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Cost Risk and Uncertainty Analysis Metrics Manual (CRUAMM)

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1: INTRODUCTION

1.1 PURPOSE

The Cost Risk and Uncertainty Handbook (CRUH), published in July 2007, is a reference for approved methods, practices, and reporting requirements needed to produce a realistic, defendable cost uncertainty analysis. It provides detailed guidance and definitions useful for cost analysts and will support Air Force cost analysts everywhere with a toolbox of useful methodologies and metrics, developed through sound research practices, to support reliable and defensible cost risk estimates.

Central to any cost risk analysis and model are the uncertainty distributions assigned to point estimates. Ideally, the analyst will have a database of historical cost and technical information that can be used to objectively develop Cost Estimating Relationships (CERs) using approved statistical methods. From that analysis the analyst will be able to objectively define the shape and dispersion of the CER uncertainty distributions. Similarly, with a suitable database or expert opinions to draw upon, the analyst will be able to develop objective uncertainty distributions for the inputs to all the cost estimating methods.

The purpose of this metrics manual is to provide the analyst with a source for uncertainty distributions by commodity in the absence of better information. This manual provides guidance on the appropriate shape and size of uncertainty distributions by commodity and at various levels within a typical cost model for that commodity. This manual does not provide guidance on how to correlate these uncertainty distributions. Some guidance is available in the CRUH and future versions of CRUAMM may address correlation, but at the moment it is left to the analyst to ensure correlation is correctly applied.

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2: ANALYSIS APPROACH

The bulk of the CRUAMM manual and its appendices contain distribution fitting results organized by work breakdown structures for commodities common in Air Force cost estimates. This approach satisfies the primary objectives of the manual, that is, to develop commodity specific descriptive statistics and uncertainty metrics to serve as uncertainty guidance to cost analysts. It provides a wealth of guidance suitable for early cost estimating and also identifies methods the analyst may wish to consider applying to the analysis of their own data collection efforts.

Normalized cost data (recurring, non-recurring, T1, etc) was collected by commodity, by WBS element and stratified consistent with typical cost estimate types (for instance new vs modified, development vs acquisition). Additionally, key technical parameters commonly used to develop cost estimating relationships were also collected by WBS element. Once collected, organized, normalized and stratified (new, modified, purpose, etc), the data was then subjected to a distribution fitting process. Results of this process yielded both descriptive statistics and the distribution fit results.

2.1 ORDERS OF DISPERSION

The data is organized around a "principle of orders of dispersion". The premise behind this is that the cost estimating process is one of narrowing uncertainty through the use of increasingly sophisticated estimating methods: throughput based on the mean of observed data, factor relationships, or more complex CERs. The uncertainty is quantified by measuring dispersion of the unexplained error in the selected estimating method. The term "Order of Dispersion" is introduced to define four broad categories of cost estimating methods. These are summarized in **Figure 2.1-1** and further defined below. CRUAMM is focused on the First, Second and Third Order of Dispersion.

- **First Order**
  - Amount of spread in a single parameter of a dataset
  - **Example**: Cost elements, cost drivers, rates, slopes
- **Second Order**
  - Amount of spread in a factor relationship
  - **Example**: Cost-to-cost driver ratios, cost per pound factors
- **Third Order**
  - Amount of spread in the error term of a best fit equation
  - **Example**: Residuals from a regression-derived CER
- **Fourth Order**
  - Prediction interval from a statistically derived CER
  - **Example**: CER prediction interval for a given independent variable

CRUAMM

Figure 2.1-1. Orders of Dispersion

2.1.1 FIRST ORDER DISPERSION

The first order of dispersion is the amount of spread in a single variable from a dataset. This can be observed for both elements of cost and their cost drivers. Consider the case where an analyst produces an estimate simply from the central tendency of the dataset, say, the median or the mean. The applicable uncertainty metric in this case is simply drawn from the dispersion in that data set. To generalize the case, for the purpose of using the dispersion in a given dataset and to apply it to other situations, divide each observation by the median or mean resulting in a set of multipliers. Note each multiplier distribution will have the same shape as its raw data counterparts except it is now expressed as a portable general-purpose factor. The first order dispersion may have direct use only when a dataset is narrow. A suggested Best Practice is to use first order metrics directly only when little is known of the system under estimation. Even if the first order metrics are not used directly, they may nonetheless have value as a boundary check of bounds obtained via other sources.

2.1.2 SECOND ORDER DISPERSION

The second order of dispersion is the amount of spread in a dependent variable paired with a single independent variable (cost driver) from a dataset. To the extent that the cost driver explains variation in cost, the overall dispersion is reduced. The second order dispersion will have direct use when a cost model uses simple cost-per-cost-driver estimating relationships.

A suggested Best Practice is to use second order metrics only in settings for which cost is expected to behave linearly with its cost driver. Even if the second order metrics are not used directly, they may nonetheless have value as a boundary check of bounds obtained via other sources.

2.1.3 THIRD ORDER DISPERSION

The third order of dispersion is the amount of spread in a best fit equation. As the equation explains the variation in cost, the overall dispersion is reduced. The shape and bounds of the third order of dispersion are obtained from the equation's residuals. The third order dispersion will have direct use when a cost model uses CERs. A suggested Best Practice is to use third order metrics only for settings in which cost is modeled with CERs. It may also be applicable to situations where cost is modeled using black-box methods.

2.1.4 FOURTH ORDER DISPERSION

The fourth order of dispersion is simply an equation's Prediction Interval (PI). Not only is the equation explaining the variation in cost, but the location of the cost driver within the dataset is known. Prediction intervals are obtained typically from the regression package from which the CER was created. The fourth order dispersion will have direct use when a cost model uses CERs for which the user has access to all the fit data. A suggested Best Practice is to use fourth order metrics when available information is suitable. An additional suggestion: publishers of CERs should include in their documentation, the PI at the center of the independent variables. Fourth order metrics are very situation-specific so are not suitable for inclusion in this general-purpose metrics manual.

2.2 DISTRIBUTION FITTING

There are many commercial tools available that will find the distribution that best fits a given sample of observations. Each tool uses a different approach and offer different options. Some require a minimum number of observations (such as 15) that is higher than many data sets we would want to analyze. Additionally, no matter which tool is selected, only those

that have the tool would be able to replicate results published in CRUAMM. For these reasons, a simple distribution fitting utility was developed in Excel.

A distribution fitting utility was developed to fit a lognormal, normal, triangular and beta distribution to the selected data. Based on Government direction, the utility included the following constraints to influence the fit process:

a. Constraining the minimum triangular and beta value to be 0 or greater
b. Not allowing the lower tail of a normal distribution to extend more than 1% negative
c. Ensuring that the upper and lower sample points are included in the fitted distribution

In addition to finding which would most closely fit the data based upon these settings, the CHI^2 goodness-of-fit test was used to determine the statistical significance of the fit because it was the only available test that would produce a p-value for any fitted distribution. As **Figure 2.2-1** demonstrates, the utility compares well to commercial tools.

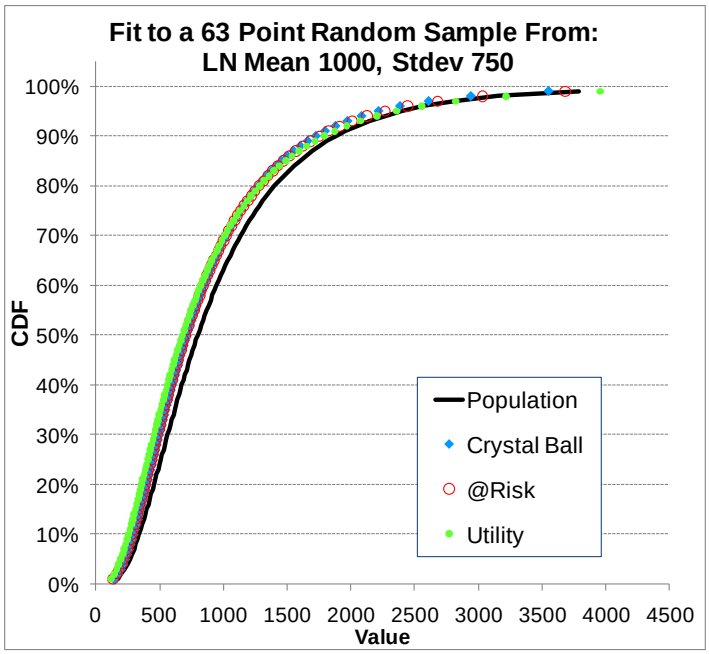


Figure 2.2-1. Curve Fit Tool Performance

As with all fit tools, there are many choices to make, particularly if none of the distributions successfully fit the data on the first pass. See section **10:Flow Chart Used to Guide the Fit Process** for details on how each dataset was processed.

3: USAGE GUIDELINES

3.1 GENERAL

First, a word about Best Practice: In parametric estimating when the analyst has access to a Cost Estimating Relationship (CER) and the CER's data, the best approach to quantifying cost estimate uncertainty is to compute a prediction interval (Fourth Level of Dispersion) for the fitted distribution for the system using the estimate's independent variable(s) value(s). Nothing contained in this document negates this Best Practice nor is this document intended to provide a shortcut around that practice. As with all risk and uncertainty guidance, ***if you have data that is applicable to your estimate then you must use it***.

This document provides the analyst with uncertainty guidance when no other source is available. It is also a useful reference to provide a cross check when the analyst can develop their own uncertainty distributions.

First, this document provides guidance on commonly used distribution shapes. Often an analyst may have a low and a high value for a given element but no guidance on choosing a distribution shape. When the analyst can establish bounds but has no basis for selecting a shape, this document identifies recommended shapes by commodity and cost element. By locating the item that most closely represents their element in the tables, an analyst can find a recommended distribution shape. Again, if the analyst has better information from which to deduce a shape they should use that information rather than rely on the generic conclusions in this document.

Second, CRUAMM is a source of both distribution shapes and their parameters. When the analyst has no basis for determining shape or bounds, this document provides guidance on both for specific WBS elements and their cost drivers by commodity. By locating the element that most closely resembles their own, the analyst can obtain a recommend distribution shape and bounds to represent uncertainty. The distributions are all unitized.

Unitized means the parameters have been normalized and are designed to be modeled as multipliers of point estimates. So, given a point estimate where:

Cost Element $_{\text{Point Estimate}}$ = Your Methodology

its uncertainty can then be modeled as follows (causing the uncertainty to scale with the point estimate):

Cost Element $_{\text{Uncertainty}}$ = Your Methodology * Unitized Distribution

Only one additional item about the methodology is necessary to use these tables. The analyst must determine if the element point estimate represents the mean, median, or mode. There are many factors that can influence this decision. The following suggestions are offered:

Linear CER, Factor Methods: Mean
Log-linear CER MUPE, IRLS, etc: Mean
Log-linear CER OLS: Median
Non-linear CER: Median
3rd Party Tools: Consult model documentation. Else Median.
Rules of Thumb: Median
Exponentially Scaled Analogy: Median

3.2 HOW TO READ THE RESULTS

The tables in this document present unitized results. Each WBS element has at least one table identifying the data set, applicable filters, and recommended distributions. The tables report three forms of the same distribution. The analyst picks the one based upon what the point estimate represents: mean, median, or mode. **Figure 3.2-1** illustrates an example table with data descriptions instead of the fit values or point estimate multipliers.

	My Point Estimate is the:		
	Mean	**Median**	**Mode**
Dataset, Filter	*Lognormal (Mean, Std Dev)*	*Lognormal (Mean, Std Dev)*	*Lognormal (Mean, Std Dev)*
Dataset, Filter	*Normal (Mean, Std Dev)*	*Normal (Mean, Std Dev)*	*Normal (Mean, Std Dev)*
Dataset, Filter	*Triangular (Low, Mode, High)*	*Triangular (Low, Mode, High)*	*Triangular (Low, Mode, High)*
Dataset, Filter	*Beta (Low, High, Alpha, Beta)*	*Beta (Low, High, Alpha, Beta)*	*Beta (Low, High, Alpha, Beta)*

Figure 3.2-1. Sample Legend Key

Figure 3.2-2 illustrates a table with unitized fit results. In this table, "Weight" and "ATP – 1st Launch" are data sets for communication satellites. "Lognormal (1.00, 0.65)" is the recommended distribution for the Weight of Communication Satellites when the point estimate is assumed to be the mean of the uncertainty. The values (1.00, 0.65) represent the mean and standard deviation, unitized by the mean. So to continue the example from above,

$$\text{Cost Element}_{\text{Uncertainty}} = \text{YourPE} * \text{Unitized Distribution}$$

Where YourPE= your point estimate. Then:

$$\text{Cost Element}_{\text{Uncertainty}} = \text{Your Methodology} * \text{Lognormal}(1.00, 0.65) \text{ or}$$
$$= \text{Lognormal}(1.00*\text{YourPE}, 0.65*\text{YourPE})$$

	My Point Estimate is the:		
	Mean	**Median**	**Mode**
Weight, Commsats	Lognormal (1.00, 0.65)	Lognormal (1.19, 0.78)	Lognormal (1.70, 1.11)
BOL, Commsats	Beta (0.02, 3.08, 0.72, 1.51)	Beta (0.02, 3.76, 0.72, 1.51)	Beta (1.00, 199.35, 0.72, 1.51)
EOL, Commsats	Beta (0.06, 2.89, 0.59, 1.18)	Beta (0.07, 3.61, 0.59, 1.18)	Beta (1.00, 50.93, 0.59, 1.18)
ATP - CDR, Commsats	Lognormal (1.00, 2.52)	Lognormal (2.71, 6.83)	Lognormal (19.90, 50.14)
CDR - 1st Launch, Commsats	Lognormal (1.00, 0.91)	Lognormal (1.35, 1.24)	Lognormal (2.49, 2.27)
ATP - 1st Launch, Commsats	Triangular (0.11, 0.63, 2.26)	Triangular (0.12, 0.67, 2.41)	Triangular (0.18, 1.00, 3.58)

Figure 3.2-2. An Illustrative Example

3.3 ADDITIONAL EXAMPLES USING UNITIZED RESULTS

3.3.1 EXAMPLE 1: LOGNORMAL

An analyst needs an uncertainty distribution for the weight of a communication satellite. The analyst's point estimate is 3500 lbs. The analyst finds the following unitized table:

	My Point Estimate is the:		
	Mean	Median	Mode
Weight, Commsats	Lognormal (1.00, 0.65)	Lognormal (1.19, 0.78)	Lognormal (1.70, 1.11)

The analyst should use the following specifications:

Distribution: Lognormal

If the analyst feels the point estimate is the **mean**:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = 3500 lbs * Lognormal(1.00, 0.65)

Or if direct specification in your cost model is desired:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(Mean, Standard Deviation)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(3500, 3500 * 0.65)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(3500, 2275)

If the analyst feels the point estimate is the **median**:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = 3500 lbs * Lognormal(1.19, 0.78)

Or if direct specification in your cost model is desired:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(Mean, Standard Deviation)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(3500 * 1.19, 3500 * 0.78)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(4177, 2730)

If the analyst feels the point estimate is the **mode**:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = 3500 lbs * Lognormal(1.70, 1.11)

Or if direct specification in your cost model is desired:

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(Mean, Standard Deviation)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(3500 * 1.70, 3500 * 1.11)

Weight of Communication Satellite $_{\text{Uncertainty}}$ = Lognormal(5950, 3885)

3.3.2 EXAMPLE 2: TRIANGULAR

An analyst needs an uncertainty distribution for amount of months from the Authority to Proceed (ATP) to the 1st launch of a communication satellite. The analyst's point estimate is 65 Months. The analyst finds the following unitized table:

	My Point Estimate is the:		
	Mean	**Median**	**Mode**
ATP - 1st Launch, Commsats	Triangular (0.11, 0.63, 2.26)	Triangular (0.12, 0.67, 2.41)	Triangular (0.18, 1.00, 3.58)

The analyst should use the following specifications:

Distribution: Triangular

If the analyst feels the point estimate is the **mean**:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = 4500 watts * Triangular (0.11, 0.63, 2.26)

Or if direct specification in your cost model is desired:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (Low, Mode, High)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (65 * .11, 65 * .62, 65 * 2.26)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (7.2, 41, 147)

If the analyst feels the point estimate is the **median**:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = 4500 watts * Triangular (0.12, 0.67, 2.41)

Or if direct specification in your cost model is desired:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (Low, Mode, High)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (65 * .12, 65 * .67, 65 * 2.41)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (7.8, 43.6, 156.7)

If the analyst feels the point estimate is the **mode**:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = 4500 watts * Triangular (0.18, 1.0, 3.58)

Or if direct specification in your cost model is desired:

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (Low, Mode, High)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (65 * .18, 65 * 1.0, 65 * 3.58)

Duration, ATP to 1st Launch $_{\text{Uncertainty}}$ = Triangular (11.7, 65, 232.7)

3.3.3 EXAMPLE 3: BETA

An analyst needs an uncertainty distribution for the Beginning of Life (BOL) power of a communication satellite. The analyst's point estimate is 4500 Watts. The analyst finds the following unitized table:

	My Point Estimate is the:		
	Mean	**Median**	**Mode**
BOL, Commsats	Beta (0.02, 3.08, 0.72, 1.51)	Beta (0.02, 3.76, 0.72, 1.51)	Beta (1.00, 199.35, 0.72, 1.51)

The analyst should use the following specifications:

Distribution: Beta

If the analyst feels the point estimate is the **mean**:

BOL Power $_{\text{Uncertainty}}$ = 4500 watts * Beta(0.02, 3.08, 0.72, 1.51)

Or if direct specification in your cost model is desired:

BOL Power $_{\text{Uncertainty}}$ = Beta (Low, High, Alpha, Beta)

BOL Power $_{\text{Uncertainty}}$ = Beta (4500 * .02, 4500 * 3.08, 0.72, 1.51)

BOL Power $_{\text{Uncertainty}}$ = Beta (90, 13830, 0.72, 1.51)

If the analyst feels the point estimate is the **median**:

BOL Power $_{\text{Uncertainty}}$ = 4500 watts * Beta(0.02, 3.76, 0.72, 1.51)

Or if direct specification in your cost model is desired:

BOL Power $_{\text{Uncertainty}}$ = Beta (Low, High, Alpha, Beta)

BOL Power $_{\text{Uncertainty}}$ = Beta (4500 * .02, 4500 * 3.76, 0.72, 1.51)

BOL Power $_{\text{Uncertainty}}$ = Beta (90, 16920, 0.72, 1.51)

If the analyst feels the point estimate is the **mode**:

BOL Power $_{\text{Uncertainty}}$ = 4500 watts * Beta(1.00, 199.35, 0.72, 1.51)

Or if direct specification in your cost model is desired:

