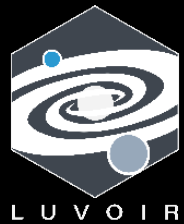
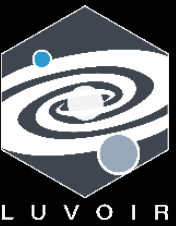


# Aerospace's Assessment of Risk vs Cost

# Intro



- Notes presented are taken from “CATE Overview Astro2020 Large Mission Concepts” presentation by The Aerospace Corporation in September, 2016
- Some LUVOIR specific notes are included to show where LUVOIR stands qualitatively
- Original Aerospace Presentation can be found at <https://asd.gsfc.nasa.gov/luvoir/events/events/telecons/2016-09-20/emmons.pptx>



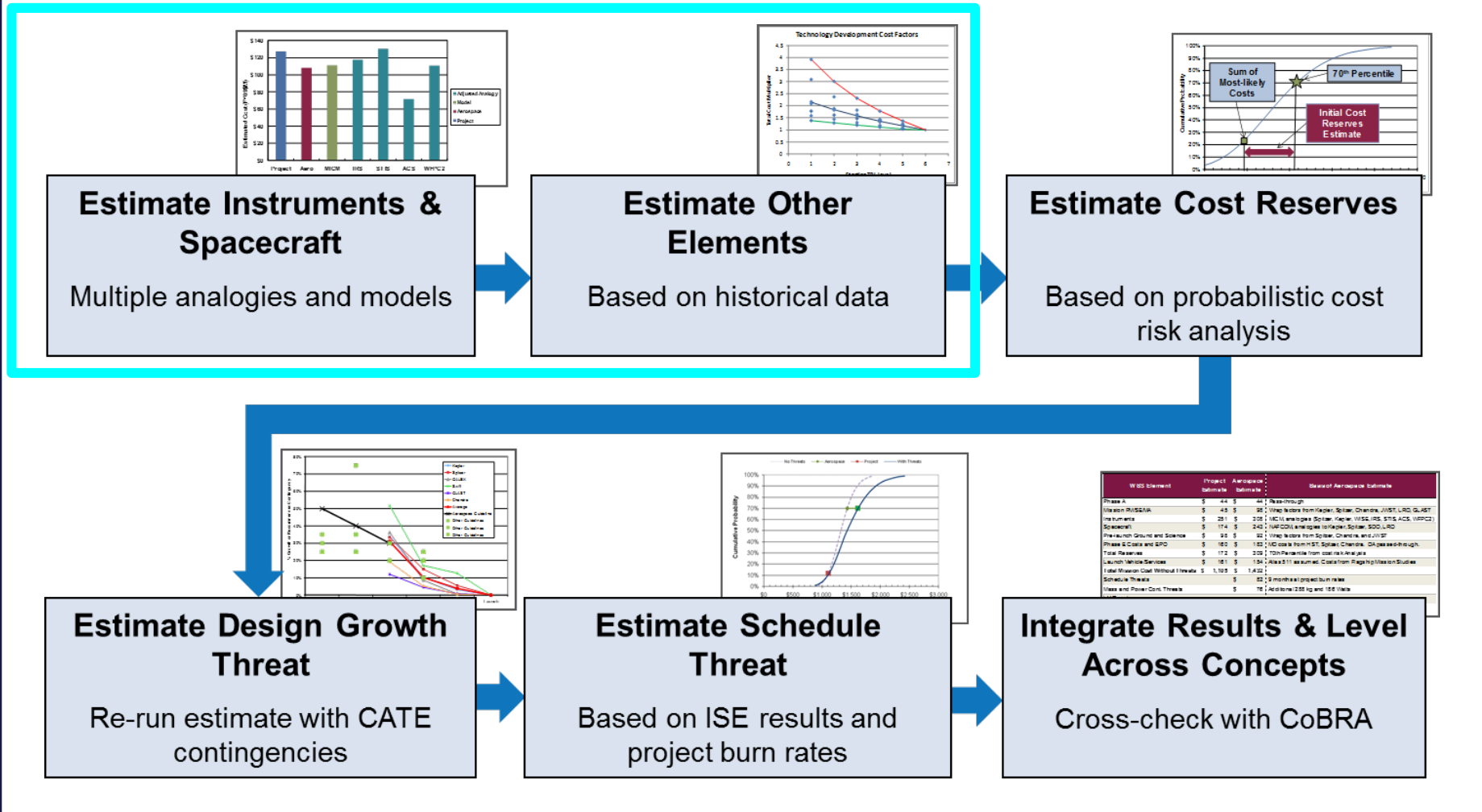
# What is the CATE?

