Financial Management & Comptroller Directorate

SPACE AND MISSILE SYSTEMS CENTER

Unmanned Space Vehicle Cost Model Past to Present

Prepared for ICEAA 2018

Chinson Yew (SMC/FM)
Ben Kwok (Tecolote Research)

Introduction

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

SPACE AND MISSILE SYSTEMS CENTER

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

SPACE AND MISSILE SYSTEMS CENTER

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

Data collection & normalization → Database → Standard CERs, Custom CERs

USCM growth over time

USCM Users

SMC

Other government

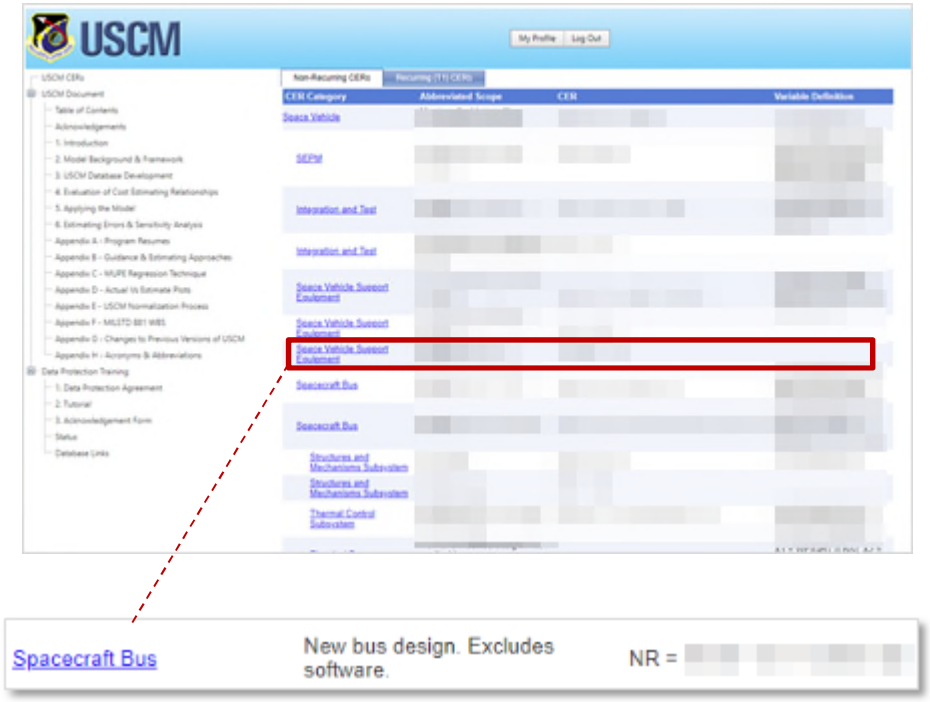
Contractors, FFRDC, Universities