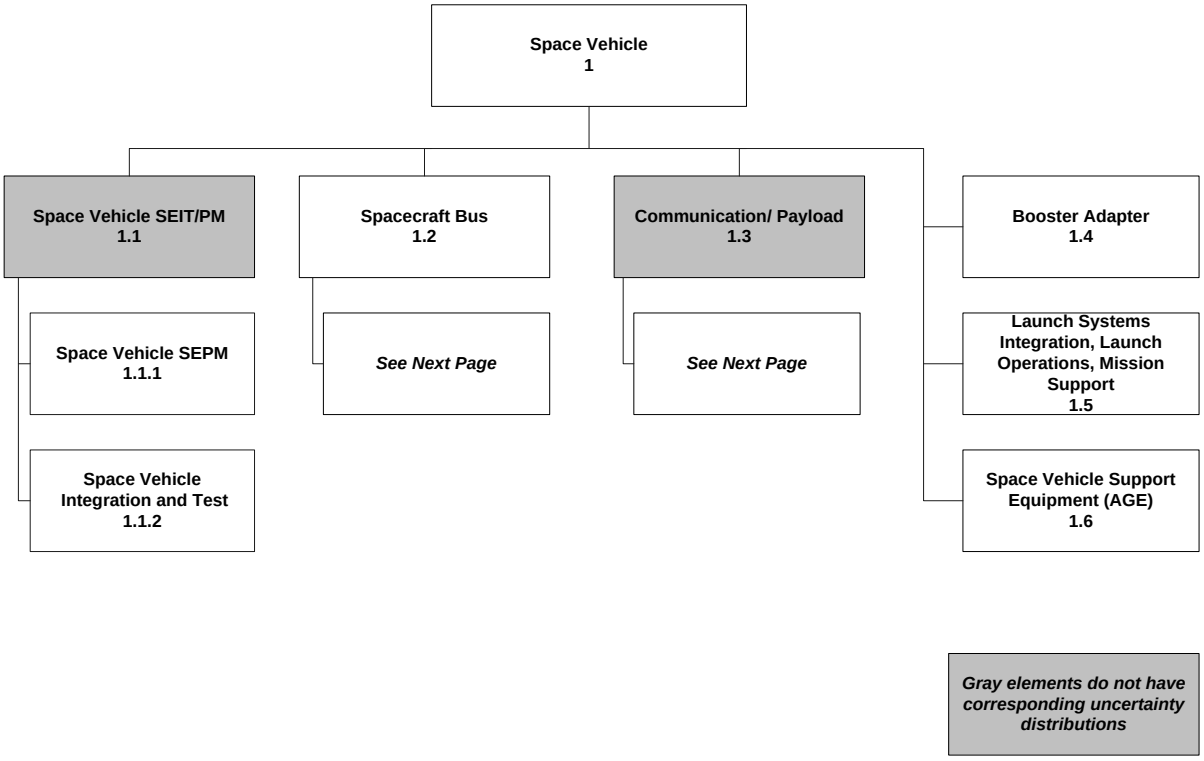
BOL Power $_{\text{Uncertainty}}$ = Beta (Low, High, Alpha, Beta)

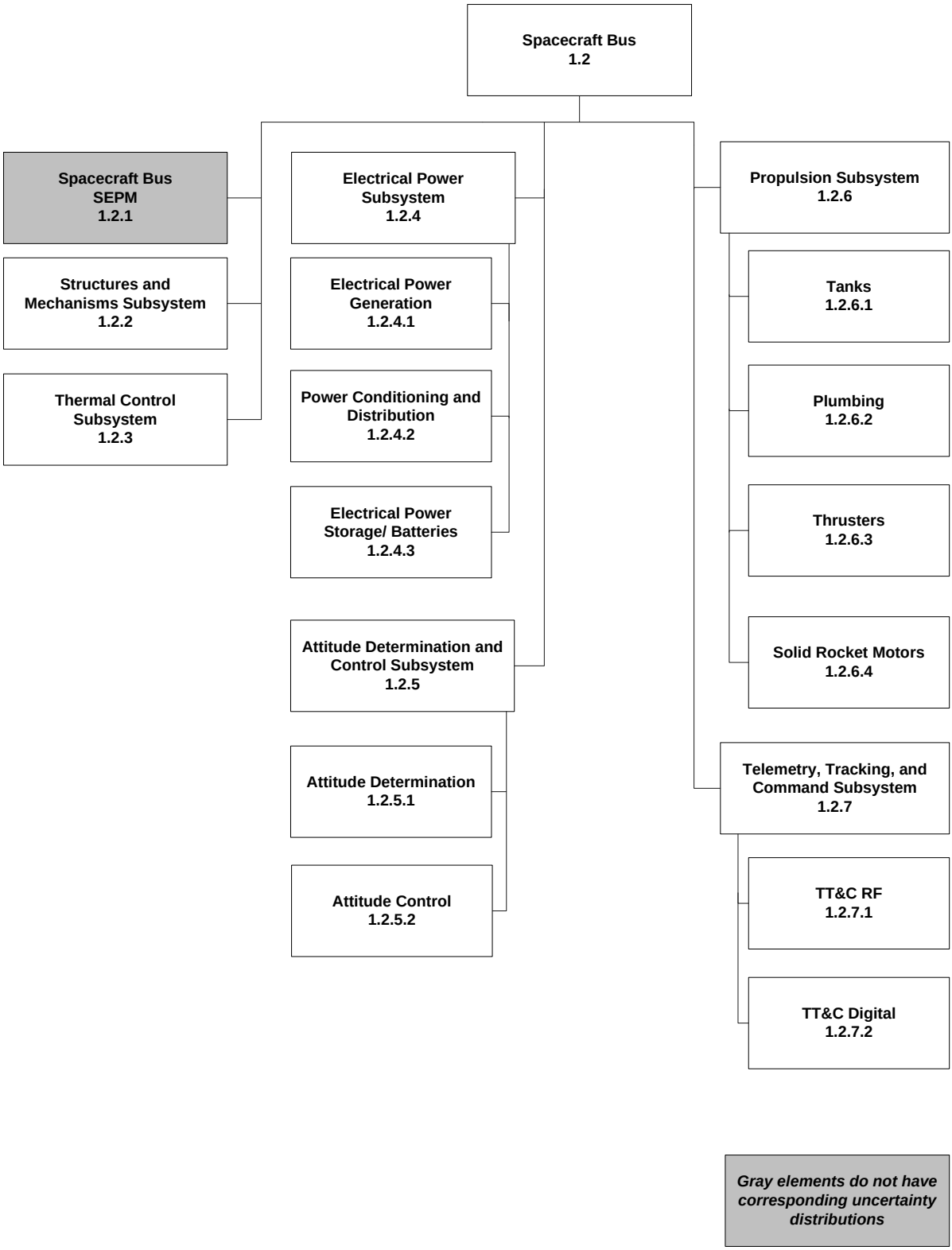
BOL Power $_{\text{Uncertainty}}$ = Beta (4500 * 1.0, 4500 * 199.35, 0.72, 1.51)

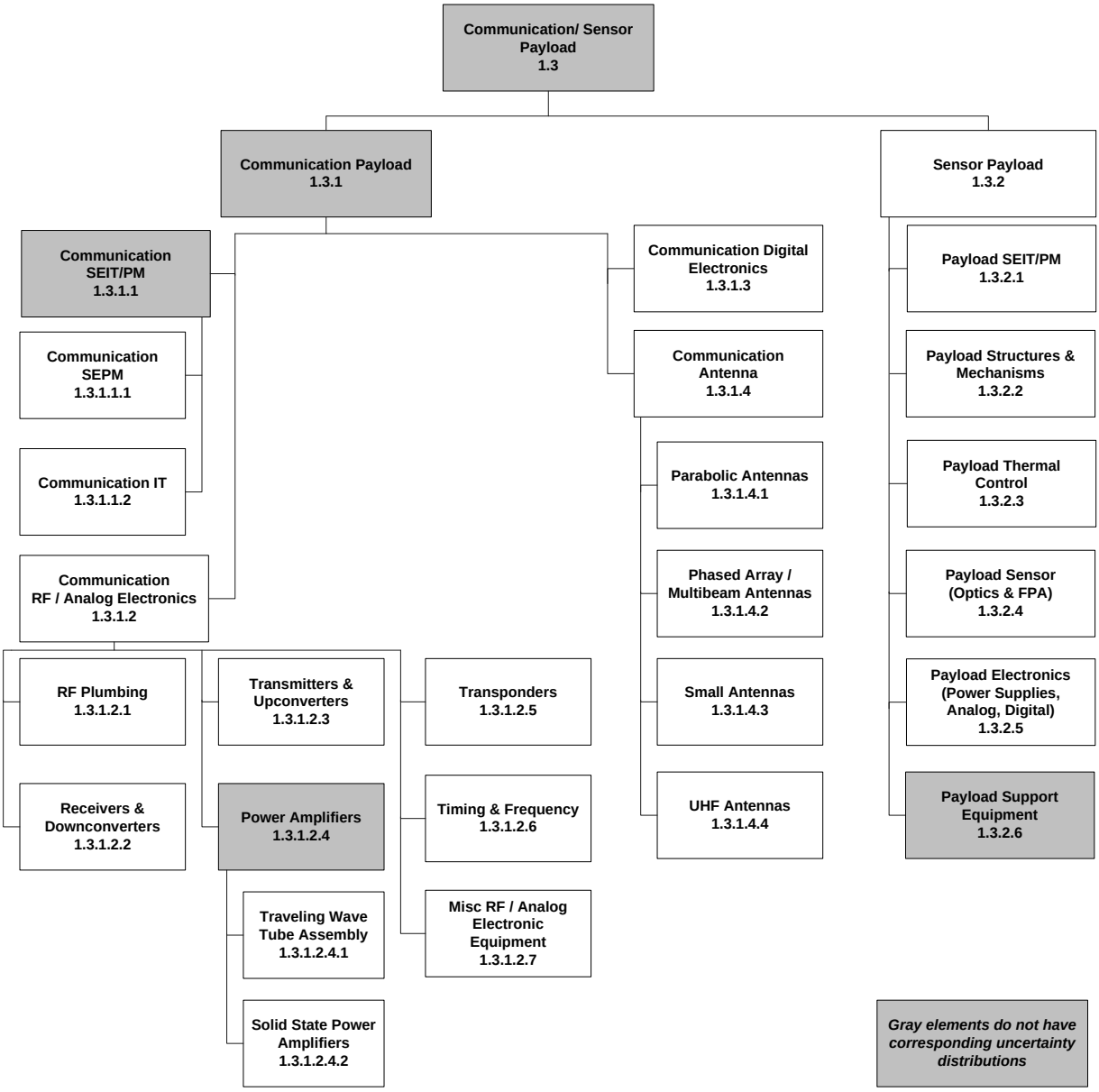
BOL Power $_{\text{Uncertainty}}$ = Beta (90, 897075, 0.72, 1.51)

4: CRUAMM SPACE SYSTEM (USCM)

4.1 CRUAMM SPACE SYSTEM (USCM) WORK BREAKDOWN STRUCTURE




Spacecraft Bus
1.2
Spacecraft Bus
SEPM
1.2.1
Structures and
Mechanisms Subsystem
1.2.2
Thermal Control
Subsystem
1.2.3
Electrical Power
Subsystem
1.2.4
Electrical Power
Generation
1.2.4.1
Power Conditioning and
Distribution
1.2.4.2
Electrical Power
Storage/ Batteries
1.2.4.3
Attitude Determination and
Control Subsystem
1.2.5
Attitude Determination
1.2.5.1
Attitude Control
1.2.5.2
Propulsion Subsystem
1.2.6
Tanks
1.2.6.1
Plumbing
1.2.6.2
Thrusters
1.2.6.3
Solid Rocket Motors
1.2.6.4
Telemetry, Tracking, and
Command Subsystem
1.2.7
TT&C RF
1.2.7.1
TT&C Digital
1.2.7.2
Gray elements do not have
corresponding uncertainty
distributions


Communication/ Sensor Payload 1.3
Communication Payload 1.3.1
Sensor Payload 1.3.2
Communication SEIT/PM 1.3.1.1
Communication SEPM 1.3.1.1.1
Communication IT 1.3.1.1.2
Communication RF / Analog Electronics 1.3.1.2
Communication Digital Electronics 1.3.1.3
Communication Antenna 1.3.1.4
Parabolic Antennas 1.3.1.4.1
Phased Array / Multibeam Antennas 1.3.1.4.2
Small Antennas 1.3.1.4.3
UHF Antennas 1.3.1.4.4
Payload SEIT/PM 1.3.2.1
Payload Structures & Mechanisms 1.3.2.2
Payload Thermal Control 1.3.2.3
Payload Sensor (Optics & FPA) 1.3.2.4
Payload Electronics (Power Supplies, Analog, Digital) 1.3.2.5
Payload Support Equipment 1.3.2.6
RF Plumbing 1.3.1.2.1
Receivers & Downconverters 1.3.1.2.2
Transmitters & Upconverters 1.3.1.2.3
Power Amplifiers 1.3.1.2.4
Traveling Wave Tube Assembly 1.3.1.2.4.1
Solid State Power Amplifiers 1.3.1.2.4.2
Transponders 1.3.1.2.5
Timing & Frequency 1.3.1.2.6
Misc RF / Analog Electronic Equipment 1.3.1.2.7
Gray elements do not have corresponding uncertainty distributions

4.2 CRUAMM SPACE SYSTEMS (USCM) EMPIRICALLY BASED UNCERTIANTY PARAMETERS

Each figure in this Section provides the unitized fit results for the First, Second and Third order data available for each element identified in **4.1 CRUAMM Space System (USCM) Work Breakdown Structure.** The fit results are color coded to identify type of data fit.

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, ComSats	10	NR	115123.98 - 992537.94	Weight	954.9 - 8630.97	0.263	0.269	Lognormal (1.0000, 0.2690)	Lognormal (1.0355, 0.2786)	Lognormal (1.1105, 0.2987)
NR Cost per Lb	10	NR	115123.98 - 992537.94	Weight	954.9 - 8630.97	0.286	0.291	Lognormal (1.0000, 0.2913)	Lognormal (1.0416, 0.3034)	Lognormal (1.1299, 0.3291)
NR Typical Cost	10					0.664	0.762	Lognormal (1.0000, 0.7618)	Lognormal (1.2571, 0.9577)	Lognormal (1.9867, 1.5135)
T1 CER	26	T1	27159.36 - 436244.49	Weight	954.9 - 8630.97	0.283	0.277	Triangular (0.4715, 0.7646, 1.7639)	Triangular (0.4909, 0.7961, 1.8365)	Triangular (0.6166, 1.0000, 2.3069)
T1 Cost per Lb, Commsat	9	T1	68617.34 - 222814.48	Weight	2758.2 - 5899.45	0.188	0.189	Lognormal (1.0000, 0.1892)	Lognormal (1.0177, 0.1925)	Lognormal (1.0542, 0.1994)
T1 Cost per Lb, Govtsat	17	T1	27159.36 - 436244.49	Weight	954.9 - 8630.97	0.328	0.311	Triangular (0.5267, 0.5940, 1.8793)	Triangular (0.5562, 0.6273, 1.9846)	Triangular (0.8866, 1.0000, 3.1637)
T1 Typical Cost, Commsat	9					0.488	0.500	Lognormal (1.0000, 0.5003)	Lognormal (1.1182, 0.5595)	Lognormal (1.3981, 0.6995)
T1 Typical Cost, Govtsat	17					0.756	0.871	Lognormal (1.0000, 0.8710)	Lognormal (1.3261, 1.1550)	Lognormal (2.3321, 2.0312)
Metrics from Entire Dataset										
NR Cost per Lb, New ComSats	10	NR	115123.98 - 992537.94	Weight	954.9 - 8630.97	0.286	0.291	Lognormal (1.0000, 0.2913)	Lognormal (1.0416, 0.3034)	Lognormal (1.1299, 0.3291)
NR Cost per Lb, Mod ComSats	16	NR	3933.93 - 331069.1	Weight	1008.81 - 7608.48	0.916	0.889	Beta (0.0613, 3.6855, 0.5674, 1.6233)	Beta (0.0848, 5.1030, 0.5674, 1.6233)	Beta (, , 0.5674, 1.6233)
NR to T1 Ratio, New ComSats	10	NR	115123.98 - 992537.94	T1	27159.36 - 436244.49	0.244	0.230	Beta (0.6689, 1.3235, 0.5228, 0.5108)	Beta (0.6669, 1.3197, 0.5228, 0.5108)	Beta (, , 0.5228, 0.5108)
NR to T1 Ratio, Mod ComSats	16	NR	3933.93 - 331069.1	T1	38264.4 - 244312.12	1.067	1.091	Beta (0.1029, 5.2404, 0.3836, 1.8131)	Beta (0.1929, 9.8282, 0.3836, 1.8131)	Beta (, , 0.3836, 1.8131)
T1 Cost per Lb, Govt ComSats	23	T1	27159.36 - 436244.49	Weight	735.77 - 8630.97	0.670	0.711	Lognormal (1.0000, 0.7105)	Lognormal (1.2267, 0.8716)	Lognormal (1.8460, 1.3116)
T1 Cost per Lb, Commer ComSats	9	T1	68617.34 - 222814.48	Weight	2758.2 - 5899.45	0.188	0.189	Lognormal (1.0000, 0.1892)	Lognormal (1.0177, 0.1925)	Lognormal (1.0542, 0.1994)
NR Cost per Lb, (All)	58	NR	2207.21 - 992537.94	Weight	148.27 - 14615.34	1.086	1.105	Beta (0.0123, 40.2305, 0.7553, 30.0000)	Beta (0.0197, 64.2851, 0.7553, 30.0000)	Beta (, , 0.7553, 30.0000)
T1 Cost per Lb, (All)	59	T1	6066.67 - 436244.49	Weight	148.27 - 14615.34	0.694	0.728	Beta (0.2850, 24.6698, 0.9062, 30.0000)	Beta (0.3698, 32.0072, 0.9062, 30.0000)	Beta (, , 0.9062, 30.0000)
NR Typical Cost, New (ComSats)	10					0.664	0.762	Lognormal (1.0000, 0.7618)	Lognormal (1.2571, 0.9577)	Lognormal (1.9867, 1.5135)
NR Typical Cost, Modified (ComSats)	16					1.346	1.427	Beta (0.0567, 4.7686, 0.1492, 0.5960)	Beta (0.3346, 28.1596, 0.1492, 0.5960)	Beta (, , 0.1492, 0.5960)
T1 Typical Cost, ComSat (Govt)	23					0.706	0.743	Lognormal (1.0000, 0.7427)	Lognormal (1.2456, 0.9251)	Lognormal (1.9327, 1.4354)
T1 Typical Cost, ComSat (Commercial)	8					0.112	0.105	Triangular (0.7196, 1.0572, 1.2232)	Triangular (0.7121, 1.0461, 1.2104)	Triangular (0.6807, 1.0000, 1.1570)
Recurring Typical Cost, ComSats (Govt)	23					0.716	0.717	Lognormal (1.0000, 0.7168)	Lognormal (1.2304, 0.8820)	Lognormal (1.8626, 1.3352)
Recurring Typical Cost, Commsats (Commercial)	9					0.636	0.738	Lognormal (1.0000, 0.7375)	Lognormal (1.2426, 0.9164)	Lognormal (1.9185, 1.4149)
NR Typical Cost, (All)	58					1.345	1.382	Lognormal (1.0000, 1.3825)	Lognormal (1.7062, 2.3589)	Lognormal (4.9673, 6.8672)
T1 Typical Cost, (All)	59					0.817	0.820	Beta (0.0564, 4.0576, 0.7763, 2.5154)	Beta (0.0726, 5.2226, 0.7763, 2.5154)	Beta (, , 0.7763, 2.5154)
Recurring Typical Cost, (All)	59					1.047	1.052	Beta (0.0473, 4.9867, 0.4693, 1.9639)	Beta (0.0798, 8.4052, 0.4693, 1.9639)	Beta (, , 0.4693, 1.9639)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints	10					0.793	0.871	Lognormal (1.0000, 0.8714)	Lognormal (1.3264, 1.1559)	Lognormal (2.3337, 2.0337)
Weight, T1 (Commsats)	9					0.275	0.259	Lognormal (1.0000, 0.2586)	Lognormal (1.0329, 0.2671)	Lognormal (1.1019, 0.2849)
Weight, T1 (Govtsats)	17					0.726	0.714	Lognormal (1.0000, 0.7140)	Lognormal (1.2287, 0.8773)	Lognormal (1.8551, 1.3245)