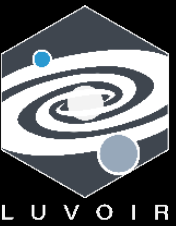
- The CATE process was developed by NAS/Aerospace for recent Decadal Surveys
  - Congress mandates the use of the CATE
  - CATE estimates are required to reflect historical project growth

# What is the CATE?



Engineering team presented our version of this at the previous STDT meeting.

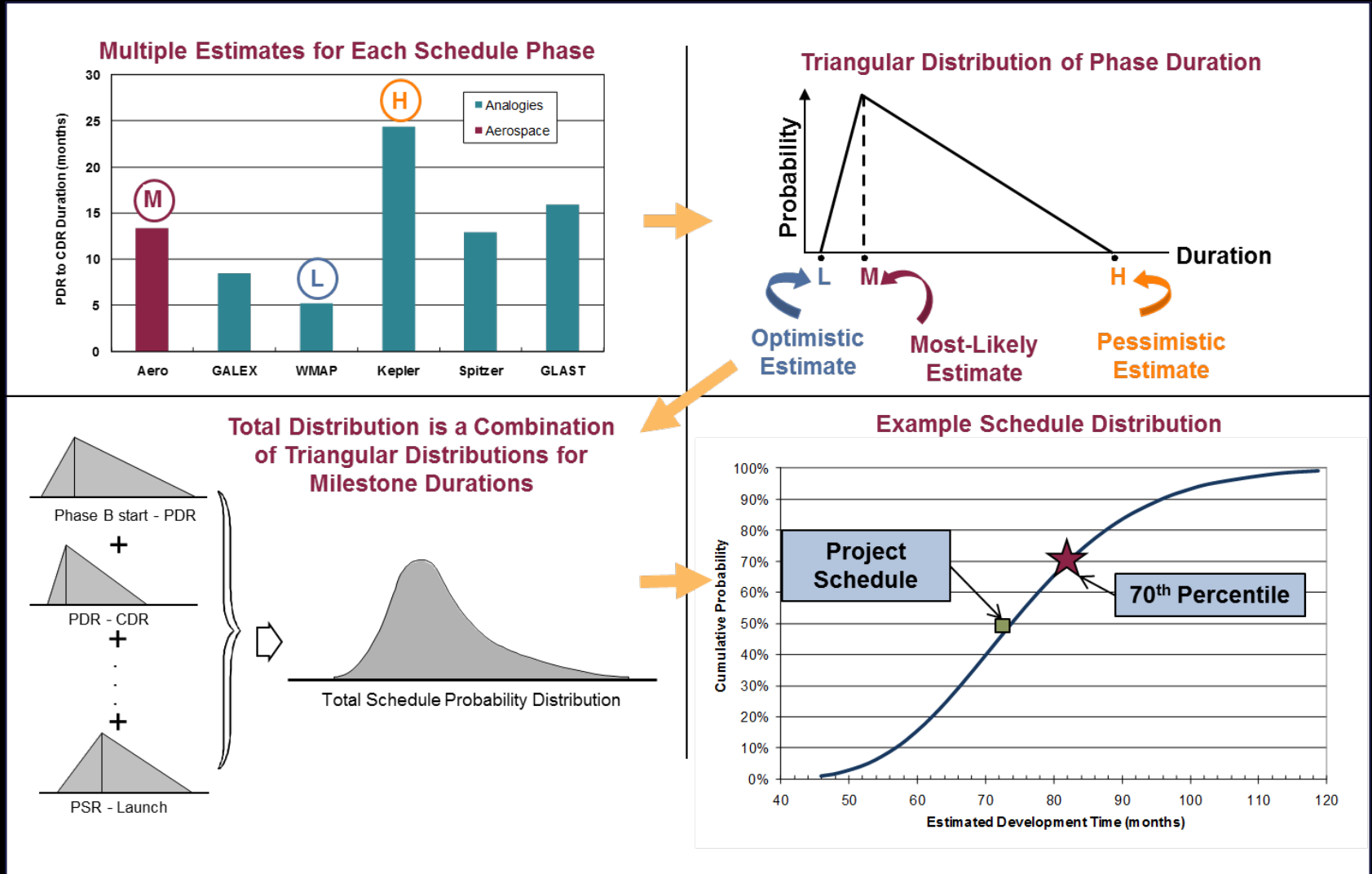




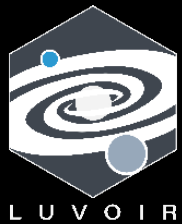
# What is the CATE?

- CATE process differs from typical Independent Cost Estimate (ICE) process