USCM websites

public vs proprietary

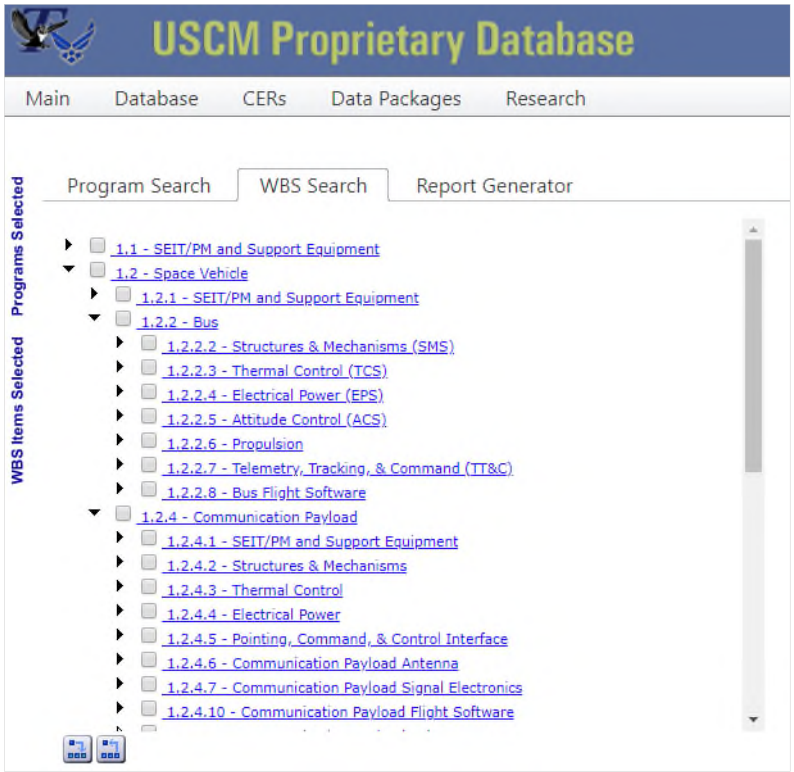
SPACE AND MISSILE SYSTEMS CENTER

USCM public website



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

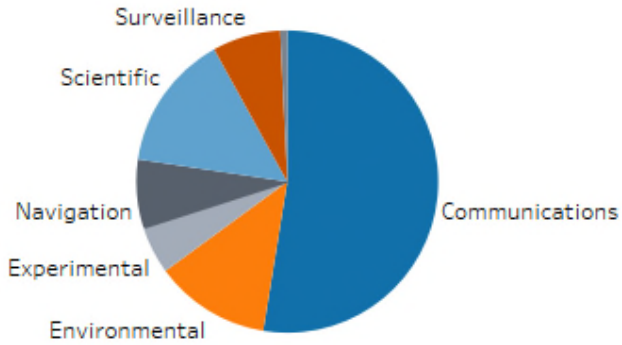
USCM proprietary website



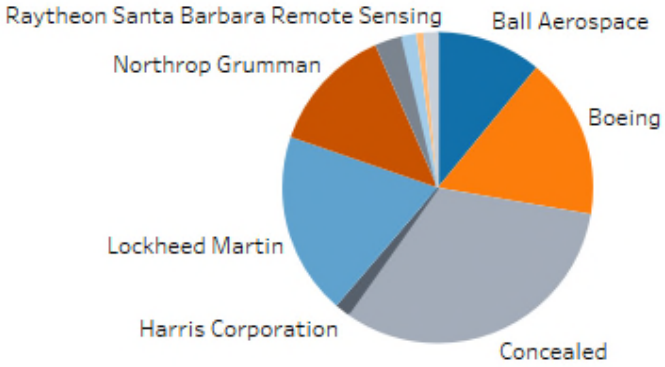
Accessible via SMC intranet and by approved users only.

USCM Statistics

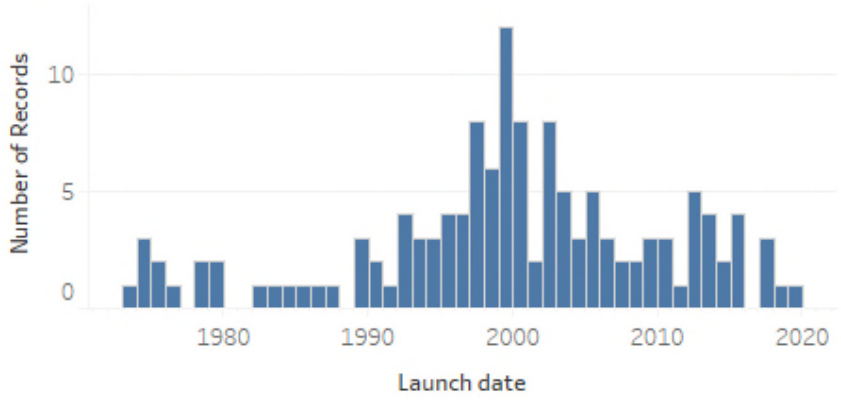
Satellite mission types



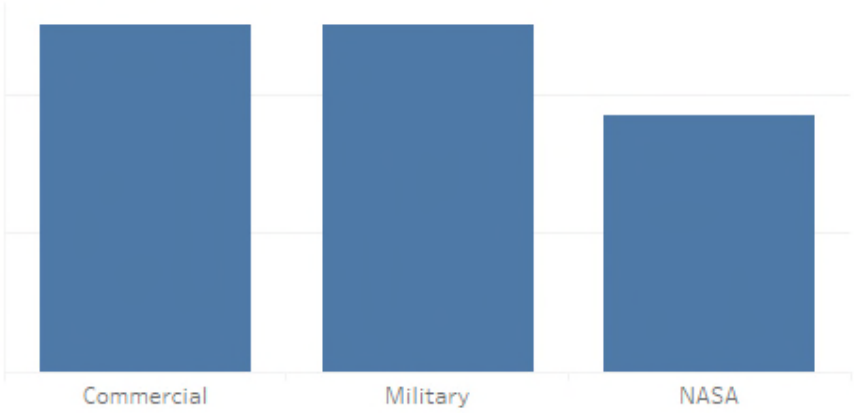
Contractor representation



Systems over time



Contracting agency



Lessons learned

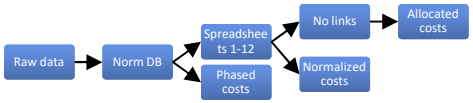
- Process
- New techniques
- Cost metric insights
- Community