Figure 4.2-1. 1.0 Space Vehicle

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	45	NR	652.91 - 263709.16	Bus + Comm Payload + SV I&T NR	2032.18 - 920490.88	0.553	0.566	Lognormal (1.0000, 0.5657)	Lognormal (1.1489, 0.6500)	Lognormal (1.5167, 0.8580)
NR per (Bus + Comm Payload + SV I&T NR), CER Datapoints, Non-Commsats	27	NR	652.91 - 158449.76	Bus + Comm Payload + SV I&T NR	2032.18 - 394226.48	0.687	0.715	Lognormal (1.0000, 0.7151)	Lognormal (1.2294, 0.8791)	Lognormal (1.8580, 1.3287)
NR per (Bus + Comm Payload + SV I&T NR), CER Datapoints, Commsats	18	NR	802.11 - 263709.16	Bus + Comm Payload + SV I&T NR	9082.81 - 920490.88	0.252	0.246	Normal (1.0000, 0.2456)	Normal (1.0000, 0.2456)	Normal (1.0000, 0.2456)
NR Typical Cost, CER Datapoints, Non-Commsats	27					1.221	1.320	Lognormal (1.0000, 1.3197)	Lognormal (1.6558, 2.1852)	Lognormal (4.5396, 5.9909)
NR Typical Cost, CER Datapoints, Commsats	18					1.137	1.480	Lognormal (1.0000, 1.4797)	Lognormal (1.7859, 2.6426)	Lognormal (5.6962, 8.4286)
Recurring CER, All	51	Rec	1664.31 - 446775.54	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.461	0.461	Lognormal (1.0000, 0.4609)	Lognormal (1.1011, 0.5075)	Lognormal (1.3350, 0.6152)
Recurring per (Bus + Comm Payload + SV I&T NR), CER Datapoints, Non-Commsats	25	Rec	1664.31 - 214116.06	Bus + Comm Payload + SV I&T NR	2032.18 - 394226.48	0.551	0.570	Lognormal (1.0000, 0.5704)	Lognormal (1.1512, 0.6566)	Lognormal (1.5258, 0.8703)
Recurring per (Bus + Comm Payload + SV I&T NR), CER Datapoints, Commsats	26	Rec	6921.57 - 446775.54	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.389	0.390	Lognormal (1.0000, 0.3905)	Lognormal (1.0735, 0.4192)	Lognormal (1.2372, 0.4831)
Recurring Typical Cost, CER Datapoints, Non-Commsats	25					1.307	1.446	Lognormal (1.0000, 1.4460)	Lognormal (1.7581, 2.5421)	Lognormal (5.4338, 7.8570)
Recurring Typical Cost, CER Datapoints, Commsats	26					1.199	1.520	Lognormal (1.0000, 1.5199)	Lognormal (1.8193, 2.7651)	Lognormal (6.0220, 9.1526)
Metrics from Entire Dataset										
NR to T1 Ratio, Commsats	28	NR	242.12 - 263709.16	T1	561.46 - 152204.98	1.255	1.246	Beta (0.0184, 5.6462, 0.3377, 1.5982)	Beta (0.0426, 13.0635, 0.3377, 1.5982)	Beta (, , 0.3377, 1.5982)
NR to T1 Ratio, Non-Commsats	27	NR	652.91 - 158449.76	T1	1011.52 - 94174.49	0.734	0.671	Triangular (0.0000, 0.1029, 2.8971)	Triangular (0.0000, 0.1162, 3.2727)	Triangular (0.0000, 1.0000, 28.1592)
NR per (Bus + Comm Payload + SV I&T NR), Commsats	28	NR	242.12 - 263709.16	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.656	0.688	Lognormal (1.0000, 0.6878)	Lognormal (1.2137, 0.8349)	Lognormal (1.7880, 1.2298)
NR per (Bus + Comm Payload + SV I&T NR), Non-Commsats	27	NR	652.91 - 158449.76	Bus + Comm Payload + SV I&T NR	2032.18 - 394226.48	0.687	0.715	Lognormal (1.0000, 0.7151)	Lognormal (1.2294, 0.8791)	Lognormal (1.8580, 1.3287)
Recurring per (Bus + Comm Payload + SV I&T NR), Commsats	29	Rec	486.09 - 446775.54	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.478	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Recurring per (Bus + Comm Payload + SV I&T NR), Non-Commsats	27	Rec	1664.31 - 214116.06	Bus + Comm Payload + SV I&T NR	2032.18 - 394226.48	0.533	0.554	Lognormal (1.0000, 0.5545)	Lognormal (1.1434, 0.6340)	Lognormal (1.4950, 0.8289)
NR to T1 Ratio, All	55	NR	242.12 - 263709.16	T1	561.46 - 152204.98	1.091	1.103	Beta (0.0203, 32.1103, 0.7343, 23.3175)	Beta (0.0326, 51.5605, 0.7343, 23.3175)	Beta (, , 0.7343, 23.3175)
NR per (Bus+CommPL+SV(I&T)NR), All	55	NR	242.12 - 263709.16	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.853	0.895	Lognormal (1.0000, 0.8950)	Lognormal (1.3420, 1.2011)	Lognormal (2.4170, 2.1632)
Recurring per (Bus+CommPL+SV(I&T)Rec), All	56	Rec	486.09 - 446775.54	Bus + Comm Payload + SV I&T NR	1024.77 - 920490.88	0.595	0.610	Lognormal (1.0000, 0.6104)	Lognormal (1.1716, 0.7151)	Lognormal (1.6081, 0.9816)
NR Typical Cost, Non-Commsats	27					1.221	1.320	Lognormal (1.0000, 1.3197)	Lognormal (1.6558, 2.1852)	Lognormal (4.5396, 5.9909)
NR Typical Cost, Commsats	28					1.523	2.021	Lognormal (1.0000, 2.0211)	Lognormal (2.2549, 4.5573)	Lognormal (11.4656, 23.1727)
Recurring Typical Cost, Commsats	29					1.281	1.621	Lognormal (1.0000, 1.6206)	Lognormal (1.9043, 3.0861)	Lognormal (6.9055, 11.1910)
Recurring Typical Cost, Non-Commsats	27					1.257	1.389	Lognormal (1.0000, 1.3890)	Lognormal (1.7116, 2.3774)	Lognormal (5.0139, 6.9645)
T1 Typical Cost, Commsats	29					1.234	1.768	Lognormal (1.0000, 1.7681)	Lognormal (2.0313, 3.5914)	Lognormal (8.3812, 14.8185)
T1 Typical Cost, Non-Commsats	27					1.004	0.963	Beta (0.0418, 3.8911, 0.4947, 1.4927)	Beta (0.0631, 5.8702, 0.4947, 1.4927)	Beta (, , 0.4947, 1.4927)
Cost Driver Metrics from CER Datasets										
Bus + CommPL + SV I&T NR, Non-Commsat	27					1.424	1.926	Lognormal (1.0000, 1.9261)	Lognormal (2.1703, 4.1802)	Lognormal (10.2219, 19.6886)
Bus + CommPL + SV I&T NR, Commsat	18					1.035	1.250	Lognormal (1.0000, 1.2503)	Lognormal (1.6010, 2.0017)	Lognormal (4.1038, 5.1309)
Bus + CommPL + SV I&T Rec, Non-Commsat	25					1.116	1.135	Beta (0.1106, 4.1577, 0.2594, 0.9209)	Beta (0.2614, 9.8277, 0.2594, 0.9209)	Beta (, , 0.2594, 0.9209)
Bus + CommPL + SV I&T Rec, Commsat	26					0.908	0.882	Beta (0.1778, 3.4207, 0.3950, 1.1631)	Beta (0.2735, 5.2604, 0.3950, 1.1631)	Beta (, , 0.3950, 1.1631)
Cost Driver Metrics from Entire Dataset										
Bus + CommPL + SV I&T NR, All	56					1.540	1.786	Lognormal (1.0000, 1.7857)	Lognormal (2.0467, 3.6548)	Lognormal (8.5732, 15.3096)
Bus + CommPL + SV I&T Rec, All	56					1.134	1.131	Lognormal (1.0000, 1.1312)	Lognormal (1.5098, 1.7079)	Lognormal (3.4418, 3.8934)

Figure 4.2-2. 1.1.1 Space Vehicle SEPM

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	30	NR	1305.41 - 69917.35	Bus NR	7168.58 - 324309.13	0.551	0.539	Triangular (0.2111, 0.2660, 2.5229)	Triangular (0.2325, 0.2930, 2.7786)	Triangular (0.7936, 1.0000, 9.4840)
NR per Bus NR, NR CER Datapoints, Non-Commsats	15	NR	1305.41 - 69917.35	Bus NR	7756.32 - 324309.13	0.560	0.579	Lognormal (1.0000, 0.5785)	Lognormal (1.1553, 0.6684)	Lognormal (1.5420, 0.8921)
NR per Bus NR, NR CER Datapoints, Commsats	15	NR	1559.06 - 56096.38	Bus NR	7168.58 - 136704.99	0.678	0.704	Lognormal (1.0000, 0.7036)	Lognormal (1.2227, 0.8602)	Lognormal (1.8279, 1.2861)
NR Typical Cost, NR CER Datapoints, Non-Commsats	15					1.369	2.449	Lognormal (1.0000, 2.4491)	Lognormal (2.6454, 6.4789)	Lognormal (18.5128, 45.3398)
NR Typical Cost, NR CER Datapoints, Commsats	15					1.134	1.513	Lognormal (1.0000, 1.5126)	Lognormal (1.8132, 2.7426)	Lognormal (5.9616, 9.0172)
T1 CER, All	49	T1	1052 - 122062.58	Bus I&T	-	0.362	0.354	Normal (1.0000, 0.3544)	Normal (1.0000, 0.3544)	Normal (1.0000, 0.3544)
T1 I&T per Bus I&T, T1 CER Datapoints, Non-Commsats	25	T1	1052 - 122062.58	Bus T1	4003.15 - 129911.57	0.595	0.645	Lognormal (1.0000, 0.6445)	Lognormal (1.1897, 0.7668)	Lognormal (1.6840, 1.0854)
T1 I&T per Bus I&T, T1 CER Datapoints, Commsats	24	T1	2793.04 - 27209.55	Bus T1	12516.48 - 89797.01	0.462	0.485	Lognormal (1.0000, 0.4847)	Lognormal (1.1113, 0.5386)	Lognormal (1.3723, 0.6651)
T1 Typical Cost, T1 CER Datapoints, Non-Commsats	25					1.703	3.478	Lognormal (1.0000, 3.4779)	Lognormal (3.6188, 12.5860)	Lognormal (47.3918, 164.8249)
T1 Typical Cost, T1 CER Datapoints, Commsats	24					0.546	0.581	Lognormal (1.0000, 0.5807)	Lognormal (1.1564, 0.6715)	Lognormal (1.5463, 0.8979)
Metrics from Entire Dataset										
NR to T1 Ratio, Comsats	25	NR	8.7 - 152195.46	T1	2793.04 - 44075.67	1.470	1.635	Lognormal (1.0000, 1.6355)	Lognormal (1.9170, 3.1351)	Lognormal (7.0444, 11.5209)
NR to T1 Ratio, Non-Comsats	23	NR	347.62 - 69917.35	T1	1052 - 122062.58	1.113	1.534	Lognormal (1.0000, 1.5345)	Lognormal (1.8315, 2.8104)	Lognormal (6.1440, 9.4276)
NR per NR Bus, Commsats	25	NR	8.7 - 152195.46	Bus NR	661.5 - 136704.99	1.336	1.655	Lognormal (1.0000, 1.6553)	Lognormal (1.9339, 3.2013)	Lognormal (7.2331, 11.9732)
NR per NR Bus, Non-Commsats	23	NR	347.62 - 69917.35	Bus NR	6433.97 - 324309.13	0.976	1.234	Lognormal (1.0000, 1.2342)	Lognormal (1.5885, 1.9605)	Lognormal (4.0081, 4.9468)
T1 I&T per Bus I&T, Govt Commsats	16	T1	2793.04 - 44075.67	Bus T1	12516.48 - 89797.01	0.616	0.664	Lognormal (1.0000, 0.6639)	Lognormal (1.2003, 0.7968)	Lognormal (1.7293, 1.1480)
T1 I&T per Bus I&T, Govt Non-Commsats	25	T1	1052 - 122062.58	Bus T1	4003.15 - 129911.57	0.553	0.587	Lognormal (1.0000, 0.5865)	Lognormal (1.1593, 0.6800)	Lognormal (1.5581, 0.9139)
T1 I&T per Bus I&T, Commercial Commsats	11	T1	3390.47 - 18350.99	Bus T1	30048.17 - 73922.87	0.254	0.244	Normal (1.0000, 0.2444)	Normal (1.0000, 0.2444)	Normal (1.0000, 0.2444)
NR to T1 Ratio, All	48	NR	8.7 - 152195.46	T1	1052 - 122062.58	1.386	1.498	Lognormal (1.0000, 1.4975)	Lognormal (1.8007, 2.6967)	Lognormal (5.8391, 8.7443)
NR per NR Bus, All	48	NR	8.7 - 152195.46	Bus NR	661.5 - 324309.13	1.248	1.459	Lognormal (1.0000, 1.4589)	Lognormal (1.7687, 2.5804)	Lognormal (5.5333, 8.0726)
T1 I&T per Bus I&T, All	54	T1	1052 - 122062.58	Bus T1	4003.15 - 129911.57	0.635	0.680	Lognormal (1.0000, 0.6798)	Lognormal (1.2092, 0.8221)	Lognormal (1.7681, 1.2020)
NR Typical Cost, Commsats	24		-		-	1.560	2.110	Lognormal (1.0000, 2.1102)	Lognormal (2.3351, 4.9274)	Lognormal (12.7327, 26.8680)
NR Typical Cost, Non-Commsats	23		-		-	1.621	3.040	Lognormal (1.0000, 3.0402)	Lognormal (3.2004, 9.7300)	Lognormal (32.7816, 99.6629)
Recurring Typical Cost, Govt Commsats	17		-		-	0.819	0.669	Triangular (0.0000, 0.1083, 2.8917)	Triangular (0.0000, 0.1222, 3.2653)	Triangular (0.0000, 1.0000, 26.7120)
Recurring Typical Cost, Govt Non-Commsats	25		-		-	1.285	1.309	Lognormal (1.0000, 1.3092)	Lognormal (1.6474, 2.1567)	Lognormal (4.4708, 5.8530)
Recurring Typical Cost, Commercial Commsats	11		-		-	0.882	1.177	Lognormal (1.0000, 1.1767)	Lognormal (1.5442, 1.8171)	Lognormal (3.6825, 4.3332)
T1 Typical Cost, Govt Commsats	17		-		-	0.827	0.938	Lognormal (1.0000, 0.9382)	Lognormal (1.3712, 1.2865)	Lognormal (2.5783, 2.4190)
T1 Typical Cost, Govt Non-Commsats	25		-		-	1.482	2.218	Lognormal (1.0000, 2.2183)	Lognormal (2.4333, 5.3979)	Lognormal (14.4078, 31.9614)
T1 Typical Cost, Commercial Commsats	11		-		-	0.436	0.458	Lognormal (1.0000, 0.4585)	Lognormal (1.1001, 0.5044)	Lognormal (1.3314, 0.6104)
NR Typical Cost, All	47		-		-	1.578	1.866	Lognormal (1.0000, 1.8664)	Lognormal (2.1174, 3.9518)	Lognormal (9.4930, 17.7175)
Recurring Typical Cost, All	55		-		-	1.153	1.200	Beta (0.0406, 4.9706, 0.3205, 1.3264)	Beta (0.0921, 11.2660, 0.3205, 1.3264)	Beta (, , 0.3205, 1.3264)
T1 Typical Cost, All	55		-		-	1.336	1.778	Lognormal (1.0000, 1.7784)	Lognormal (2.0403, 3.6284)	Lognormal (8.4930, 15.1039)
Cost Driver Metrics from CER Datasets										
Bus NR, NR CER Datapoints, Non-Commsats	15		-		-	1.092	1.438	Lognormal (1.0000, 1.4375)	Lognormal (1.7511, 2.5173)	Lognormal (5.3697, 7.7190)
Bus NR, NR CER Datapoints, Commsats	15		-		-	0.631	0.631	Lognormal (1.0000, 0.6311)	Lognormal (1.1825, 0.7463)	Lognormal (1.6535, 1.0436)
Bus T1, T1 CER Datapoints, Non-Commsats	25		-		-	0.939	0.926	Lognormal (1.0000, 0.9256)	Lognormal (1.3626, 1.2612)	Lognormal (2.5300, 2.3418)
Bus T1, T1 CER Datapoints, Commsats	24		-		-	0.508	0.539	Lognormal (1.0000, 0.5390)	Lognormal (1.1360, 0.6123)	Lognormal (1.4661, 0.7902)
Cost Driver Metrics from Entire Dataset										
Bus NR, All	53		-		-	1.048	1.035	Beta (0.0174, 4.2450, 0.4590, 1.5157)	Beta (0.0285, 6.9424, 0.4590, 1.5157)	Beta (, , 0.4590, 1.5157)
Bus T1, All	53		-		-	0.716	0.710	Lognormal (1.0000, 0.7099)	Lognormal (1.2263, 0.8705)	Lognormal (1.8443, 1.3092)