  - Starts with ICE
  - *Adds three types of cost threats*, where appropriate:
    - Schedule
    - design (mass & power growth), and
    - launch vehicle

# Analogy Based Schedule Risk Process Overview

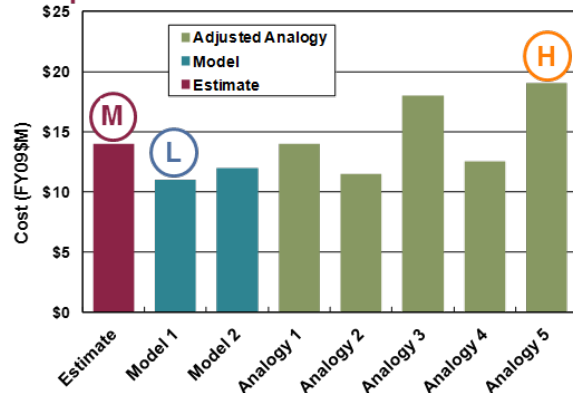


# Cost Risk Process Overview

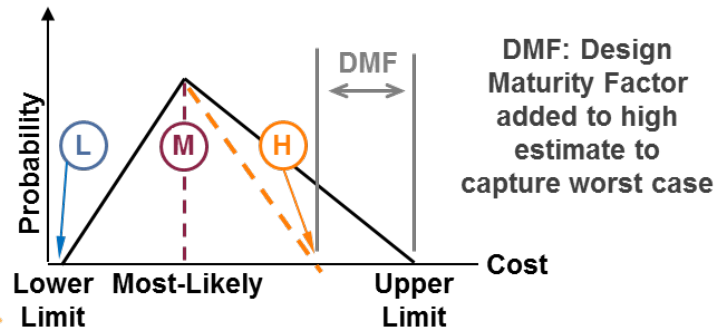


Used to estimate reserves

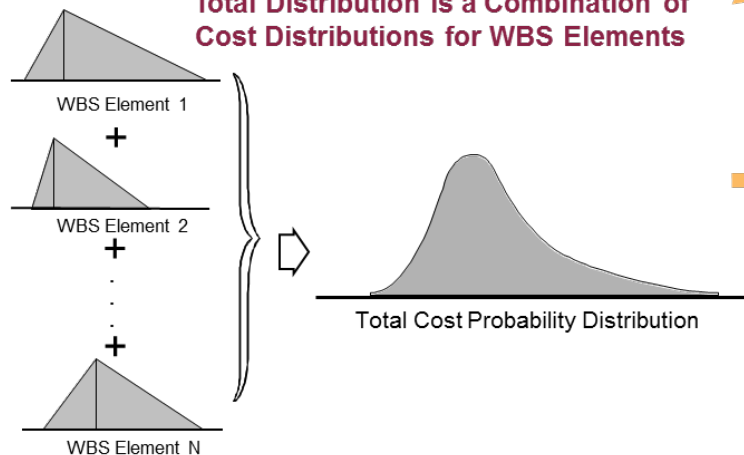
Multiple Cost Estimates for Each WBS Element



