## Financial Management & Comptroller Directorate

SPACE AND MISSILE SYSTEMS CENTER



# Unmanned Space Vehicle Cost Model Past to Present

Prepared for ICEAA 2018

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### Introduction

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#### Who we are

#### **Chinson Yew**

Chief of Cost of Research @ SMC/FM

#### **Ben Kwok**

Principal analyst @ Tecolote Research USCM task lead

### What we hope to accomplish

- Provide a brief overview of the Unmanned Space Vehicle Cost Model (USCM).
- Share lessons learned.

# Overview of content





## SMC/FMCR Overview

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**Mission:** To provide timely and value-added cost research products that support cost estimating activities at SMC and the DoD Space Cost Community.

### **Commodities**

- Space\*
- Software\*
- O&S\*
- Ground\*
- Launch\*

### **Industry Collaboration**

- CIPTs
  - SMC, NRO, NASA, S/W, O&S, Launch
- Joint Space Cost Council (JSCC)
- Air Force
- OSD

### **Standards/Policy**

- CADE\*
- SRDR\*
- MIL-STD 881D\*

### **Research and Analysis Efforts**

- Time phasing costs\*
  - SW estimating & guidance\*
- Nonrecurring costs
- Engineering Change Order (ECOs) factors\*
- Cost models (USCM, LVCM)\*

- Data collections (sensors, small sats\*)
- Estimating crosschecks
- Weight growth factors\*
- SEITPM
- Cyber security / information assurance\*

- Business Case Analysis
- Economic Analysis
- Economic Impact Analysis\*
- Schedule Risk Analysis

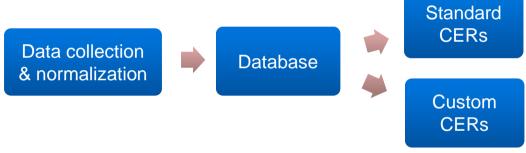




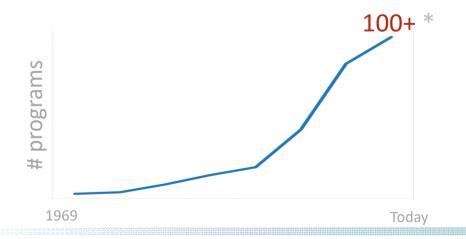
## **USCM** Overview

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The Unmanned Space Vehicle Cost Model is a suite of products that uses end-of-program costs to help the SMC estimator.



### **USCM** growth over time







### **USCM** websites

public vs proprietary

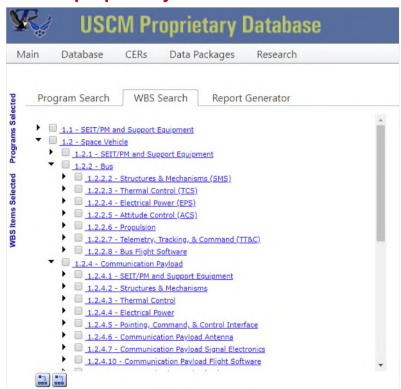
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#### **USCM** public website

LISON CERE		ecuring (11) CERs			
State of Contents	CER Category	Abbreviated Scope	CER		Variable Definition
- Submissioneris	Seace Vehicle				
- 1. Introduction					
- 2. Model Sackground & Framework	SERM				
- 3: USCM Detatase Development					
4. Evaluation of Cost Estimating Relationships					
5. Applying the block:     6. Estimating Errors & Sensitivity Analysis	Integration, and Test				
- Appendix J.: Program Resumes					
- Appendix 5 - Guidanux & Estimating Approaches	tota protein, and Test				
- Appendix C - N/LPE Regression Technique					
- Appendix D - Actual Its Estimate Pluts	Space Vehicle Support Equipment				
- Appendix E - USCM fromalization Process					
- Appendix F - MILETO BE1 WIEL	Space Vehicle Support Equipment				
Appendix D - Changes to Previous Versions of USOM     Appendix H - Accorpting & Abbreviations	Specie Vehicle Surgort Equipment				
F Data Protection Training	Environment				
1. Data Protection Agreement.	Seececraft Dus				
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- 3. Acknowledgement Form	Seasonal Dus				
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pacecraft Bus	New bus d software.	lesign. Exclud	es	NR =	

US citizens who are gov't employees, contractors, and students can get access @ www.uscmonline.com

#### **USCM proprietary website**



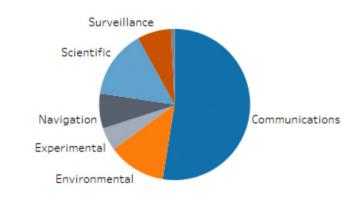
Accessible via SMC intranet and by approved users only.