Figure 4.2-3. 1.1.2 Space Vehicle I&T

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, New Design	19	NR	9181.96 - 161400.93	Weight	340.41 - 4145.36	0.395	0.402	Lognormal (1.0000, 0.4023)	Lognormal (1.0779, 0.4336)	Lognormal (1.2523, 0.5037)
NR Cost per Lb	19	NR	9181.96 - 161400.93	Weight	340.41 - 4145.36	0.489	0.505	Lognormal (1.0000, 0.5046)	Lognormal (1.1201, 0.5653)	Lognormal (1.4054, 0.7092)
NR Typical Cost	19					0.616	0.598	Triangular (0.0000, 0.3201, 2.6799)	Triangular (0.0000, 0.3550, 2.9721)	Triangular (0.0000, 1.0000, 8.3731)
T1 CER, Non-scientific	39	T1	4003.15 - 89797.01	Weight	340.41 - 5004.39	0.289	0.292	Lognormal (1.0000, 0.2915)	Lognormal (1.0416, 0.3037)	Lognormal (1.1302, 0.3295)
T1 Cost per Lb, Standard Bus	15	T1	30048.17 - 73922.87	Weight	1874.55 - 4950.19	0.154	0.149	Triangular (0.6162, 1.0424, 1.3414)	Triangular (0.6105, 1.0328, 1.3290)	Triangular (0.5911, 1.0000, 1.2868)
T1 Cost per Lb, Unique Bus	24	T1	4003.15 - 89797.01	Weight	340.41 - 5004.39	0.313	0.315	Lognormal (1.0000, 0.3151)	Lognormal (1.0485, 0.3304)	Lognormal (1.1526, 0.3632)
T1 Typical Cost, Standard Bus	15					0.324	0.317	Beta (0.7630, 1.8770, 0.2286, 0.8460)	Beta (0.9182, 2.2589, 0.2286, 0.8460)	Beta (, , 0.2286, 0.8460)
T1 Typical Cost, Unique Bus	24					0.679	0.748	Lognormal (1.0000, 0.7485)	Lognormal (1.2491, 0.9349)	Lognormal (1.9488, 1.4586)
Metrics from Entire Dataset										
NR Cost per Lb, New Design	24	NR	9181.96 - 161400.93	Weight	340.41 - 5004.39	0.572	0.577	Lognormal (1.0000, 0.5769)	Lognormal (1.1545, 0.6661)	Lognormal (1.5388, 0.8878)
NR Cost per Lb, Modified Design	27	NR	885.23 - 57451.27	Weight	148.27 - 4950.19	0.816	0.692	Triangular (0.0000, 0.0424, 2.9576)	Triangular (0.0000, 0.0481, 3.3560)	Triangular (0.0000, 1.0000, 69.8029)
NR to T1 Ratio, New Design	24	NR	9181.96 - 161400.93	T1	4003.15 - 108139.53	0.558	0.546	Triangular (0.0788, 0.3884, 2.5328)	Triangular (0.0865, 0.4264, 2.7800)	Triangular (0.2028, 1.0000, 6.5202)
NR to T1 Ratio, Modified Design	27	NR	885.23 - 57451.27	T1	8777.83 - 115014.34	0.969	1.056	Lognormal (1.0000, 1.0557)	Lognormal (1.4541, 1.5351)	Lognormal (3.0747, 3.2459)
T1 Cost per Lb, New Design	24	T1	4003.15 - 108139.53	Weight	340.41 - 5004.39	0.575	0.624	Lognormal (1.0000, 0.6242)	Lognormal (1.1788, 0.7359)	Lognormal (1.6382, 1.0226)
T1 Cost per Lb, Modified Design	27	T1	8777.83 - 115014.34	Weight	148.27 - 4950.19	0.580	0.651	Lognormal (1.0000, 0.6507)	Lognormal (1.1930, 0.7763)	Lognormal (1.6981, 1.1049)
T1 Cost per Lb, Standard Bus	17	T1	20909.56 - 73922.87	Weight	1874.55 - 4950.19	0.175	0.171	Triangular (0.5484, 1.0772, 1.3744)	Triangular (0.5399, 1.0606, 1.3531)	Triangular (0.5091, 1.0000, 1.2758)
T1 Cost per Lb, Unique Bus	39	T1	4003.15 - 181728.65	Weight	148.27 - 14615.34	0.626	0.657	Lognormal (1.0000, 0.6565)	Lognormal (1.1963, 0.7854)	Lognormal (1.7119, 1.1239)
NR Cost per Lb, (All)	56	NR	661.5 - 443323.05	Weight	148.27 - 14615.34	1.206	1.325	Lognormal (1.0000, 1.3255)	Lognormal (1.6604, 2.2008)	Lognormal (4.5776, 6.0675)
T1 Cost per Lb, (All)	54	T1	4003.15 - 129911.57	Weight	340.41 - 14615.34	0.522	0.560	Lognormal (1.0000, 0.5601)	Lognormal (1.1462, 0.6420)	Lognormal (1.5057, 0.8433)
NR Typical Cost, New Design	24					0.612	0.597	Triangular (0.0078, 0.3141, 2.6781)	Triangular (0.0086, 0.3482, 2.9695)	Triangular (0.0248, 1.0000, 8.5276)
NR Typical Cost, Modified Design	27					1.081	1.087	Beta (0.0644, 4.1777, 0.3444, 1.1698)	Beta (0.1240, 8.0507, 0.3444, 1.1698)	Beta (, , 0.3444, 1.1698)
T1 Typical Cost, Standard Bus	17					0.350	0.362	Lognormal (1.0000, 0.3619)	Lognormal (1.0635, 0.3848)	Lognormal (1.2027, 0.4352)
T1 Typical Bus, Unique Bus	39					0.944	0.939	Lognormal (1.0000, 0.9390)	Lognormal (1.3718, 1.2882)	Lognormal (2.5814, 2.4240)
Recurring Typical Cost, New Design	24					0.994	1.095	Lognormal (1.0000, 1.0947)	Lognormal (1.4827, 1.6232)	Lognormal (3.2597, 3.5685)
Recurring Typical Cost, Modified Design	27					0.822	0.804	Beta (0.1337, 3.1148, 0.5326, 1.3002)	Beta (0.1774, 4.1310, 0.5326, 1.3002)	Beta (, , 0.5326, 1.3002)
Recurring Typical Cost, Standard Bus	17					0.830	0.870	Lognormal (1.0000, 0.8699)	Lognormal (1.3254, 1.1530)	Lognormal (2.3284, 2.0254)
Recurring Typical Cost, Unique Bus	39					1.051	1.150	Lognormal (1.0000, 1.1503)	Lognormal (1.5242, 1.7533)	Lognormal (3.5409, 4.0731)
NR Typical Cost, (All)	56					1.509	1.832	Lognormal (1.0000, 1.8323)	Lognormal (2.0875, 3.8249)	Lognormal (9.0961, 16.6671)
T1 Typical Cost, (All)	56					0.841	0.866	Lognormal (1.0000, 0.8657)	Lognormal (1.3227, 1.1450)	Lognormal (2.3139, 2.0031)
Recurring Typical Cost, (All)	56					1.016	1.077	Lognormal (1.0000, 1.0775)	Lognormal (1.4700, 1.5839)	Lognormal (3.1765, 3.4226)
Cost Driver Metrics from CER Datasets										
Weight, NR (New Design)	18					0.585	0.598	Lognormal (1.0000, 0.5978)	Lognormal (1.1651, 0.6965)	Lognormal (1.5815, 0.9455)
Weight, T1 (Standard Bus)	15					0.352	0.347	Beta (0.6394, 1.6885, 0.3659, 0.6986)	Beta (0.7240, 1.9118, 0.3659, 0.6986)	Beta (, , 0.3659, 0.6986)
Weight, T1 (Unique Bus)	24					0.635	0.712	Lognormal (1.0000, 0.7118)	Lognormal (1.2275, 0.8737)	Lognormal (1.8494, 1.3165)

Figure 4.2-4. 1.2 Spacecraft Bus

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	16	NR	1391.89 - 29450.77	Weight	119.18 - 1730.62	0.533	0.549	Lognormal (1.0000, 0.5492)	Lognormal (1.1409, 0.6266)	Lognormal (1.4850, 0.8156)
NR Cost per lb	16	NR	1391.89 - 29450.77	Weight	119.18 - 1730.62	0.533	0.549	Lognormal (1.0000, 0.5492)	Lognormal (1.1409, 0.6266)	Lognormal (1.4850, 0.8156)
NR Cost	16		-		-	0.794	0.664	Triangular (0.0000, 0.1219, 2.8781)	Triangular (0.0000, 0.1374, 3.2429)	Triangular (0.0000, 1.0000, 23.6089)
T1 CER Residuals	42	T1	379.31 - 38605.44	Weight	102 - 11442	0.394	0.390	Normal (1.0000, 0.3904)	Normal (1.0000, 0.3904)	Normal (1.0000, 0.3904)
T1 Cost per lb	42	T1	379.31 - 38605.44	Weight	102 - 11442	0.394	0.390	Normal (1.0000, 0.3904)	Normal (1.0000, 0.3904)	Normal (1.0000, 0.3904)
T1 Cost	42		-		-	1.408	1.319	Lognormal (1.0000, 1.3194)	Lognormal (1.6556, 2.1844)	Lognormal (4.5378, 5.9873)
Metrics from Entire Dataset										
NR Cost per lb, New Design	24	NR	886.87 - 101361.87	Weight	119.18 - 11442	0.704	0.702	Lognormal (1.0000, 0.7020)	Lognormal (1.2218, 0.8578)	Lognormal (1.8240, 1.2805)
NR Cost per lb, Modified Design	19	NR	80.79 - 12018.67	Weight	18.15 - 1625.67	0.888	0.905	Lognormal (1.0000, 0.9054)	Lognormal (1.3490, 1.2214)	Lognormal (2.4548, 2.2226)
NR to T1 Ratio, New Design	24	NR	886.87 - 101361.87	T1	444.84 - 38605.44	0.659	0.676	Lognormal (1.0000, 0.6761)	Lognormal (1.2071, 0.8161)	Lognormal (1.7589, 1.1892)
NR to T1 Ratio, Modified Design	19	NR	80.79 - 12018.67	T1	379.31 - 12466.6	0.616	0.625	Lognormal (1.0000, 0.6248)	Lognormal (1.1791, 0.7367)	Lognormal (1.6394, 1.0243)
T1 Cost per lb, Govt	42	T1	379.31 - 38605.44	Weight	102 - 11442	0.449	0.450	Lognormal (1.0000, 0.4503)	Lognormal (1.0967, 0.4939)	Lognormal (1.3191, 0.5940)
T1 Cost per lb, Commer	11	T1	1557.56 - 13207.48	Weight	343.39 - 989.49	0.681	0.713	Lognormal (1.0000, 0.7128)	Lognormal (1.2281, 0.8754)	Lognormal (1.8521, 1.3202)
NR Cost per lb, All	49	NR	62.92 - 101361.87	Weight	18.15 - 11442	0.971	0.956	Beta (0.0000, 9.4648, 0.8730, 7.3900)	Beta (0.0000, 13.3428, 0.8730, 7.3900)	Beta (, , 0.8730, 7.3900)
T1 Cost per lb, All	53	T1	379.31 - 38605.44	Weight	102 - 11442	0.532	0.542	Lognormal (1.0000, 0.5418)	Lognormal (1.1374, 0.6163)	Lognormal (1.4713, 0.7972)
NR Cost, New Design	23		-		-	0.885	0.929	Lognormal (1.0000, 0.9287)	Lognormal (1.3647, 1.2674)	Lognormal (2.5418, 2.3606)
NR Cost, Modified Design	19		-		-	0.796	0.701	Triangular (0.0000, 0.0179, 2.9821)	Triangular (0.0000, 0.0203, 3.3897)	Triangular (0.0000, 1.0000, 166.8890)
T1 Cost, Govt	43		-		-	1.373	1.443	Lognormal (1.0000, 1.4432)	Lognormal (1.7558, 2.5339)	Lognormal (5.4125, 7.8111)
T1 Cost, Commer	11		-		-	0.746	0.776	Lognormal (1.0000, 0.7758)	Lognormal (1.2656, 0.9819)	Lognormal (2.0274, 1.5728)
Recurring Cost, Govt	43		-		-	1.122	1.149	Lognormal (1.0000, 1.1486)	Lognormal (1.5229, 1.7493)	Lognormal (3.5323, 4.0573)
Recurring Cost, Commer	11		-		-	1.287	1.141	Lognormal (1.0000, 1.1407)	Lognormal (1.5170, 1.7303)	Lognormal (3.4907, 3.9818)
NR Cost, All	48		-		-	1.163	1.172	Beta (0.0090, 5.9098, 0.4274, 2.1174)	Beta (0.0174, 11.4071, 0.4274, 2.1174)	Beta (, , 0.4274, 2.1174)
T1 Cost, All	54		-		-	1.278	1.458	Lognormal (1.0000, 1.4585)	Lognormal (1.7684, 2.5791)	Lognormal (5.5299, 8.0653)
Recurring Cost, All	54		-		-	1.144	1.166	Beta (0.0576, 5.7985, 0.3818, 1.9442)	Beta (0.1165, 11.7306, 0.3818, 1.9442)	Beta (, , 0.3818, 1.9442)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals	16		-		-	0.833	1.026	Lognormal (1.0000, 1.0261)	Lognormal (1.4328, 1.4703)	Lognormal (2.9415, 3.0184)
Weight, T1 CER Residuals	40		-		-	0.674	0.650	Triangular (0.0000, 0.1638, 2.8362)	Triangular (0.0000, 0.1842, 3.1880)	Triangular (0.0000, 1.0000, 17.3096)
Cost Driver Metrics from Entire Dataset										
Weight, All	52		-		-	0.705	0.683	Triangular (0.0289, 0.0390, 2.9321)	Triangular (0.0328, 0.0441, 3.3210)	Triangular (0.7421, 1.0000, 75.2324)

Figure 4.2-5. 1.2.2 Structures and Mechanisms Subsystem

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for New or Modified Design	20	NR	199.28 - 10160.57	Subsystem Weight	2.31 - 761.23	0.600	0.582	Triangular (0.1421, 0.2129, 2.6450)	Triangular (0.1577, 0.2364, 2.9358)	Triangular (0.6673, 1.0000, 12.4207)
NR Cost per lb, New Design	12	NR	783.8 - 10160.57	Subsystem Weight	17.8 - 701.37	1.300	1.135	Lognormal (1.0000, 1.1354)	Lognormal (1.5130, 1.7178)	Lognormal (3.4633, 3.9321)
NR Cost per lb, Modified Design	8	NR	199.28 - 4492.18	Subsystem Weight	2.31 - 761.23	1.507	1.635	Lognormal (1.0000, 1.6351)	Lognormal (1.9167, 3.1339)	Lognormal (7.0409, 11.5126)
NR Cost, New Design	12		-		-	0.800	0.845	Lognormal (1.0000, 0.8449)	Lognormal (1.3091, 1.1061)	Lognormal (2.2436, 1.8956)
NR Cost, Modified Design	8		-		-	1.138	1.019	Lognormal (1.0000, 1.0186)	Lognormal (1.4274, 1.4540)	Lognormal (2.9086, 2.9627)
T1 CER Residuals for Thermal Control Subsystem and Payload Weight	46	T1	21.61 - 3775.54	Subsystem Weight	2.31 - 761.23	0.564	0.549	Lognormal (1.0000, 0.5491)	Lognormal (1.1408, 0.6264)	Lognormal (1.4847, 0.8152)
T1 Cost per Thermal Control Subsystem Lb	46	T1	21.61 - 3775.54	Subsystem Weight	2.31 - 761.23	1.223	1.212	Lognormal (1.0000, 1.2120)	Lognormal (1.5713, 1.9044)	Lognormal (3.8795, 4.7020)
T1 Cost per Payload Lb	46	T1	21.61 - 3775.54	Payload Weight	113.97 - 6325.26	0.889	0.905	Beta (0.0650, 7.7644, 0.8154, 5.8990)	Beta (0.0903, 10.7912, 0.8154, 5.8990)	Beta (, , 0.8154, 5.8990)
T1 Cost	46		-		-	0.819	0.788	Lognormal (1.0000, 0.7880)	Lognormal (1.2732, 1.0032)	Lognormal (2.0637, 1.6261)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	26	NR	481.77 - 13931.98	Subsystem Weight	11.01 - 701.37	1.338	1.482	Beta (0.0817, 75.9750, 0.3671, 29.9736)	Beta (0.2097, 195.0588, 0.3671, 29.9736)	Beta (, , 0.3671, 29.9736)
NR Cost per lb, Modified Design, All	13	NR	199.28 - 4492.18	Subsystem Weight	2.31 - 761.23	1.122	1.035	Beta (0.0534, 3.1282, 0.2713, 0.6100)	Beta (0.1013, 5.9329, 0.2713, 0.6100)	Beta (, , 0.2713, 0.6100)
NR to T1 Ratio, New Design, All	26	NR	481.77 - 13931.98	T1	122.16 - 5659.01	0.872	0.908	Lognormal (1.0000, 0.9080)	Lognormal (1.3507, 1.2265)	Lognormal (2.4645, 2.2378)
NR to T1 Ratio, Modified Design, All	11	NR	199.28 - 4492.18	T1	170.26 - 3775.54	1.137	1.199	Lognormal (1.0000, 1.1988)	Lognormal (1.5612, 1.8716)	Lognormal (3.8049, 4.5614)
T1 Cost per Thermal Control Subsystem lb, Commsat	27	T1	236.82 - 3775.54	Subsystem Weight	36.3 - 761.23	0.761	0.647	Lognormal (1.0000, 0.6468)	Lognormal (1.1910, 0.7704)	Lognormal (1.6892, 1.0927)
T1 Cost per Thermal Control Subsystem Lb, Non-Commsat	25	T1	21.61 - 5659.01	Subsystem Weight	2.31 - 599	1.055	1.024	Lognormal (1.0000, 1.0237)	Lognormal (1.4310, 1.4649)	Lognormal (2.9306, 2.9999)
T1 Cost per Payload lb, Commsat	26	T1	236.82 - 3775.54	Payload Weight	159.3 - 3574.16	0.771	0.777	Beta (0.1848, 3.8310, 0.6310, 2.1912)	Beta (0.2445, 5.0681, 0.6310, 2.1912)	Beta (, , 0.6310, 2.1912)
T1 Cost per Payload lb, Non-Commsat	20	T1	21.61 - 2558.58	Payload Weight	113.97 - 6325.26	1.087	1.281	Lognormal (1.0000, 1.2809)	Lognormal (1.6250, 2.0815)	Lognormal (4.2912, 5.4967)
NR Cost per lb, All	48	NR	12 - 13931.98	Subsystem Weight	2.31 - 761.23	1.490	1.568	Beta (0.0020, 78.3105, 0.3872, 29.9954)	Beta (0.0055, 218.6624, 0.3872, 29.9954)	Beta (, , 0.3872, 29.9954)
T1 Cost per Thermal Control Subsystem lb, all	51	T1	21.61 - 5659.01	Subsystem Weight	6.3 - 761.23	0.900	0.943	Lognormal (1.0000, 0.9429)	Lognormal (1.3744, 1.2960)	Lognormal (2.5964, 2.4482)
NR Cost, New Design, All	26		-		-	0.846	0.838	Beta (0.1076, 3.1108, 0.4995, 1.1815)	Beta (0.1458, 4.2152, 0.4995, 1.1815)	Beta (, , 0.4995, 1.1815)
NR Cost, Modified Design, All	13		-		-	1.044	1.100	Beta (0.1618, 3.6473, 0.2003, 0.6327)	Beta (0.4247, 9.5742, 0.2003, 0.6327)	Beta (, , 0.2003, 0.6327)
NR Cost, Existing Design, All	8		-		-	0.857	0.815	Lognormal (1.0000, 0.8153)	Lognormal (1.2903, 1.0520)	Lognormal (2.1480, 1.7513)
T1 Cost, Commsat	27		-		-	0.592	0.603	Lognormal (1.0000, 0.6030)	Lognormal (1.1677, 0.7041)	Lognormal (1.5923, 0.9601)
T1 Cost, Non-Commsats	25		-		-	1.304	1.278	Lognormal (1.0000, 1.2776)	Lognormal (1.6224, 2.0727)	Lognormal (4.2703, 5.4556)
Recurring Cost, Commsat	27		-		-	1.233	1.193	Lognormal (1.0000, 1.1925)	Lognormal (1.5563, 1.8559)	Lognormal (3.7695, 4.4952)
Recurring Cost, Non-Commsats	25		-		-	1.217	1.354	Lognormal (1.0000, 1.3544)	Lognormal (1.6835, 2.2801)	Lognormal (4.7717, 6.4626)
NR Cost, All	52		-		-	0.964	0.946	Lognormal (1.0000, 0.9457)	Lognormal (1.3764, 1.3016)	Lognormal (2.6073, 2.4657)
T1 Cost, All	52		-		-	0.964	0.946	Lognormal (1.0000, 0.9457)	Lognormal (1.3764, 1.3016)	Lognormal (2.6073, 2.4657)
Recurring Cost, All	51		-		-	1.044	1.047	Lognormal (1.0000, 1.0474)	Lognormal (1.4481, 1.5168)	Lognormal (3.0369, 3.1809)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals, New Design	12		-		-	0.981	0.684	Lognormal (1.0000, 0.6843)	Lognormal (1.2117, 0.8292)	Lognormal (1.7792, 1.2175)
Weight, NR CER Residuals, Modified Design	8		-		-	1.355	1.507	Beta (0.0113, 3.7249, 0.0494, 0.1362)	Beta (0.6160, 202.9972, 0.0494, 0.1362)	Beta (, , 0.0494, 0.1362)
Thermal Control Subsystem Weight, T1 CER Residuals	46		-		-	1.216	1.255	Lognormal (1.0000, 1.2554)	Lognormal (1.6050, 2.0150)	Lognormal (4.1348, 5.1910)
Payload Weight, T1 CER Residuals	46		-		-	0.903	0.855	Lognormal (1.0000, 0.8545)	Lognormal (1.3154, 1.1240)	Lognormal (2.2759, 1.9448)
Cost Driver Metrics from Entire Dataset										
Thermal Control Subsystem Weight, All	53		-		-	1.156	0.913	Beta (0.0153, 5.0430, 0.7390, 3.0340)	Beta (0.0211, 6.9451, 0.7390, 3.0340)	Beta (, , 0.7390, 3.0340)
Payload Weight, All	46		-		-	0.903	0.855	Lognormal (1.0000, 0.8545)	Lognormal (1.3154, 1.1240)	Lognormal (2.2759, 1.9448)