Process

Automation and production pipeline

SPACE AND MISSILE SYSTEMS CENTER

Normalization

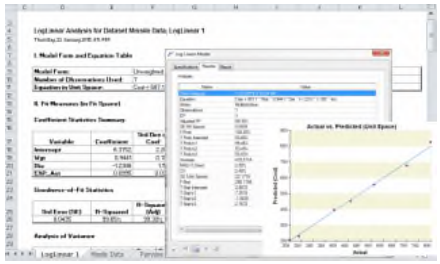


Normalization Database

Technical parameter Database

USCM SQL Database

CER development



CER Database

New techniques

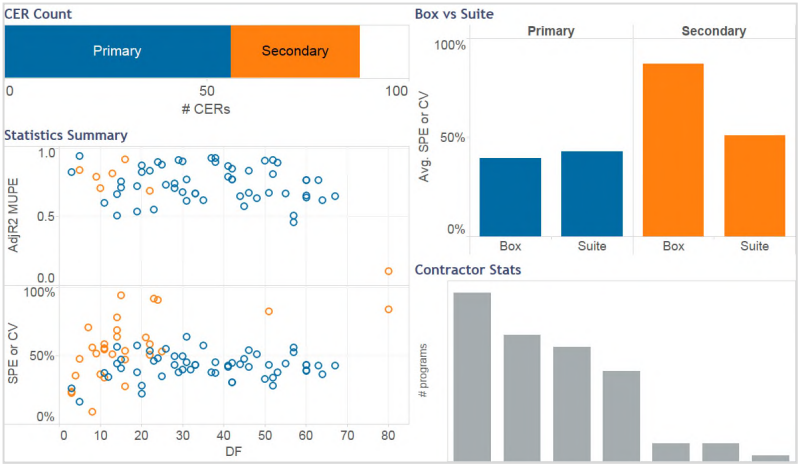
Data quality score

Using algorithms to quantify data quality

Accuracy of NR/R split + **# accounts or rows** + **% of allocations** + **Are costs complete?**

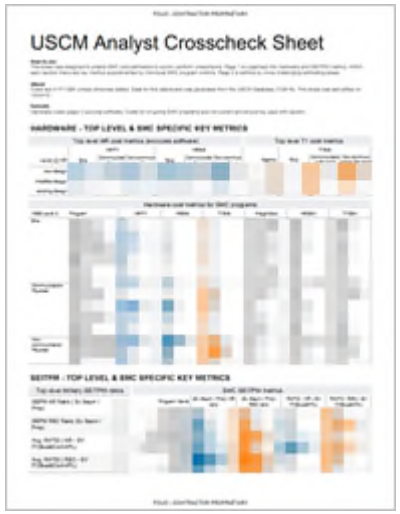
Co$tat Database

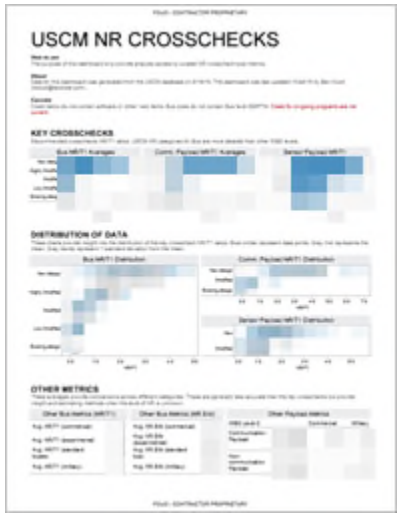
Analytics approach to model validation



Crosscheck sheets

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

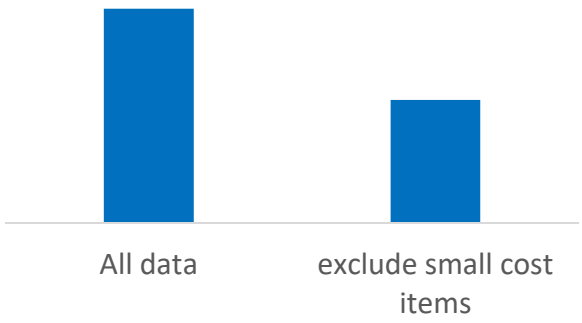
Ratios

Level of effort to Prime mission product

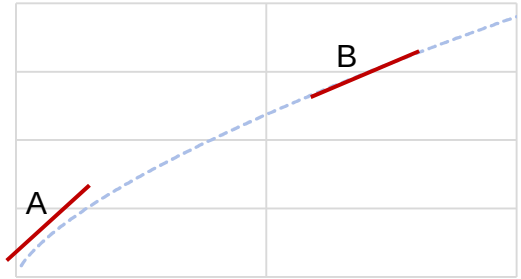
Observation

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

NR/T1 comparison



Slope A > Slope B



$$\frac{\text{LOE}}{\text{PMP}}$$

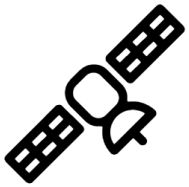
Community

Staying engaged

SPACE AND MISSILE SYSTEMS CENTER

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

SPACE AND MISSILE SYSTEMS CENTER

- Q&A
- Please reach out

Chinson Yew
Phone: 310-653-2692
Chinson.Yew.2@us.af.mil

Bruce Thompson
Phone: 310-653-1710
Bruce.Thompson.11@us.af.mil

Ben Kwok
Phone: 310-640-4700 x52231
bkwok@tecolote.com