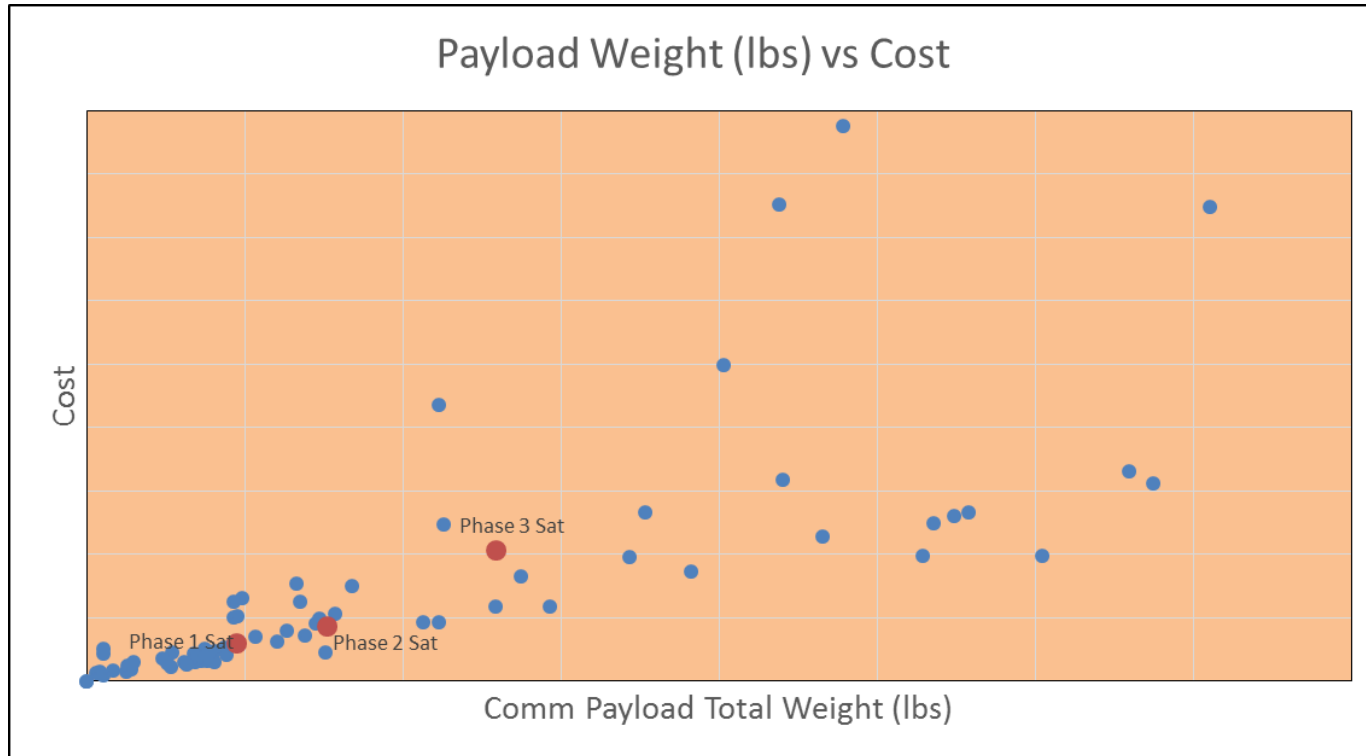


# Results – Space Vehicle Level



- Results show expected relationship across the program/product evolution
  - Costs increase as size, design life and capability increase across the program phases
  - Results are consistent with historical data for prototype-like systems (yellow data points)

# Results – Space Vehicle Level



- Costs increase as size, design life and capability increase across the program phases
  - Phase 1 and 2 costs are in family, but at lower end, of similar size payloads
  - As expected, Phase 3 costs (Production) are in family with similar size payloads



# Summary

- Preliminary results are consistent with technical assumptions and show expected relationship across the program/product evolution
- Preliminary results are consistent with historical data for prototype systems
- Our evolving process allows for responsiveness to program specific attributes and to changes to a program's acquisition strategy
- Our process enabled a successful external Cost Estimating Review
- Next steps...program phases



# References

- PUBLIC LAW 114–92—NOV. 25, 2015, FY16 National Defense Authorization Act (NDAA), Section 804 “Middle Tier Acquisition”
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- Demonstration Satellite Cost Model (DSCM): Executive Documentation, January 2011
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