Figure 4.2-6. 1.2.3 Thermal Control Subsystem

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for New or Modified Design	27	NR	515.99 - 28002.84	Weight	82.2 - 2012.99	0.541	0.529	Triangular (0.0324, 0.4958, 2.4718)	Triangular (0.0352, 0.5393, 2.6887)	Triangular (0.0653, 1.0000, 4.9856)
NR Cost per lb, New Design	13	NR	2508 - 28002.84	Weight	233.66 - 2012.99	0.585	0.562	Triangular (0.1334, 0.2783, 2.5883)	Triangular (0.1475, 0.3077, 2.8617)	Triangular (0.4795, 1.0000, 9.3005)
NR Cost per lb, Modified Design	14	NR	515.99 - 16962.22	Weight	82.2 - 1968.7	0.558	0.519	Triangular (0.0000, 0.5683, 2.4317)	Triangular (0.0000, 0.6127, 2.6219)	Triangular (0.0000, 1.0000, 4.2790)
NR Cost, New Design	13		-		-	0.598	0.582	Triangular (0.0000, 0.3690, 2.6310)	Triangular (0.0000, 0.4073, 2.9040)	Triangular (0.0000, 1.0000, 7.1294)
NR Cost, Modified Design	14		-		-	0.953	0.951	Beta (0.0898, 2.9516, 0.3073, 0.6588)	Beta (0.1458, 4.7923, 0.3073, 0.6588)	Beta (, , 0.3073, 0.6588)
T1 CER Residuals for Govt or Commer	51	T1	803.6 - 39707.21	Weight	68.29 - 2341.64	0.481	0.483	Lognormal (1.0000, 0.4832)	Lognormal (1.1106, 0.5367)	Lognormal (1.3700, 0.6620)
T1 Cost per lb, Govt	40	T1	803.6 - 39707.21	Weight	68.29 - 2341.64	0.616	0.637	Lognormal (1.0000, 0.6371)	Lognormal (1.1857, 0.7555)	Lognormal (1.6670, 1.0621)
T1 Cost per lb, Commer	11	T1	3738.72 - 27814.25	Weight	233.66 - 1910.87	0.279	0.281	Lognormal (1.0000, 0.2812)	Lognormal (1.0388, 0.2921)	Lognormal (1.1209, 0.3152)
T1 Cost, Govt	40		-		-	0.870	0.900	Beta (0.0740, 3.6587, 0.5265, 1.5116)	Beta (0.1054, 5.2097, 0.5265, 1.5116)	Beta (, , 0.5265, 1.5116)
T1 Cost, Commer	11		-		-	0.576	0.630	Lognormal (1.0000, 0.6297)	Lognormal (1.1818, 0.7442)	Lognormal (1.6504, 1.0394)
Cost Driver Metrics from Entire Dataset										
NR Cost per lb, New Design, All	24	NR	1136.95 - 65246.82	Weight	68.29 - 2341.64	0.750	0.749	Beta (0.1769, 4.2937, 0.7656, 3.0637)	Beta (0.2262, 5.4913, 0.7656, 3.0637)	Beta (, , 0.7656, 3.0637)
NR Cost per lb, Modified Design, All	27	NR	493.97 - 16962.22	Weight	82.2 - 1968.7	0.801	0.684	Triangular (0.0000, 0.0660, 2.9340)	Triangular (0.0000, 0.0748, 3.3234)	Triangular (0.0000, 1.0000, 44.4449)
NR to T1 Ratio, New Design, All	24	NR	1136.95 - 65246.82	T1	803.6 - 39707.21	0.594	0.572	Triangular (0.1124, 0.2716, 2.6159)	Triangular (0.1245, 0.3007, 2.8961)	Triangular (0.4139, 1.0000, 9.6302)
NR to T1 Ratio, Modified Design, All	27	NR	493.97 - 16962.22	T1	1516.85 - 31505.69	0.919	0.919	Beta (0.0935, 3.8954, 0.5029, 1.6064)	Beta (0.1383, 5.7616, 0.5029, 1.6064)	Beta (, , 0.5029, 1.6064)
T1 Cost per lb, Govt, All	43	T1	803.6 - 39707.21	Weight	68.29 - 2341.64	0.600	0.622	Lognormal (1.0000, 0.6223)	Lognormal (1.1778, 0.7330)	Lognormal (1.6339, 1.0168)
T1 Cost per lb, Commer, All	11	T1	3738.72 - 27814.25	Weight	233.66 - 1910.87	0.279	0.281	Lognormal (1.0000, 0.2812)	Lognormal (1.0388, 0.2921)	Lognormal (1.1209, 0.3152)
NR Cost per lb, All	53	NR	40.75 - 65246.82	Weight	68.29 - 2341.64	1.170	1.217	Beta (0.0021, 13.3001, 0.5469, 6.7404)	Beta (0.0039, 24.7128, 0.5469, 6.7404)	Beta (, , 0.5469, 6.7404)
T1 Cost per lb, All	54	T1	803.6 - 39707.21	Weight	68.29 - 2341.64	0.609	0.639	Lognormal (1.0000, 0.6388)	Lognormal (1.1866, 0.7581)	Lognormal (1.6709, 1.0674)
NR Cost, New Design, All	24		-		-	0.947	0.950	Lognormal (1.0000, 0.9497)	Lognormal (1.3791, 1.3097)	Lognormal (2.6230, 2.4910)
NR Cost, Modified Design, All	27		-		-	1.191	1.257	Beta (0.1363, 4.6797, 0.1924, 0.8195)	Beta (0.4513, 15.4966, 0.1924, 0.8195)	Beta (, , 0.1924, 0.8195)
T1 Cost, Govt, All	43		-		-	0.868	0.904	Beta (0.0691, 3.4147, 0.4875, 1.2646)	Beta (0.0990, 4.8908, 0.4875, 1.2646)	Beta (, , 0.4875, 1.2646)
T1 Cost, Commer, All	11		-		-	0.576	0.630	Lognormal (1.0000, 0.6297)	Lognormal (1.1818, 0.7442)	Lognormal (1.6504, 1.0394)
Recurring Cost, Govt	42		-		-	0.969	0.932	Beta (0.0589, 4.3339, 0.5748, 2.0362)	Beta (0.0855, 6.2957, 0.5748, 2.0362)	Beta (, , 0.5748, 2.0362)
Recurring Cost, Commer	11		-		-	0.532	0.552	Lognormal (1.0000, 0.5516)	Lognormal (1.1420, 0.6299)	Lognormal (1.4895, 0.8216)
NR Cost, All	53		-		-	1.381	1.611	Lognormal (1.0000, 1.6111)	Lognormal (1.8962, 3.0550)	Lognormal (6.8183, 10.9850)
T1 Cost, All	54		-		-	0.820	0.848	Beta (0.0701, 3.4650, 0.5993, 1.5888)	Beta (0.0935, 4.6189, 0.5993, 1.5888)	Beta (, , 0.5993, 1.5888)
Recurring Cost, All	54		-		-	1.163	1.262	Lognormal (1.0000, 1.2616)	Lognormal (1.6099, 2.0310)	Lognormal (4.1721, 5.2635)
Cost Driver Metrics from Entire Dataset										
Weight, NR CER Residuals, New Design	13		-		-	0.605	0.627	Lognormal (1.0000, 0.6273)	Lognormal (1.1805, 0.7405)	Lognormal (1.6449, 1.0318)
Weight, NR CER Residuals, Modified Design	14		-		-	0.762	0.677	Triangular (0.0000, 0.0847, 2.9153)	Triangular (0.0000, 0.0957, 3.2929)	Triangular (0.0000, 1.0000, 34.4132)
Weight, T1 CER Residuals, Govt	40		-		-	0.813	0.814	Beta (0.0913, 3.1308, 0.5737, 1.3452)	Beta (0.1188, 4.0723, 0.5737, 1.3452)	Beta (, , 0.5737, 1.3452)
Weight, T1 CER Residuals, Commer	11		-		-	0.388	0.371	Lognormal (1.0000, 0.3709)	Lognormal (1.0666, 0.3956)	Lognormal (1.2133, 0.4500)
Cost Driver Metrics from Entire Dataset										
Weight, All	54		-		-	0.705	0.679	Triangular (0.0000, 0.0792, 2.9208)	Triangular (0.0000, 0.0896, 3.3049)	Triangular (0.0000, 1.0000, 36.8672)

Figure 4.2-7. 1.2.4 EPS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER #1, All	11	NR	2477.38 - 11424.26	Weight	86.96 - 621.13	0.271	0.259	Triangular (0.5206, 0.7584, 1.7210)	Triangular (0.5418, 0.7892, 1.7911)	Triangular (0.6865, 1.0000, 2.2694)
NR CER #2, All	12	NR	2477.38 - 11424.26	Weight	86.96 - 621.13	0.327	0.316	Triangular (0.4490, 0.6665, 1.8845)	Triangular (0.4725, 0.7013, 1.9830)	Triangular (0.6737, 1.0000, 2.8276)
NR CER #3, All	12	NR	2477.38 - 11424.26	BOL	520 - 10403	0.289	0.280	Triangular (0.4632, 0.7630, 1.7737)	Triangular (0.4822, 0.7943, 1.8464)	Triangular (0.6071, 1.0000, 2.3246)
NR Cost per Lb, NR CER Datapoints, All	12	NR	2477.38 - 11424.26	Weight	86.96 - 621.13	0.463	0.445	Triangular (0.0709, 0.7294, 2.1997)	Triangular (0.0746, 0.7680, 2.3160)	Triangular (0.0972, 1.0000, 3.0157)
NR Typical Cost, NR CER Datapoints, All	12					0.486	0.463	Triangular (0.2965, 0.3942, 2.3093)	Triangular (0.3215, 0.4275, 2.5040)	Triangular (0.7521, 1.0000, 5.8576)
T1 CER, All	44	NR	0 - 20222.18	Weight	10.92 - 621.13	0.421	0.412	Triangular (0.1552, 0.7265, 2.1183)	Triangular (0.1635, 0.7651, 2.2308)	Triangular (0.2137, 1.0000, 2.9158)
T1 Cost per Lb, Commercial	10	T1	1839.7 - 13567.79	Weight	66.9 - 525.5	0.387	0.369	Triangular (0.3442, 0.6256, 2.0302)	Triangular (0.3649, 0.6631, 2.1520)	Triangular (0.5503, 1.0000, 3.2454)
T1 Cost per Lb, Government	34	T1	319.1 - 17861.82	Weight	10.92 - 621.13	0.673	0.708	Lognormal (1.0000, 0.7077)	Lognormal (1.2251, 0.8670)	Lognormal (1.8387, 1.3013)
T1 Typical Cost, Commercial	10					0.642	0.717	Lognormal (1.0000, 0.7168)	Lognormal (1.2304, 0.8819)	Lognormal (1.8625, 1.3350)
T1 Typical Cost, Government	34					1.065	1.011	Lognormal (1.0000, 1.0110)	Lognormal (1.4220, 1.4376)	Lognormal (2.8754, 2.9070)
Metrics from Entire Dataset										
NR to T1 Ratio, New Design	20	NR	184.22 - 20222.18	T1	319.1 - 17450.68	0.707	0.641	Triangular (0.0000, 0.1905, 2.8095)	Triangular (0.0000, 0.2136, 3.1495)	Triangular (0.0000, 1.0000, 14.7445)
NR to T1 Ratio, Modified Design	17	NR	138.54 - 7416.68	T1	765.54 - 17861.82	1.060	1.384	Lognormal (1.0000, 1.3844)	Lognormal (1.7078, 2.3642)	Lognormal (4.9806, 6.8950)
NR Cost per Lb, New Design	20	NR	184.22 - 20222.18	Weight	10.92 - 621.13	0.647	0.630	Triangular (0.0283, 0.1925, 2.7792)	Triangular (0.0316, 0.2155, 3.1103)	Triangular (0.1468, 1.0000, 14.4348)
NR Cost per Lb, Modified Design	17	NR	138.54 - 7416.68	Weight	33.35 - 596.76	0.849	0.928	Lognormal (1.0000, 0.9282)	Lognormal (1.3644, 1.2663)	Lognormal (2.5397, 2.3573)
T1 Cost per Lb, New Design	20	T1	319.1 - 17450.68	Weight	10.92 - 621.13	0.752	0.818	Lognormal (1.0000, 0.8182)	Lognormal (1.2921, 1.0572)	Lognormal (2.1571, 1.7650)
T1 Cost per Lb, Modified Design	17	T1	765.54 - 17861.82	Weight	33.35 - 596.76	0.464	0.452	Triangular (0.3180, 0.4049, 2.2772)	Triangular (0.3445, 0.4387, 2.4674)	Triangular (0.7853, 1.0000, 5.6243)
NR Cost per Lb, All	45	NR	1.24 - 20222.18	Weight	10.92 - 621.13	1.062	1.055	Beta (0.0003, 5.4745, 0.5514, 2.4678)	Beta (0.0004, 8.8015, 0.5514, 2.4678)	Beta (, , 0.5514, 2.4678)
T1 Cost per Lb, All	50	T1	34.88 - 17861.82	Weight	10.92 - 621.13	0.622	0.638	Lognormal (1.0000, 0.6376)	Lognormal (1.1860, 0.7562)	Lognormal (1.6681, 1.0636)
NR Typical Cost, New Design	20					0.985	0.995	Lognormal (1.0000, 0.9950)	Lognormal (1.4107, 1.4036)	Lognormal (2.8072, 2.7931)
NR Typical Cost, Modified Design	17					1.089	1.264	Lognormal (1.0000, 1.2639)	Lognormal (1.6117, 2.0370)	Lognormal (4.1863, 5.2911)
Recurring Typical Cost, New Design	20					1.003	0.937	Beta (0.0527, 3.5826, 0.4797, 1.3079)	Beta (0.0776, 5.2727, 0.4797, 1.3079)	Beta (, , 0.4797, 1.3079)
Recurring Typical Cost, Modified Design	17					1.023	1.213	Lognormal (1.0000, 1.2127)	Lognormal (1.5719, 1.9063)	Lognormal (3.8836, 4.7098)
T1 Typical Cost, Modified Design	20					1.121	1.085	Lognormal (1.0000, 1.0855)	Lognormal (1.4759, 1.6021)	Lognormal (3.2150, 3.4899)
T1 Typical Cost, Modified Design	17					1.002	1.183	Lognormal (1.0000, 1.1832)	Lognormal (1.5491, 1.8329)	Lognormal (3.7177, 4.3986)
NR Typical Cost, All	43					1.189	1.205	Beta (0.0005, 4.5342, 0.3160, 1.1173)	Beta (0.0011, 10.2913, 0.3160, 1.1173)	Beta (, , 0.3160, 1.1173)
Recurring Typical Cost, All	51					1.017	1.028	Beta (0.0029, 4.2807, 0.4890, 1.6092)	Beta (0.0047, 6.8080, 0.4890, 1.6092)	Beta (, , 0.4890, 1.6092)
T1 Typical Cost, All	51					1.080	1.104	Lognormal (1.0000, 1.1044)	Lognormal (1.4899, 1.6454)	Lognormal (3.3071, 3.6524)
Cost Driver Metrics from CER Dataset										
Weight, NR CER Datapoints, All	12					0.735	0.732	Beta (0.3092, 2.2084, 0.2024, 0.3540)	Beta (0.4636, 3.3113, 0.2024, 0.3540)	Beta (, , 0.2024, 0.3540)
Weight, T1 CER Datapoints, Commercial	10					0.375	0.358	Normal (1.0000, 0.3585)	Normal (1.0000, 0.3585)	Normal (1.0000, 0.3585)
Weight, T1 CER Datapoints, Government	34					0.780	0.692	Triangular (0.0000, 0.0429, 2.9571)	Triangular (0.0000, 0.0487, 3.3544)	Triangular (0.0000, 1.0000, 68.9146)
Cost Driver Metrics from Entire Dataset										
Weight, All	50					0.684	0.670	Triangular (0.0000, 0.1062, 2.8938)	Triangular (0.0000, 0.1199, 3.2677)	Triangular (0.0000, 1.0000, 27.2524)