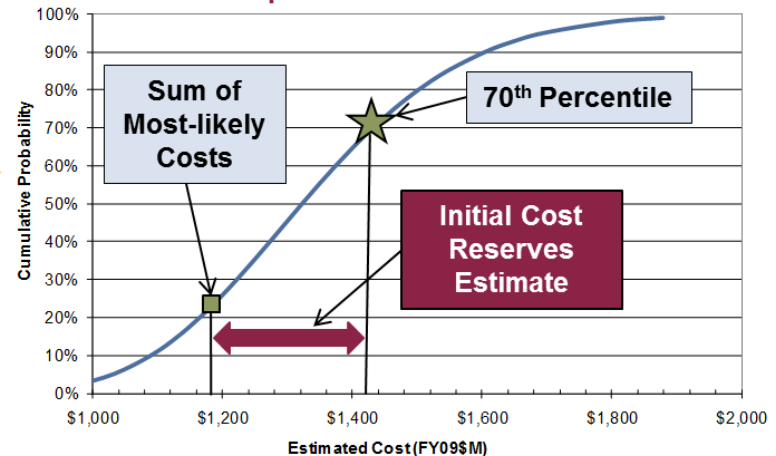
Triangular Distribution of Possible Element Cost



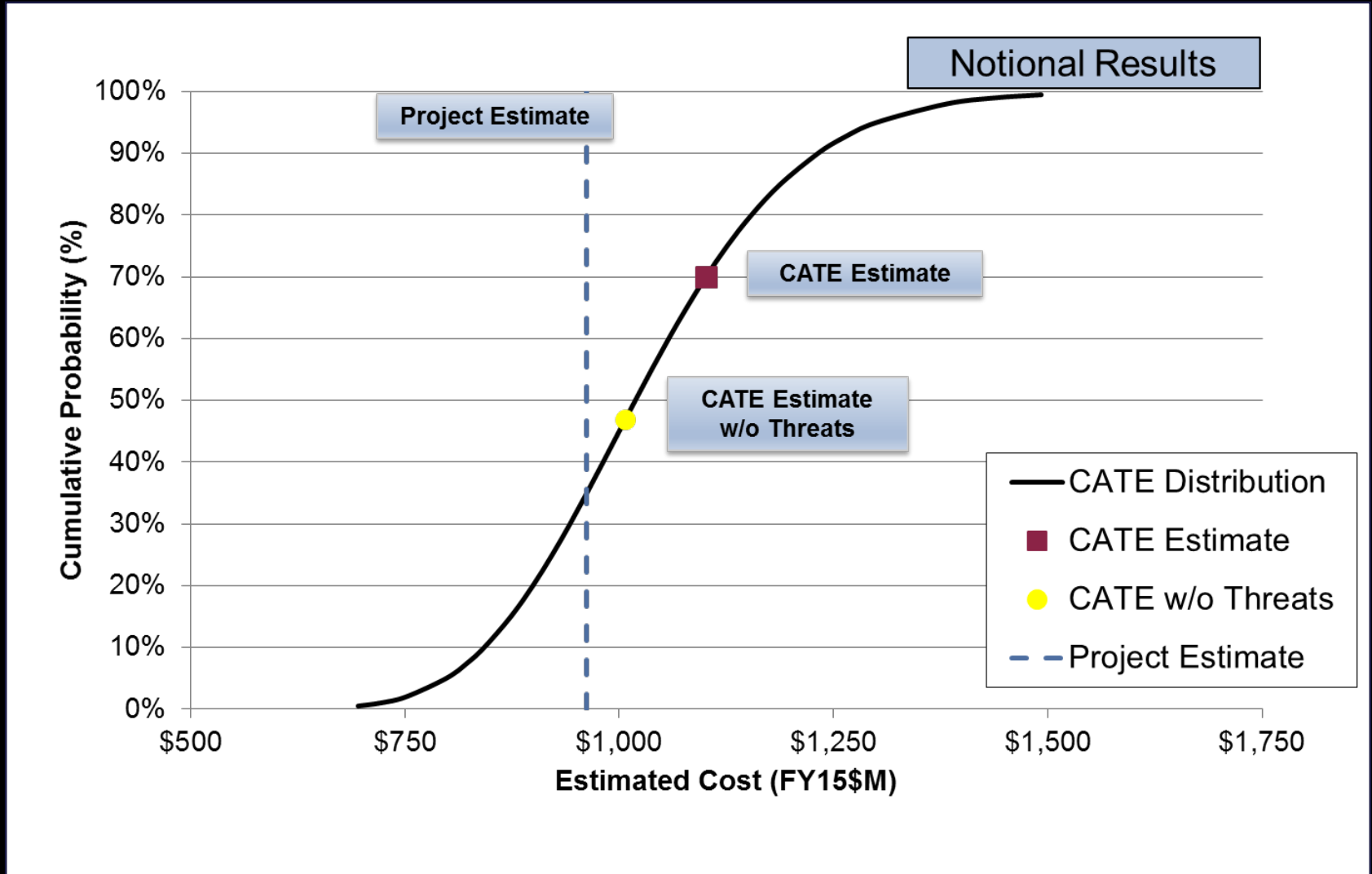
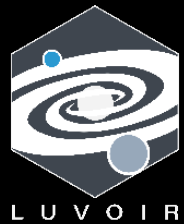
Total Distribution is a Combination of Cost Distributions for WBS Elements