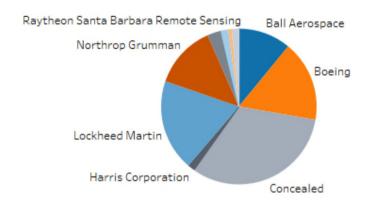
## **USCM Statistics**

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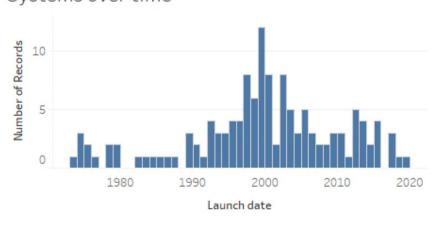
### Satellite mission types



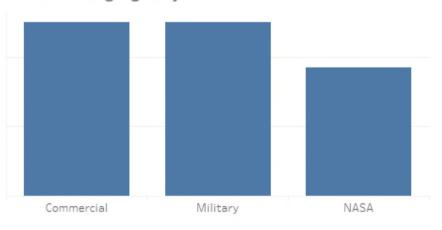
#### Contractor representation



#### Systems over time



#### Contracting agency





### Lessons learned

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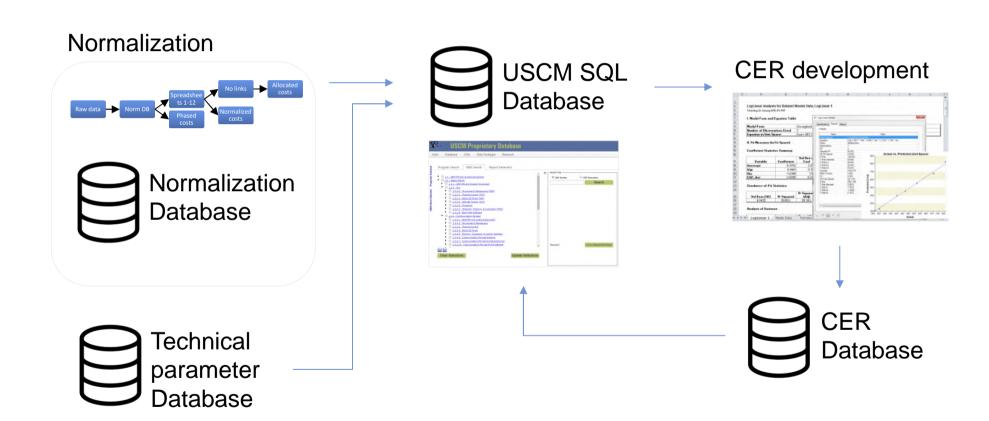
- Process
- New techniques
- Cost metric insights
- Community



### **Process**

Automation and production pipeline

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# New techniques

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### Data quality score

Using algorithms to quantify data quality

Accuracy of NR/R split

+ # accounts or rows

% of allocations

Are costs complete?

### **Co\$tat Database**

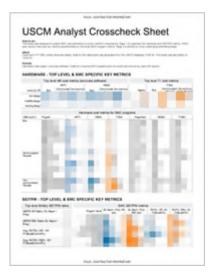
Analytics approach to model validation



#### **Crosscheck sheets**

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Utilizing data visualization to quickly inform the analyst







# Cost metric insights

Useful, intuitive... situational SPACE AND MISSILE SYSTEMS CENTER

### NR/T1

Development to first unit production ratio

#### Observation

- Noisy metric
- NR/T1 impacted by quantity and scale

### \$/lb

Dollars per pound

#### Observation

- Most satellite CERs are non-linear
- \$/lb metrics only applicable in a given weight range

### **Ratios**

Level of effort to Prime mission product

#### Observation

- Works when numerator scales w/denominator
- First bullet not always true

### NR/T1 comparison



Slope A > Slope B







# Community

Staying engaged

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# Cost research roadshow

Program office outreach to understand estimating needs and to guide future model updates.



# Contractor engagement

SMC holds bi-annual cost IPTs to collaborate with the hardware contractors. We come to a common understanding of how to interpret the data.



# Estimating support

We also provide surge support to help develop estimating methods.



### **Training**

We ensure the SMC staff understands how to use USCM.



# Thank you ICEAA!

We hope this sparks ideas

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Q&A

Please reach out

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