Figure 4.2-8. 1.2.4.1 Electrical Power Generation

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for New or Modified Desi	34	NR	40.75 - 14073.72	Weight	17.65 - 750.15	0.541	0.522	Triangular (0.0000, 0.5607, 2.4393)	Triangular (0.0000, 0.6056, 2.6349)	Triangular (0.0000, 1.0000, 4.3506)
NR Cost per lb, New Design	10	NR	5371.14 - 14073.72	Weight	101.51 - 714.51	0.589	0.681	Lognormal (1.0000, 0.6815)	Lognormal (1.2101, 0.8247)	Lognormal (1.7721, 1.2076)
NR Cost per lb, Modified Design	24	NR	40.75 - 4600.05	Weight	17.65 - 750.15	0.648	0.626	Triangular (0.0000, 0.2357, 2.7643)	Triangular (0.0000, 0.2633, 3.0878)	Triangular (0.0000, 1.0000, 11.7289)
NR Cost, New Design	10		-		-	0.349	0.368	Lognormal (1.0000, 0.3677)	Lognormal (1.0655, 0.3918)	Lognormal (1.2095, 0.4448)
NR Cost, Modified Design	24		-		-	0.731	0.699	Triangular (0.0000, 0.0234, 2.9766)	Triangular (0.0000, 0.0266, 3.3803)	Triangular (0.0000, 1.0000, 127.2821)
T1 CER Residuals	40	T1	289.31 - 20254.64	Weight	17.65 - 750.15	0.528	0.538	Lognormal (1.0000, 0.5381)	Lognormal (1.1356, 0.6110)	Lognormal (1.4643, 0.7879)
T1 Cost per lb	40	T1	289.31 - 20254.64	Weight	17.65 - 750.15	0.593	0.621	Lognormal (1.0000, 0.6207)	Lognormal (1.1770, 0.7306)	Lognormal (1.6305, 1.0121)
T1 Cost	40		-		-	0.818	0.894	Lognormal (1.0000, 0.8941)	Lognormal (1.3414, 1.1994)	Lognormal (2.4137, 2.1581)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	21	NR	656.17 - 38246.72	Weight	31.42 - 1213.42	0.818	0.943	Lognormal (1.0000, 0.9433)	Lognormal (1.3747, 1.2967)	Lognormal (2.5979, 2.4505)
NR Cost per lb, Modified Design, All	24	NR	40.75 - 4600.05	Weight	17.65 - 750.15	0.648	0.626	Triangular (0.0000, 0.2357, 2.7643)	Triangular (0.0000, 0.2633, 3.0878)	Triangular (0.0000, 1.0000, 11.7289)
NR to T1 Ratio, New Design, All	21	NR	656.17 - 38246.72	T1	289.31 - 21490.47	0.571	0.553	Triangular (0.1653, 0.2731, 2.5616)	Triangular (0.1825, 0.3015, 2.8283)	Triangular (0.6054, 1.0000, 9.3807)
NR to T1 Ratio, Modified Design, All	24	NR	40.75 - 4600.05	T1	381.24 - 20254.64	1.107	1.141	Beta (0.0133, 5.7521, 0.4470, 2.1527)	Beta (0.0245, 10.5973, 0.4470, 2.1527)	Beta (, , 0.4470, 2.1527)
T1 Cost per lb, Comm	27	T1	554.27 - 10725.23	Weight	166.4 - 750.15	0.418	0.417	Lognormal (1.0000, 0.4173)	Lognormal (1.0836, 0.4522)	Lognormal (1.2723, 0.5310)
T1 Cost per lb, Non-Comm	25	T1	289.31 - 21490.47	Weight	17.65 - 1213.42	0.811	0.865	Lognormal (1.0000, 0.8652)	Lognormal (1.3223, 1.1440)	Lognormal (2.3121, 2.0004)
NR Cost per lb, All	51	NR	40.75 - 38246.72	Weight	17.65 - 1213.42	1.313	1.478	Lognormal (1.0000, 1.4777)	Lognormal (1.7843, 2.6366)	Lognormal (5.6804, 8.3940)
T1 Cost per lb, All	52	T1	289.31 - 21490.47	Weight	17.65 - 1213.42	0.717	0.774	Lognormal (1.0000, 0.7738)	Lognormal (1.2644, 0.9784)	Lognormal (2.0214, 1.5641)
NR Cost, New Design, All	21		-		-	0.862	0.940	Lognormal (1.0000, 0.9399)	Lognormal (1.3724, 1.2899)	Lognormal (2.5848, 2.4295)
NR Cost, Modified Design, All	24		-		-	0.731	0.699	Triangular (0.0000, 0.0234, 2.9766)	Triangular (0.0000, 0.0266, 3.3803)	Triangular (0.0000, 1.0000, 127.2821)
T1 Cost, Comm	27		-		-	0.489	0.483	Lognormal (1.0000, 0.4826)	Lognormal (1.1104, 0.5358)	Lognormal (1.3689, 0.6606)
T1 Cost, Non-Comm	25		-		-	1.107	1.123	Beta (0.0537, 3.9880, 0.2983, 0.9419)	Beta (0.1143, 8.4877, 0.2983, 0.9419)	Beta (, , 0.2983, 0.9419)
Recurring Cost, Comm	27		-		-	1.260	1.286	Lognormal (1.0000, 1.2859)	Lognormal (1.6290, 2.0947)	Lognormal (4.3226, 5.5584)
Recurring Cost, Non-Comm	25		-		-	1.087	1.079	Beta (0.0741, 3.8424, 0.3099, 0.9512)	Beta (0.1473, 7.6401, 0.3099, 0.9512)	Beta (, , 0.3099, 0.9512)
NR Cost, All	51		-		-	1.431	1.543	Lognormal (1.0000, 1.5428)	Lognormal (1.8386, 2.8366)	Lognormal (6.2149, 9.5884)
T1 Cost, All	52		-		-	0.881	0.892	Lognormal (1.0000, 0.8919)	Lognormal (1.3400, 1.1951)	Lognormal (2.4059, 2.1458)
Recurring Cost, All	52		-		-	1.352	1.671	Lognormal (1.0000, 1.6711)	Lognormal (1.9474, 3.2543)	Lognormal (7.3857, 12.3420)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals, New Design	10		-		-	0.508	0.468	Triangular (0.0000, 0.7496, 2.2504)	Triangular (0.0000, 0.7869, 2.3626)	Triangular (0.0000, 1.0000, 3.0024)
Weight, NR CER Residuals, Modified Desigr	24		-		-	0.648	0.624	Triangular (0.0000, 0.2413, 2.7587)	Triangular (0.0000, 0.2694, 3.0801)	Triangular (0.0000, 1.0000, 11.4342)
Weight, T1 CER Residuals	40		-		-	0.586	0.567	Beta (0.0000, 3.8321, 2.0415, 5.7817)	Beta (0.0000, 4.1685, 2.0415, 5.7817)	Beta (0.0000, 5.5913, 2.0415, 5.7817)
Cost Driver Metrics from Entire Dataset										
Weight, All	52		-		-	0.670	0.658	Lognormal (1.0000, 0.6577)	Lognormal (1.1969, 0.7872)	Lognormal (1.7146, 1.1276)

Figure 4.2-9. 1.2.4.2 EPS PCD

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	12	NR	60.62 - 3943.47	Weight	65.25 - 816.99	0.422	0.377	Triangular (0.0000, 1.1798, 1.8202)	Triangular (0.0000, 1.1395, 1.7581)	Triangular (0.0000, 1.0000, 1.5428)
NR Cost per lb, Modified Design	7	NR	60.62 - 1225.84	Weight	65.25 - 816.99	0.508	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Cost, Modified Design	7		-		-	0.579	0.505	Triangular (0.0000, 0.6166, 2.3834)	Triangular (0.0000, 0.6613, 2.5563)	Triangular (0.0000, 1.0000, 3.8655)
T1 CER Residuals	22	T1	244.47 - 8683.85	Weight	29.17 - 949.08	0.463	0.489	Lognormal (1.0000, 0.4888)	Lognormal (1.1131, 0.5441)	Lognormal (1.3790, 0.6740)
T1 Cost per lb, Govt	12	T1	332.99 - 8683.85	Weight	29.17 - 949.08	0.614	0.659	Lognormal (1.0000, 0.6594)	Lognormal (1.1978, 0.7898)	Lognormal (1.7187, 1.1333)
T1 Cost per lb, Commer	10	T1	244.47 - 3521.23	Weight	65.25 - 635.22	0.313	0.305	Beta (0.7427, 1.7893, 0.2896, 0.8883)	Beta (0.8648, 2.0834, 0.2896, 0.8883)	Beta (, , 0.2896, 0.8883)
T1 Cost, Govt	12		-		-	0.838	0.672	Triangular (0.0000, 0.0997, 2.9003)	Triangular (0.0000, 0.1124, 3.2706)	Triangular (0.0000, 1.0000, 29.1044)
T1 Cost, Commer	10		-		-	0.616	0.683	Lognormal (1.0000, 0.6835)	Lognormal (1.2113, 0.8279)	Lognormal (1.7771, 1.2146)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	16	NR	770.88 - 34629.13	Weight	57.3 - 836.7	0.587	0.564	Triangular (0.1590, 0.2458, 2.5952)	Triangular (0.1759, 0.2718, 2.8697)	Triangular (0.6471, 1.0000, 10.5583)
NR Cost per lb, Modified Design, All	16	NR	60.62 - 1225.84	Weight	20.67 - 816.99	0.878	1.069	Lognormal (1.0000, 1.0691)	Lognormal (1.4639, 1.5650)	Lognormal (3.1370, 3.3537)
NR Cost per lb, Existing Design, All	9	NR	3.03 - 394.18	Weight	31.2 - 949.08	0.925	0.888	Beta (0.0431, 2.8374, 0.4217, 0.8096)	Beta (0.0591, 3.8924, 0.4217, 0.8096)	Beta (, , 0.4217, 0.8096)
NR to T1 Ratio, New Design, All	16	NR	770.88 - 34629.13	T1	419.97 - 15449.82	0.832	0.878	Lognormal (1.0000, 0.8784)	Lognormal (1.3310, 1.1692)	Lognormal (2.3580, 2.0713)
NR to T1 Ratio, Modified Design, All	16	NR	60.62 - 1225.84	T1	195.19 - 5406.3	0.706	0.752	Lognormal (1.0000, 0.7523)	Lognormal (1.2514, 0.9413)	Lognormal (1.9595, 1.4740)
NR to T1 Ratio, Existing Design, All	9	NR	3.03 - 394.18	T1	158.93 - 4937.71	0.834	0.806	Beta (0.0305, 2.0379, 0.2648, 0.2835)	Beta (0.0323, 2.1565, 0.2648, 0.2835)	Beta (, , 0.2648, 0.2835)
T1 Cost per lb, Govt, All	39	T1	158.93 - 15449.82	Weight	20.67 - 949.08	0.663	0.708	Lognormal (1.0000, 0.7081)	Lognormal (1.2253, 0.8676)	Lognormal (1.8397, 1.3026)
T1 Cost per lb, Commer, All	11	T1	244.47 - 3521.23	Weight	65.25 - 635.22	0.369	0.359	Beta (0.6877, 1.8294, 0.2752, 0.7307)	Beta (0.8302, 2.2086, 0.2752, 0.7307)	Beta (, , 0.2752, 0.7307)
NR Cost per lb, All	41	NR	3.03 - 34629.13	Weight	20.67 - 949.08	1.218	1.250	Beta (0.0024, 4.7113, 0.2899, 1.0786)	Beta (0.0062, 11.9706, 0.2899, 1.0786)	Beta (, , 0.2899, 1.0786)
T1 Cost per lb, All	50	T1	158.93 - 15449.82	Weight	20.67 - 949.08	0.744	0.794	Lognormal (1.0000, 0.7939)	Lognormal (1.2769, 1.0137)	Lognormal (2.0817, 1.6528)
NR Cost, New Design, All	15		-		-	0.636	0.661	Lognormal (1.0000, 0.6607)	Lognormal (1.1985, 0.7918)	Lognormal (1.7217, 1.1374)
NR Cost, Modified Design, All	16		-		-	0.604	0.624	Lognormal (1.0000, 0.6239)	Lognormal (1.1787, 0.7354)	Lognormal (1.6376, 1.0217)
NR Cost, Existing Design, All	9		-		-	1.019	1.025	Beta (0.0210, 2.7339, 0.2224, 0.3939)	Beta (0.0390, 5.0796, 0.2224, 0.3939)	Beta (, , 0.2224, 0.3939)
T1 Cost, Govt, All	39		-		-	1.253	1.196	Lognormal (1.0000, 1.1958)	Lognormal (1.5588, 1.8640)	Lognormal (3.7877, 4.5292)
T1 Cost, Commer, All	11		-		-	0.580	0.634	Lognormal (1.0000, 0.6338)	Lognormal (1.1839, 0.7503)	Lognormal (1.6595, 1.0517)
Recurring Cost, Govt	39		-		-	1.162	1.174	Beta (0.0342, 4.8809, 0.3428, 1.3774)	Beta (0.0727, 10.3708, 0.3428, 1.3774)	Beta (, , 0.3428, 1.3774)
Recurring Cost, Commer	11		-		-	0.517	0.528	Lognormal (1.0000, 0.5275)	Lognormal (1.1306, 0.5964)	Lognormal (1.4452, 0.7624)
NR Cost, All	40		-		-	1.372	1.577	Lognormal (1.0000, 1.5771)	Lognormal (1.8674, 2.9451)	Lognormal (6.5122, 10.2703)
T1 Cost, All	49		-		-	0.989	0.987	Lognormal (1.0000, 0.9874)	Lognormal (1.4053, 1.3876)	Lognormal (2.7754, 2.7404)
Recurring Cost, All	50		-		-	1.261	1.254	Lognormal (1.0000, 1.2544)	Lognormal (1.6042, 2.0123)	Lognormal (4.1283, 5.1785)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals New Design	5		-		-	0.613	0.548	Beta (0.2882, 1.6607, 0.2922, 0.2712)	Beta (0.2772, 1.5971, 0.2922, 0.2712)	Beta (, , 0.2922, 0.2712)
Weight, NR CER Residuals, Modified Desigr	7		-		-	0.696	0.665	Lognormal (1.0000, 0.6647)	Lognormal (1.2008, 0.7982)	Lognormal (1.7313, 1.1508)
Weight, T1 CER Residuals, Govt	12		-		-	0.801	0.683	Triangular (0.0000, 0.0689, 2.9311)	Triangular (0.0000, 0.0779, 3.3128)	Triangular (0.0000, 1.0000, 42.5401)
Weight, T1 CER Residuals, Commer	10		-		-	0.399	0.372	Normal (1.0000, 0.3718)	Normal (1.0000, 0.3718)	Normal (1.0000, 0.3718)
Cost Driver Metrics from Entire Dataset										
Weight, All	50		-		-	0.840	0.839	Beta (0.0720, 4.3834, 0.7449, 2.7158)	Beta (0.0951, 5.7889, 0.7449, 2.7158)	Beta (, , 0.7449, 2.7158)