Example Total Cost Distribution

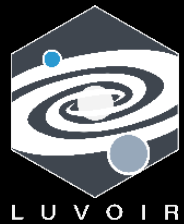


# Example Cost Risk S-Curve





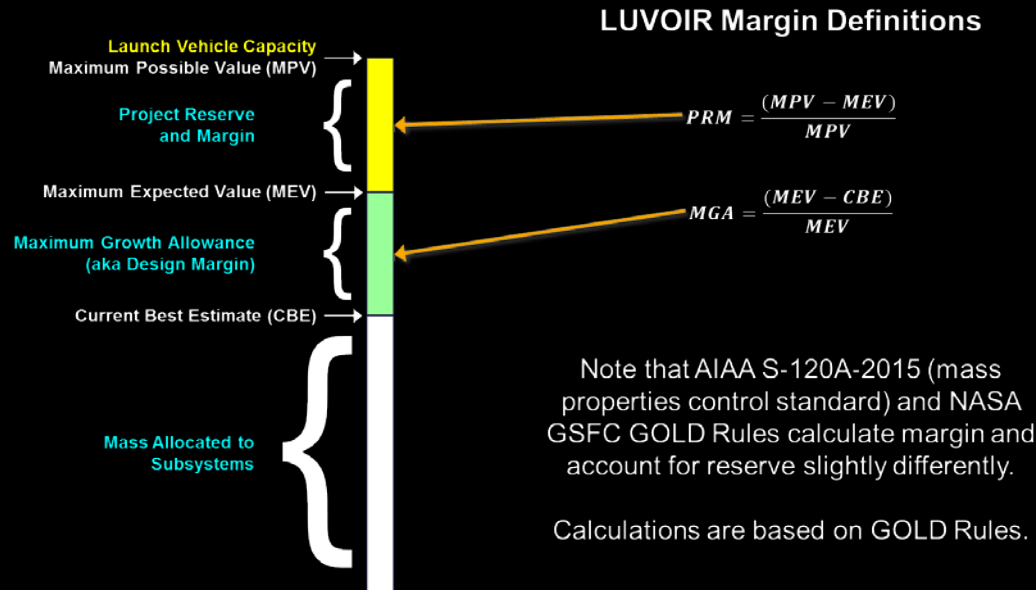
# Design Growth



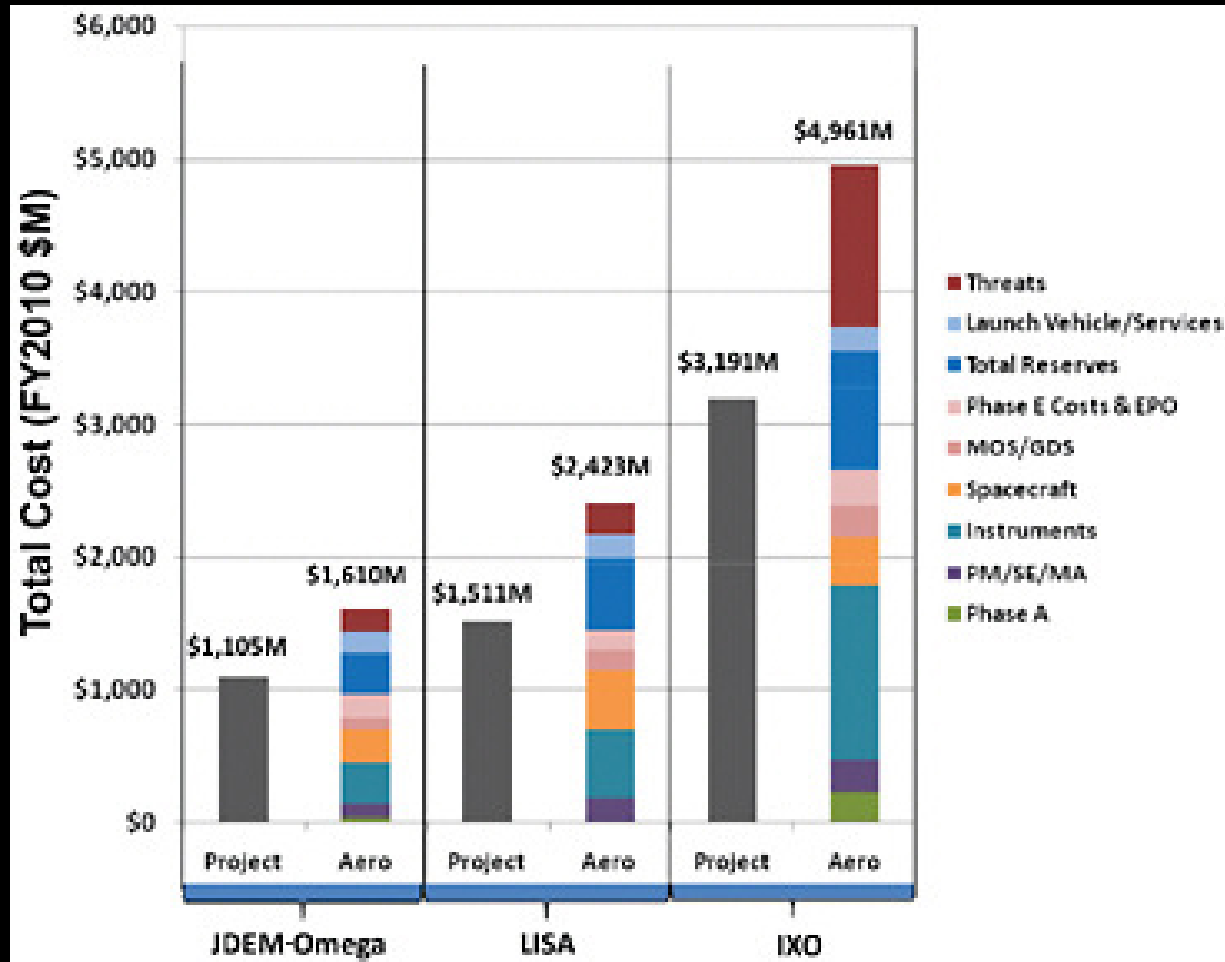
- All CATE estimates based on project team inputs
  - Aerospace accounts for the maturity of the design presented so that more mature concepts aren't penalized for being too detailed.
  - Aerospace accounts for the current state of technology development
- Aerospace indicates that **mass and power drive cost estimates** from both analogies and models
  - **LUV O I R is applying aerospace & GSFC standards and recommendations for mass and power margins/reserves**

# Launch Vehicle Threats

- Aerospace will add the cost of moving to next larger launch vehicle as the “Launch Vehicle” cost threat if mass contingency results in less than 10% launch vehicle mass margin
  - We are going to ask Aerospace for clarification on this.
  - It isn't clear if the 10% is additional headroom on top of the margins/reserves LUVOIR is already accounting for or if that is one of the categories that we are already accounting for.