Figure 4.2-10. 1.2.4.3 EPS Battery

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Fitted Samples										
NR CER,(All)	36	NR	289.73 - 35001.91	Weight	12.81 - 315.47	0.536	0.523	Triangular (0.0000, 0.5575, 2.4425)	Triangular (0.0000, 0.6024, 2.6395)	Triangular (0.0000, 1.0000, 4.3816)
NR Cost per Lb, Modified Design	14	NR	289.73 - 7880.28	Weight	12.81 - 315.47	0.686	0.735	Lognormal (1.0000, 0.7354)	Lognormal (1.2413, 0.9129)	Lognormal (1.9127, 1.4067)
NR Cost per Lb, New Design	22	NR	1091.86 - 35001.91	Weight	22.53 - 270.98	0.553	0.530	Triangular (0.2472, 0.2538, 2.4990)	Triangular (0.2719, 0.2790, 2.7477)	Triangular (0.9743, 1.0000, 9.8477)
NR Typical Cost, Modified Design	14					0.844	0.908	Lognormal (1.0000, 0.9082)	Lognormal (1.3508, 1.2268)	Lognormal (2.4649, 2.2385)
NR Typical Cost, New Design	22					0.479	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 CER,(All)	45	T1	761.03 - 34719.83	Weight	12.81 - 1152.21	0.393	0.390	Triangular (0.1442, 0.8264, 2.0294)	Triangular (0.1495, 0.8568, 2.1040)	Triangular (0.1745, 1.0000, 2.4556)
T1 Cost per Lb, Commsat	13	T1	3341.48 - 9851.67	Weight	88.5 - 315.47	0.258	0.245	Triangular (0.6220, 0.6866, 1.6913)	Triangular (0.6490, 0.7164, 1.7647)	Triangular (0.9059, 1.0000, 2.4632)
T1 Cost per Lb, Govtsat	32	T1	761.03 - 34719.83	Weight	12.81 - 1152.21	0.462	0.453	Triangular (0.0717, 0.6993, 2.2290)	Triangular (0.0759, 0.7403, 2.3596)	Triangular (0.1026, 1.0000, 3.1875)
T1 Typical Cost, Commsat	13					0.392	0.414	Lognormal (1.0000, 0.4144)	Lognormal (1.0825, 0.4486)	Lognormal (1.2684, 0.5257)
T1 Typial Cost, Govtsat	32					0.928	1.077	Lognormal (1.0000, 1.0768)	Lognormal (1.4695, 1.5824)	Lognormal (3.1736, 3.4174)
Metrics from Larger Samples										
NR Cost per Lb, New Design	24	NR	1091.86 - 85578.23	Weight	22.53 - 1152.21	0.591	0.568	Triangular (0.1734, 0.2216, 2.6050)	Triangular (0.1920, 0.2453, 2.8845)	Triangular (0.7827, 1.0000, 11.7568)
NR Cost per Lb, Modified Design	15	NR	289.73 - 7880.28	Weight	12.81 - 315.47	0.734	0.784	Lognormal (1.0000, 0.7839)	Lognormal (1.2706, 0.9960)	Lognormal (2.0513, 1.6079)
NR Cost per Lb, New Design (Military)	10	NR	1091.86 - 35001.91	Weight	22.53 - 262.1	0.469	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Cost per Lb, Modified Design (NASA)	5	NR	336.52 - 3778.99	Weight	12.81 - 220.31	0.622	0.662	Lognormal (1.0000, 0.6620)	Lognormal (1.1993, 0.7940)	Lognormal (1.7249, 1.1419)
NR Cost per Lb, New Design (NASA)	12	NR	4953.57 - 85578.23	Weight	24.84 - 1152.21	0.599	0.610	Lognormal (1.0000, 0.6096)	Lognormal (1.1712, 0.7140)	Lognormal (1.6064, 0.9793)
NR to T1 Ratio, Modified Design	15	NR	289.73 - 7880.28	T1	761.03 - 10227.96	1.033	1.149	Lognormal (1.0000, 1.1487)	Lognormal (1.5230, 1.7494)	Lognormal (3.5326, 4.0578)
NR to T1 Ratio, New Design	24	NR	1091.86 - 85578.23	T1	408.15 - 34719.83	0.571	0.555	Triangular (0.1769, 0.2540, 2.5691)	Triangular (0.1954, 0.2805, 2.8375)	Triangular (0.6967, 1.0000, 10.1160)
NR to T1 Ratio, New Design (Military)	10	NR	1091.86 - 35001.91	T1	408.15 - 11476.29	0.406	0.403	Normal (1.0000, 0.4033)	Normal (1.0000, 0.4033)	Normal (1.0000, 0.4033)
NR to T1 Ratio, Modified Design (NASA)	5	NR	336.52 - 3778.99	T1	761.03 - 10227.96	1.098	1.623	Lognormal (1.0000, 1.6226)	Lognormal (1.9060, 3.0928)	Lognormal (6.9244, 11.2357)
NR to T1 Ratio, New Design (NASA)	12	NR	4953.57 - 85578.23	T1	2232.57 - 34719.83	0.555	0.526	Triangular (0.1311, 0.3882, 2.4807)	Triangular (0.1434, 0.4247, 2.7136)	Triangular (0.3376, 1.0000, 6.3895)
T1 Cost per Lb, Commsat	11	T1	3341.48 - 9851.67	Weight	88.5 - 315.47	0.245	0.229	Triangular (0.6376, 0.7150, 1.6474)	Triangular (0.6633, 0.7438, 1.7138)	Triangular (0.8918, 1.0000, 2.3042)
T1 Cost per Lb, Govtsat	43	T1	408.15 - 34719.83	Weight	12.81 - 1152.21	0.510	0.501	Triangular (0.1016, 0.5013, 2.3971)	Triangular (0.1102, 0.5437, 2.5998)	Triangular (0.2027, 1.0000, 4.7817)
NR Cost per Lb, (All)	49	NR	3.17 - 85578.23	Weight	12.81 - 1152.21	1.053	1.066	Beta (0.0003, 3.8116, 0.3861, 1.0858)	Beta (0.0006, 6.6273, 0.3861, 1.0858)	Beta (, , 0.3861, 1.0858)
T1 Cost per Lb, (All)	54	T1	408.15 - 34719.83	Weight	12.81 - 1152.21	0.522	0.516	Lognormal (1.0000, 0.5158)	Lognormal (1.1252, 0.5804)	Lognormal (1.4246, 0.7349)
NR Typical Cost, New Design	24					0.851	1.027	Lognormal (1.0000, 1.0272)	Lognormal (1.4335, 1.4725)	Lognormal (2.9460, 3.0260)
NR Typical Cost, Modified Design	15					0.862	0.934	Lognormal (1.0000, 0.9336)	Lognormal (1.3681, 1.2772)	Lognormal (2.5605, 2.3905)
NR Typical Cost, New Design (Military)	10					0.519	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Typical Cost, Modified Design (NASA)	5					0.671	0.623	Triangular (0.0378, 0.2026, 2.7596)	Triangular (0.0422, 0.2266, 3.0863)	Triangular (0.1865, 1.0000, 13.6225)
NR Typical Cost, New Design (NASA)	10					0.392	0.360	Triangular (0.0000, 1.3289, 1.6711)	Triangular (0.0000, 1.2627, 1.5879)	Triangular (0.0000, 1.0000, 1.2576)
T1 Typical Cost, Commsat	11					0.421	0.415	Beta (0.6932, 2.0439, 0.1955, 0.6652)	Beta (0.9057, 2.6704, 0.1955, 0.6652)	Beta (, , 0.1955, 0.6652)
T1 Typical Cost, Govtsat	43					0.991	1.079	Lognormal (1.0000, 1.0790)	Lognormal (1.4712, 1.5875)	Lognormal (3.1841, 3.4358)
Recurring Typical Cost, Govtsat	43					1.218	1.491	Lognormal (1.0000, 1.4906)	Lognormal (1.7950, 2.6756)	Lognormal (5.7832, 8.6205)
NR Typical Cost, (All)	49					1.063	1.005	Beta (0.0004, 4.1004, 0.5040, 1.5632)	Beta (0.0006, 6.3173, 0.5040, 1.5632)	Beta (, , 0.5040, 1.5632)
T1 Typical Cost, (All)	54					0.962	1.065	Lognormal (1.0000, 1.0652)	Lognormal (1.4610, 1.5563)	Lognormal (3.1187, 3.3220)
Recurring Typical Cost, (All)	54					1.279	1.579	Lognormal (1.0000, 1.5789)	Lognormal (1.8690, 2.9509)	Lognormal (6.5283, 10.3077)
Cost Driver Samples from Fitted Samples										
Weight, NR CER Datapoints (Modified Design)	14					0.789	0.773	Beta (0.1073, 3.5049, 0.7203, 2.0213)	Beta (0.1351, 4.4115, 0.7203, 2.0213)	Beta (, , 0.7203, 2.0213)
Weight, NR CER Datapoints (New Design)	22					0.531	0.514	Triangular (0.0068, 0.5776, 2.4156)	Triangular (0.0073, 0.6223, 2.6026)	Triangular (0.0118, 1.0000, 4.1819)
Weight, T1 CER Datapoints (Commsat)	13					0.417	0.444	Lognormal (1.0000, 0.4442)	Lognormal (1.0942, 0.4860)	Lognormal (1.3101, 0.5820)
Weight, T1 CER Datapoints (Govtsat)	32					1.329	2.093	Lognormal (1.0000, 2.0928)	Lognormal (2.3195, 4.8542)	Lognormal (12.4783, 26.1147)
Cost Driver Samples from Larger Samples										
Weight,(All)	52		-		-	0.573	0.567	Triangular (0.0000, 0.4133, 2.5867)	Triangular (0.0000, 0.4541, 2.8420)	Triangular (0.0000, 1.0000, 6.2589)

Figure 4.2-11. 1.2.5 ADC

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	28	NR	330.97 - 18730.51	Weight	3.5 - 100.6	0.479	0.460	Triangular (0.0000, 0.7796, 2.2204)	Triangular (0.0000, 0.8156, 2.3229)	Triangular (0.0000, 1.0000, 2.8481)
NR Cost Per Lb, New Design	18	NR	734.81 - 18730.51	Weight	7.6 - 100.6	0.531	0.518	Triangular (0.0893, 0.4616, 2.4490)	Triangular (0.0973, 0.5027, 2.6668)	Triangular (0.1935, 1.0000, 5.3052)
NR Cost Per Lb, Modified Design	10	NR	330.97 - 3502.25	Weight	3.5 - 87.68	0.540	0.489	Triangular (0.0000, 0.6725, 2.3275)	Triangular (0.0000, 0.7144, 2.4722)	Triangular (0.0000, 1.0000, 3.4607)
NR Cost, New Design	18					0.607	0.575	Beta (0.0766, 1.9535, 0.8181, 0.8447)	Beta (0.0772, 1.9674, 0.8181, 0.8447)	Beta (, , 0.8181, 0.8447)
NR Cost, Modified Design	10					0.788	0.855	Lognormal (1.0000, 0.8548)	Lognormal (1.3155, 1.1245)	Lognormal (2.2767, 1.9460)
T1 CER Residuals	42	T1	132.19 - 9371.02	Weight	3.5 - 100.6	0.574	0.581	Lognormal (1.0000, 0.5811)	Lognormal (1.1566, 0.6721)	Lognormal (1.5471, 0.8991)
T1 Cost Per Lb	42	T1	132.19 - 9371.02	Weight	3.5 - 100.6	0.788	0.887	Lognormal (1.0000, 0.8869)	Lognormal (1.3367, 1.1855)	Lognormal (2.3881, 2.1181)
T1 Cost	42					0.634	0.610	Lognormal (1.0000, 0.6105)	Lognormal (1.1716, 0.7152)	Lognormal (1.6082, 0.9818)
Metrics from Entire Dataset										
NR Cost Per Lb, New Design, All	19	NR	734.81 - 37323.32	Weight	7.6 - 269.91	0.544	0.532	Triangular (0.1355, 0.3671, 2.4974)	Triangular (0.1487, 0.4028, 2.7406)	Triangular (0.3691, 1.0000, 6.8035)
NR Cost Per Lb, Modified Design, All	10	NR	330.97 - 3502.25	Weight	3.5 - 87.68	0.540	0.489	Triangular (0.0000, 0.6725, 2.3275)	Triangular (0.0000, 0.7144, 2.4722)	Triangular (0.0000, 1.0000, 3.4607)
NR to T1 Ratio, New Design, All	19	NR	734.81 - 37323.32	T1	360.47 - 16100.67	0.703	0.728	Lognormal (1.0000, 0.7276)	Lognormal (1.2367, 0.8999)	Lognormal (1.8915, 1.3764)
NR to T1 Ratio, Modified Design, All	9	NR	362.07 - 3502.25	T1	1256.95 - 17877	0.461	0.439	Triangular (0.2932, 0.4697, 2.2371)	Triangular (0.3165, 0.5070, 2.4147)	Triangular (0.6242, 1.0000, 4.7626)
T1 Cost per Lb, Commsat Unique Bus	10	T1	1462.51 - 9371.02	Weight	7.6 - 45.37	0.691	0.796	Lognormal (1.0000, 0.7958)	Lognormal (1.2780, 1.0171)	Lognormal (2.0875, 1.6613)
T1 Cost per Lb, Commsat Std Bus	15	T1	1668.82 - 5929.58	Weight	27.98 - 49.84	0.307	0.295	Triangular (0.5495, 0.6175, 1.8331)	Triangular (0.5785, 0.6501, 1.9300)	Triangular (0.8899, 1.0000, 2.9688)
T1 Cost per Lb, Non-Commsat Unique Bus	20	T1	132.19 - 17877	Weight	3.5 - 269.91	0.800	0.896	Lognormal (1.0000, 0.8956)	Lognormal (1.3424, 1.2022)	Lognormal (2.4191, 2.1665)
NR Cost per Lb, All	40	NR	3.73 - 37323.32	Weight	3.5 - 269.91	1.068	1.083	Beta (0.0007, 4.2388, 0.4152, 1.3458)	Beta (0.0013, 7.4094, 0.4152, 1.3458)	Beta (, , 0.4152, 1.3458)
T1 Cost per Lb, All	47	T1	132.19 - 17877	Weight	3.5 - 269.91	0.773	0.845	Lognormal (1.0000, 0.8448)	Lognormal (1.3091, 1.1059)	Lognormal (2.2434, 1.8952)
NR Cost, New Design, All	19					0.775	0.811	Lognormal (1.0000, 0.8107)	Lognormal (1.2873, 1.0436)	Lognormal (2.1334, 1.7295)
NR Cost, Modified Design, All	10					0.788	0.855	Lognormal (1.0000, 0.8548)	Lognormal (1.3155, 1.1245)	Lognormal (2.2767, 1.9460)
T1 Cost, Non-Commsat Unique Bus	20					0.831	0.862	Lognormal (1.0000, 0.8621)	Lognormal (1.3203, 1.1383)	Lognormal (2.3017, 1.9844)
T1 Cost, Commsat Unique Bus	9					0.308	0.302	Lognormal (1.0000, 0.3022)	Lognormal (1.0447, 0.3157)	Lognormal (1.1401, 0.3445)
T1 Cost, Commsat Std Bus	15					0.429	0.455	Lognormal (1.0000, 0.4549)	Lognormal (1.0986, 0.4997)	Lognormal (1.3259, 0.6031)
Recurring Cost, Commsat Unique Bus	10					0.792	0.652	Triangular (0.0000, 0.1585, 2.8415)	Triangular (0.0000, 0.1778, 3.1871)	Triangular (0.0000, 1.0000, 17.9255)
Recurring Cost, Commsat Std Bus	15					0.911	0.922	Beta (0.2575, 3.3853, 0.2575, 0.8274)	Beta (0.4839, 6.3611, 0.2575, 0.8274)	Beta (, , 0.2575, 0.8274)
Recurring Cost, Non-Commsat Unique Bus	20					0.845	0.699	Triangular (0.0000, 0.0236, 2.9764)	Triangular (0.0000, 0.0268, 3.3792)	Triangular (0.0000, 1.0000, 126.0064)
NR Cost, All	40					1.360	1.301	Beta (0.0007, 6.6274, 0.3501, 1.9716)	Beta (0.0016, 15.9855, 0.3501, 1.9716)	Beta (, , 0.3501, 1.9716)
T1 Cost, All	47					0.842	0.903	Lognormal (1.0000, 0.9028)	Lognormal (1.3473, 1.2164)	Lognormal (2.4455, 2.2079)
Recurring Cost, All	47					0.938	0.909	Lognormal (1.0000, 0.9088)	Lognormal (1.3513, 1.2281)	Lognormal (2.4674, 2.2424)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, New Design	18					0.644	0.683	Lognormal (1.0000, 0.6834)	Lognormal (1.2112, 0.8278)	Lognormal (1.7770, 1.2145)
Weight, NR CER Datapoints, Modified Desig	10					0.779	0.676	Triangular (0.0000, 0.0892, 2.9108)	Triangular (0.0000, 0.1006, 3.2821)	Triangular (0.0000, 1.0000, 32.6384)
Weight, T1 CER Datapoints	42					0.618	0.619	Lognormal (1.0000, 0.6194)	Lognormal (1.1763, 0.7286)	Lognormal (1.6276, 1.0081)
Cost Driver Metrics from Entire Dataset										
Weight, All	46					0.604	0.595	Lognormal (1.0000, 0.5950)	Lognormal (1.1636, 0.6923)	Lognormal (1.5755, 0.9373)

Figure 4.2-12. 1.2.5.1 Attitude Determination

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	20	NR	357.05 - 8060.55	Weight	11.73 - 194.1	0.465	0.456	Lognormal (1.0000, 0.4558)	Lognormal (1.0990, 0.5009)	Lognormal (1.3272, 0.6049)
NR Cost per Lb, New Design	14	NR	357.05 - 8060.55	Weight	11.73 - 190.9	0.673	0.772	Lognormal (1.0000, 0.7716)	Lognormal (1.2631, 0.9746)	Lognormal (2.0151, 1.5549)
NR Cost per Lb, Modified Design	6	NR	482.83 - 3826.79	Weight	13.89 - 194.1	0.505	0.472	Triangular (0.1667, 0.5120, 2.3214)	Triangular (0.1792, 0.5505, 2.4959)	Triangular (0.3255, 1.0000, 4.5342)
NR Cost, New Design	14		-		-	0.639	0.613	Triangular (0.0000, 0.2722, 2.7278)	Triangular (0.0000, 0.3028, 3.0347)	Triangular (0.0000, 1.0000, 10.0222)
NR Cost, Modified Design	6		-		-	0.732	0.696	Lognormal (1.0000, 0.6963)	Lognormal (1.2185, 0.8484)	Lognormal (1.8092, 1.2597)
T1 CER Residuals	41	T1	47.68 - 3266.61	Weight	11.7 - 200.55	0.460	0.455	Triangular (0.0936, 0.6632, 2.2432)	Triangular (0.0996, 0.7055, 2.3862)	Triangular (0.1411, 1.0000, 3.3823)
T1 Cost per Lb	41	T1	47.68 - 3266.61	Weight	11.7 - 200.55	0.516	0.506	Triangular (0.1346, 0.4465, 2.4190)	Triangular (0.1466, 0.4864, 2.6351)	Triangular (0.3014, 1.0000, 5.4178)
T1 Cost	41		-		-	0.659	0.631	Triangular (0.0000, 0.2206, 2.7794)	Triangular (0.0000, 0.2468, 3.1101)	Triangular (0.0000, 1.0000, 12.6021)
Metrics from Entire Dataset										
NR Cost per Lb, New Design, All	15	NR	357.05 - 27829.52	Weight	11.73 - 796.8	0.430	0.425	Normal (1.0000, 0.4251)	Normal (1.0000, 0.4251)	Normal (1.0000, 0.4251)
NR Cost per Lb, Modified Design, All	7	NR	482.83 - 4444.87	Weight	13.89 - 194.1	0.541	0.512	Triangular (0.1818, 0.3736, 2.4446)	Triangular (0.1989, 0.4088, 2.6750)	Triangular (0.4866, 1.0000, 6.5432)
NR to T1 Ratio, New Design, All	16	NR	357.05 - 27829.52	T1	47.68 - 12005.2	0.725	0.629	Triangular (0.0000, 0.2257, 2.7743)	Triangular (0.0000, 0.2522, 3.0998)	Triangular (0.0000, 1.0000, 12.2925)
NR to T1 Ratio, Modified Design, All	7	NR	482.83 - 4444.87	T1	263.45 -	0.859	0.815	Beta (0.2059, 2.7012, 0.3292, 0.7051)	Beta (0.3031, 3.9765, 0.3292, 0.7051)	Beta (, , 0.3292, 0.7051)
T1 Cost per Lb, Govt	36	T1	47.68 - 12005.2	Weight	11.7 - 796.8	0.504	0.494	Triangular (0.1044, 0.5203, 2.3753)	Triangular (0.1130, 0.5631, 2.5702)	Triangular (0.2006, 1.0000, 4.5648)
T1 Cost per Lb, Commer	11	T1	832.91 - 3249.31	Weight	59.52 - 200.55	0.401	0.381	Triangular (0.4100, 0.5134, 2.0766)	Triangular (0.4384, 0.5490, 2.2203)	Triangular (0.7985, 1.0000, 4.0444)
NR Cost per Lb, All	33	NR	24.24 - 27829.52	Weight	11.73 - 796.8	1.034	1.128	Lognormal (1.0000, 1.1279)	Lognormal (1.5074, 1.7002)	Lognormal (3.4252, 3.8634)
T1 Cost per Lb, All	47	T1	47.68 - 12005.2	Weight	11.7 - 796.8	0.515	0.503	Triangular (0.1449, 0.4417, 2.4134)	Triangular (0.1579, 0.4812, 2.6291)	Triangular (0.3281, 1.0000, 5.4637)
NR Cost, New Design, All	15		-		-	0.611	0.577	Triangular (0.0000, 0.3838, 2.6162)	Triangular (0.0000, 0.4230, 2.8834)	Triangular (0.0000, 1.0000, 6.8172)
NR Cost, Modified Design, All	7		-		-	0.748	0.803	Lognormal (1.0000, 0.8028)	Lognormal (1.2824, 1.0295)	Lognormal (2.1089, 1.6931)
T1 Cost, Govt, All	36		-		-	1.247	1.285	Lognormal (1.0000, 1.2846)	Lognormal (1.6280, 2.0913)	Lognormal (4.3145, 5.5425)
T1 Cost, Commer, All	11		-		-	0.566	0.632	Lognormal (1.0000, 0.6323)	Lognormal (1.1832, 0.7482)	Lognormal (1.6563, 1.0473)
Recurring Cost, Govt	36		-		-	1.076	1.098	Lognormal (1.0000, 1.0981)	Lognormal (1.4852, 1.6308)	Lognormal (3.2759, 3.5972)
Recurring Cost, Commer	11		-		-	0.754	0.742	Lognormal (1.0000, 0.7417)	Lognormal (1.2451, 0.9235)	Lognormal (1.9301, 1.4316)
NR Cost, All	32		-		-	0.998	0.993	Beta (0.0103, 3.4347, 0.4173, 1.0267)	Beta (0.0161, 5.3441, 0.4173, 1.0267)	Beta (, , 0.4173, 1.0267)
T1 Cost, All	47		-		-	1.195	1.186	Lognormal (1.0000, 1.1857)	Lognormal (1.5511, 1.8391)	Lognormal (3.7316, 4.4245)
Recurring Cost, All	47		-		-	1.137	1.181	Lognormal (1.0000, 1.1813)	Lognormal (1.5477, 1.8284)	Lognormal (3.7076, 4.3798)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals, New Design	14		-		-	0.678	0.656	Triangular (0.0100, 0.1368, 2.8532)	Triangular (0.0112, 0.1538, 3.2082)	Triangular (0.0731, 1.0000, 20.8554)
Weight, NR CER Residuals, Modified Desigr	6		-		-	0.687	0.625	Triangular (0.0763, 0.1555, 2.7682)	Triangular (0.0849, 0.1729, 3.0774)	Triangular (0.4908, 1.0000, 17.8007)
Weight, NR CER Residuals, Modified Desigr	41		-		-	0.635	0.615	Triangular (0.1072, 0.1530, 2.7398)	Triangular (0.1199, 0.1710, 3.0628)	Triangular (0.7008, 1.0000, 17.9083)
Cost Driver Metrics from Entire Dataset										
Weight,All	45		-		-	0.639	0.628	Triangular (0.0797, 0.1450, 2.7753)	Triangular (0.0894, 0.1624, 3.1097)	Triangular (0.5502, 1.0000, 19.1463)