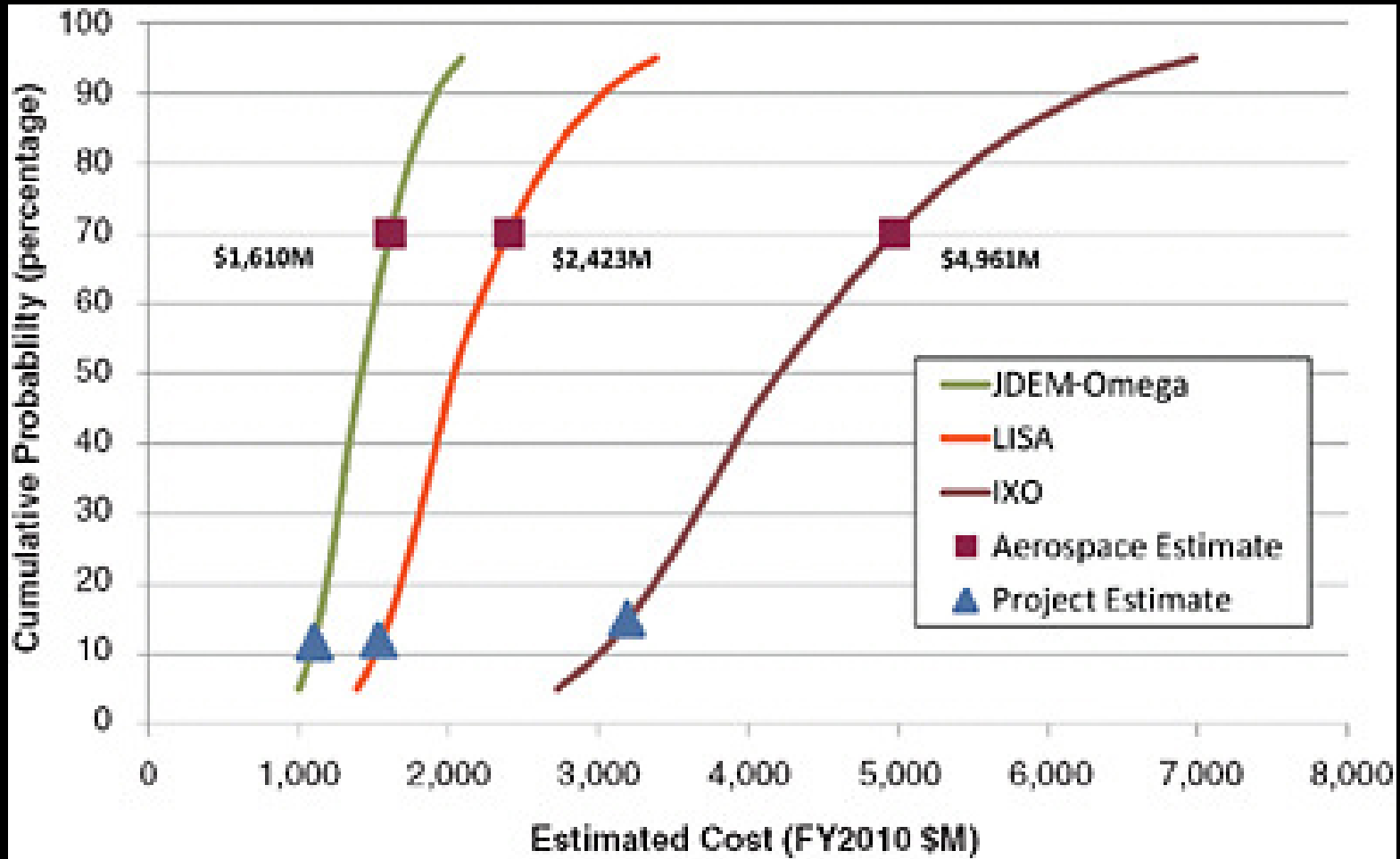


# Example of Project vs Aerospace Estimates



Project estimate compared with contractor (Aerospace Corporation) appraisal of program costs for JDEM-Omega, LISA, and IXO. Costs shown are for the full mission, including Phase A, and are in FY2010 dollars.

# Examples of S-Curves for Cost Estimates



Program S-curve cost comparison. Costs match those presented in Figure C.3. Project estimates reflect a 10 to 15 percent probability that the project will be completed at that low a cost.