Figure 4.2-13. 1.2.5.2 Attitude Control

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	21	NR	117.09 - 9070.36	Weight	18.95 - 628.89	0.673	0.695	Lognormal (1.0000, 0.6945)	Lognormal (1.2175, 0.8456)	Lognormal (1.8049, 1.2535)
NR Cost per Lb, NR CER Datapoints, LEO	8	NR	573.55 - 5538.73	Weight	18.95 - 173.31	0.771	0.959	Lognormal (1.0000, 0.9590)	Lognormal (1.3855, 1.3287)	Lognormal (2.6598, 2.5507)
NR Cost per Lb, NR CER Datapoints, Non-LEO	13	NR	117.09 - 9070.36	Weight	20.02 - 628.89	1.138	1.331	Lognormal (1.0000, 1.3314)	Lognormal (1.6651, 2.2170)	Lognormal (4.6169, 6.1470)
NR Typical Cost, NR CER Datapoints, LEO	8					0.873	1.066	Lognormal (1.0000, 1.0661)	Lognormal (1.4617, 1.5584)	Lognormal (3.1232, 3.3298)
NR Typical Cost, NR CER Datapoints, Non-LEO	13					0.675	0.687	Lognormal (1.0000, 0.6869)	Lognormal (1.2132, 0.8334)	Lognormal (1.7857, 1.2266)
T1 CER, All	40	T1	430.2 - 18327.13	Weight	18.95 - 635.77	0.377	0.374	Normal (1.0000, 0.3737)	Normal (1.0000, 0.3737)	Normal (1.0000, 0.3737)
T1 Cost per Lb, T1 CER Datapoints, Commercial	14	T1	1555.31 - 13248.66	Weight	50.96 - 635.77	0.545	0.643	Beta (0.5999, 33.3815, 0.3707, 30.0000)	Beta (0.8136, 45.2790, 0.3707, 30.0000)	Beta (, , 0.3707, 30.0000)
T1 Cost per Lb, T1 CER Datapoints, Government	26	T1	430.2 - 18327.13	Weight	18.95 - 628.89	0.531	0.520	Triangular (0.0794, 0.4675, 2.4531)	Triangular (0.0865, 0.5092, 2.6714)	Triangular (0.1698, 1.0000, 5.2467)
T1 Typical Cost, T1 CER Datapoints, Commercial	14					0.520	0.526	Lognormal (1.0000, 0.5255)	Lognormal (1.1297, 0.5937)	Lognormal (1.4417, 0.7576)
T1 Typical Cost, T1 CER Datapoints, Government	26					1.190	1.633	Lognormal (1.0000, 1.6329)	Lognormal (1.9148, 3.1267)	Lognormal (7.0205, 11.4639)
Metrics from Entire Dataset										
NR to T1 Ratio, New Design	24	NR	573.55 - 21912.05	T1	430.2 - 24103.77	0.703	0.641	Triangular (0.0000, 0.1918, 2.8082)	Triangular (0.0000, 0.2150, 3.1485)	Triangular (0.0000, 1.0000, 14.6447)
NR Cost per Lb, New Design	24	NR	573.55 - 21912.05	Weight	18.95 - 628.89	0.983	1.097	Lognormal (1.0000, 1.0966)	Lognormal (1.4841, 1.6275)	Lognormal (3.2688, 3.5846)
T1 Cost per Lb, Commercial	16	T1	1134.7 - 13248.66	Weight	47.47 - 635.77	0.530	0.587	Lognormal (1.0000, 0.5868)	Lognormal (1.1595, 0.6804)	Lognormal (1.5588, 0.9147)
T1 Cost per Lb, Government	34	T1	430.2 - 24103.77	Weight	18.95 - 628.89	0.732	0.794	Lognormal (1.0000, 0.7936)	Lognormal (1.2766, 1.0131)	Lognormal (2.0806, 1.6511)
NR to T1 Ratio, All	41	NR	3.44 - 21912.05	T1	430.2 - 24103.77	1.091	1.071	Beta (0.0000, 6.1933, 0.5691, 2.9555)	Beta (0.0000, 10.0648, 0.5691, 2.9555)	Beta (, , 0.5691, 2.9555)
NR Cost per Lb, All	41	NR	3.44 - 21912.05	Weight	18.95 - 635.77	1.372	1.499	Lognormal (1.0000, 1.4990)	Lognormal (1.8019, 2.7011)	Lognormal (5.8509, 8.7706)
T1 Cost per Lb, All	50	T1	430.2 - 24103.77	Weight	18.95 - 635.77	0.712	0.777	Lognormal (1.0000, 0.7769)	Lognormal (1.2663, 0.9838)	Lognormal (2.0307, 1.5776)
NR Typical Cost, New Design	24					1.040	1.309	Lognormal (1.0000, 1.3087)	Lognormal (1.6470, 2.1554)	Lognormal (4.4678, 5.8469)
Recurring Typical Cost, Commercial	16					0.888	0.964	Lognormal (1.0000, 0.9637)	Lognormal (1.3888, 1.3383)	Lognormal (2.6785, 2.5812)
Recurring Typical Cost, Government	34					1.195	1.267	Lognormal (1.0000, 1.2669)	Lognormal (1.6140, 2.0448)	Lognormal (4.2045, 5.3266)
T1 Typical Cost, Commercial	16					0.550	0.545	Lognormal (1.0000, 0.5452)	Lognormal (1.1390, 0.6210)	Lognormal (1.4775, 0.8056)
T1 Typical Cost, Government	34					1.281	1.681	Lognormal (1.0000, 1.6807)	Lognormal (1.9557, 3.2869)	Lognormal (7.4799, 12.5714)
NR Typical Cost, All	41					1.382	1.696	Lognormal (1.0000, 1.6963)	Lognormal (1.9691, 3.3403)	Lognormal (7.6353, 12.9519)
Recurring Typical Cost, All	50					1.078	1.069	Lognormal (1.0000, 1.0689)	Lognormal (1.4637, 1.5645)	Lognormal (3.1359, 3.3518)
T1 Typical Cost, All	50					1.029	1.176	Lognormal (1.0000, 1.1756)	Lognormal (1.5434, 1.8145)	Lognormal (3.6766, 4.3224)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, LEO	8					0.707	0.770	Lognormal (1.0000, 0.7699)	Lognormal (1.2620, 0.9716)	Lognormal (2.0101, 1.5476)
Weight, NR CER Datapoints, Non-LEO	13					1.134	1.381	Lognormal (1.0000, 1.3807)	Lognormal (1.7048, 2.3538)	Lognormal (4.9547, 6.8409)
Weight, T1 CER Datapoints, Commercial	14					0.590	0.528	Triangular (0.0000, 0.5400, 2.4600)	Triangular (0.0000, 0.5842, 2.6617)	Triangular (0.0000, 1.0000, 4.5558)
Weight, T1 CER Datapoints, Government	26					1.232	1.473	Lognormal (1.0000, 1.4735)	Lognormal (1.7808, 2.6239)	Lognormal (5.6470, 8.3207)
Cost Driver Metrics from Entire Dataset										
Weight, All	50					0.946	0.969	Beta (0.1030, 3.9415, 0.4235, 1.3889)	Beta (0.1661, 6.3543, 0.4235, 1.3889)	Beta (, , 0.4235, 1.3889)

Figure 4.2-14. 1.2.6 Propulsion Subsystem

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
T1 CER,(All)	32	T1	53.11 - 4149.18	Weight	11.92 - 381.6	0.410	0.408	Normal (1.0000, 0.4084)	Normal (1.0000, 0.4084)	Normal (1.0000, 0.4084)
T1 Cost per Lb, CER Datapoints, All	32	T1	53.11 - 4149.18	Weight	11.92 - 381.6	0.560	0.561	Lognormal (1.0000, 0.5607)	Lognormal (1.1465, 0.6429)	Lognormal (1.5070, 0.8450)
T1 Typical Cost, CER Datapoints, All	32					0.750	0.744	Lognormal (1.0000, 0.7444)	Lognormal (1.2467, 0.9280)	Lognormal (1.9375, 1.4423)
Metrics from Entire Dataset										
NR to T1 Ratio, Government	14	NR	12.22 - 8121.08	T1	53.11 - 8046.07	1.118	1.121	Lognormal (1.0000, 1.1211)	Lognormal (1.5023, 1.6841)	Lognormal (3.3902, 3.8006)
NR Cost per Lb, Government	14	NR	12.22 - 8121.08	Weight	21.98 - 381.6	1.163	1.219	Beta (0.0371, 3.6626, 0.1926, 0.5326)	Beta (0.1169, 11.5256, 0.1926, 0.5326)	Beta (, , 0.1926, 0.5326)
T1 Cost per Lb, Commercial	12	T1	211.04 - 1742.27	Weight	13.08 - 277.55	0.430	0.450	Lognormal (1.0000, 0.4503)	Lognormal (1.0967, 0.4939)	Lognormal (1.3192, 0.5941)
T1 Cost per Lb, Government	24	T1	53.11 - 8046.07	Weight	11.92 - 381.6	0.708	0.802	Lognormal (1.0000, 0.8016)	Lognormal (1.2816, 1.0273)	Lognormal (2.1050, 1.6873)
NR to T1 Ratio, All	17	NR	12.22 - 8121.08	T1	53.11 - 8046.07	1.031	1.007	Beta (0.0170, 3.1802, 0.3456, 0.7665)	Beta (0.0278, 5.2231, 0.3456, 0.7665)	Beta (, , 0.3456, 0.7665)
NR Cost per Lb, All	17	NR	12.22 - 8121.08	Weight	13.08 - 381.6	1.104	1.135	Beta (0.0107, 3.3449, 0.2376, 0.5633)	Beta (0.0250, 7.7989, 0.2376, 0.5633)	Beta (, , 0.2376, 0.5633)
T1 Cost per Lb, All	36	T1	53.11 - 8046.07	Weight	11.92 - 381.6	0.752	0.853	Lognormal (1.0000, 0.8528)	Lognormal (1.3143, 1.1209)	Lognormal (2.2702, 1.9362)
NR Typical Cost, Government	14					1.587	2.052	Lognormal (1.0000, 2.0522)	Lognormal (2.2828, 4.6848)	Lognormal (11.8967, 24.4141)
Recurring Typical Cost, Commercial	12					0.589	0.629	Lognormal (1.0000, 0.6294)	Lognormal (1.1816, 0.7437)	Lognormal (1.6497, 1.0383)
Recurring Typical Cost, Government	24					0.978	0.933	Lognormal (1.0000, 0.9335)	Lognormal (1.3680, 1.2770)	Lognormal (2.5601, 2.3898)
T1 Typical Cost, Commercial	12					0.300	0.300	Triangular (0.1595, 1.3168, 1.5237)	Triangular (0.1523, 1.2575, 1.4550)	Triangular (0.1211, 1.0000, 1.1571)
T1 Typical Cost, Government	24					1.224	1.646	Lognormal (1.0000, 1.6458)	Lognormal (1.9258, 3.1695)	Lognormal (7.1421, 11.7544)
NR Typical Cost, All	17					1.538	1.826	Lognormal (1.0000, 1.8259)	Lognormal (2.0818, 3.8011)	Lognormal (9.0222, 16.4735)
Recurring Typical Cost, All	36					0.958	0.951	Lognormal (1.0000, 0.9511)	Lognormal (1.3801, 1.3127)	Lognormal (2.6287, 2.5003)
T1 Typical Cost, All	36					1.024	1.268	Lognormal (1.0000, 1.2678)	Lognormal (1.6147, 2.0472)	Lognormal (4.2101, 5.3376)
Cost Driver Metrics from CER Datasets										
Weight, T1 CER Datapoints, All	32					0.709	0.679	Triangular (0.0000, 0.0807, 2.9193)	Triangular (0.0000, 0.0913, 3.3022)	Triangular (0.0000, 1.0000, 36.1615)
Cost Driver Metrics from Entire Dataset										
Weight, All	36					0.694	0.674	Triangular (0.0120, 0.0830, 2.9050)	Triangular (0.0135, 0.0938, 3.2833)	Triangular (0.1443, 1.0000, 35.0031)

Figure 4.2-15. 1.2.6.1 Tanks

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
T1 CER Residuals	21	T1	93.74 - 4167.6		-	0.880	0.877	Beta (0.0695, 4.0168, 0.6248, 2.0257)	Beta (0.0956, 5.5206, 0.6248, 2.0257)	Beta (, , 0.6248, 2.0257)
T1 Cost per lb	21	T1	93.74 - 4167.6	Weight	3.36 - 75.34	1.037	1.221	Lognormal (1.0000, 1.2208)	Lognormal (1.5781, 1.9264)	Lognormal (3.9298, 4.7973)
T1 Cost	21		-		-	0.880	0.879	Beta (0.0714, 3.1746, 0.4836, 1.1324)	Beta (0.0992, 4.4112, 0.4836, 1.1324)	Beta (, , 0.4836, 1.1324)
Metrics from Entire Dataset										
NR to T1 Ratio, Govt	16	NR	15.5 - 5211.4	T1	93.74 - 4167.6	1.182	1.224	Beta (0.0130, 5.1391, 0.3323, 1.3937)	Beta (0.0293, 11.5678, 0.3323, 1.3937)	Beta (, , 0.3323, 1.3937)
T1 Cost per lb, Govt	22	T1	93.74 - 4167.6	Weight	3.36 - 75.34	1.037	1.121	Beta (0.1921, 49.9377, 0.4950, 29.9844)	Beta (0.3397, 88.2852, 0.4950, 29.9844)	Beta (, , 0.4950, 29.9844)
T1 Cost per lb, Commer	10	T1	50.93 - 1501.21	Weight	6.39 - 62.97	0.762	0.821	Lognormal (1.0000, 0.8205)	Lognormal (1.2936, 1.0614)	Lognormal (2.1645, 1.7761)
NR Cost per lb, All	17	NR	15.5 - 5211.4	Weight	3.36 - 146.8	1.166	1.095	Lognormal (1.0000, 1.0949)	Lognormal (1.4829, 1.6237)	Lognormal (3.2607, 3.5703)
T1 Cost per lb, All	33	T1	50.93 - 4167.6	Weight	3.36 - 75.34	1.206	1.451	Lognormal (1.0000, 1.4515)	Lognormal (1.7626, 2.5584)	Lognormal (5.4761, 7.9484)
T1 Cost, Govt	22		-		-	0.893	0.900	Beta (0.0738, 3.2819, 0.4643, 1.1439)	Beta (0.1057, 4.6971, 0.4643, 1.1439)	Beta (, , 0.4643, 1.1439)
T1 Cost, Commer	10		-		-	0.726	0.678	Triangular (0.0000, 0.0827, 2.9173)	Triangular (0.0000, 0.0933, 3.2909)	Triangular (0.0000, 1.0000, 35.2581)
Recurring Cost, Govt	22		-		-	0.746	0.690	Triangular (0.0000, 0.0479, 2.9521)	Triangular (0.0000, 0.0543, 3.3464)	Triangular (0.0000, 1.0000, 61.6553)
Recurring Cost, Commer	10		-		-	0.527	0.471	Triangular (0.0000, 0.7388, 2.2612)	Triangular (0.0000, 0.7769, 2.3780)	Triangular (0.0000, 1.0000, 3.0608)
NR Cost, All	17		-		-	1.246	1.298	Lognormal (1.0000, 1.2981)	Lognormal (1.6386, 2.1271)	Lognormal (4.3997, 5.7113)
T1 Cost, All	33		-		-	0.960	0.970	Lognormal (1.0000, 0.9696)	Lognormal (1.3929, 1.3505)	Lognormal (2.7024, 2.6202)
Recurring Cost, All										
Cost Driver Metrics from Entire Dataset			-		-					
Weight, All	34		-		-	0.777	0.797	Lognormal (1.0000, 0.7971)	Lognormal (1.2788, 1.0193)	Lognormal (2.0913, 1.6670)

Figure 4.2-16. 1.2.6.2 Plumbing

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
T1 CER	29	T1	20.78 - 13262.27	Weight	1.8 - 284.79	0.400	0.395	Lognormal (1.0000, 0.3945)	Lognormal (1.0750, 0.4241)	Lognormal (1.2423, 0.4901)
T1 Cost per Lb, CER Datapoints, Commercial	10	T1	207.11 - 4216.27	Weight	6.84 - 91.24	0.151	0.139	Triangular (0.6075, 1.1906, 1.2019)	Triangular (0.5937, 1.1635, 1.1746)	Triangular (0.5103, 1.0000, 1.0095)
T1 Cost per Lb, CER Datapoints, Government	19	T1	20.78 - 13262.27	Weight	1.8 - 284.79	0.477	0.466	Triangular (0.0707, 0.6550, 2.2743)	Triangular (0.0753, 0.6979, 2.4231)	Triangular (0.1080, 1.0000, 3.4722)
T1 Typical Cost, CER Datapoints, Commercial	10					0.348	0.285	Normal (1.0000, 0.2848)	Normal (1.0000, 0.2848)	Normal (1.0000, 0.2848)
T1 Typical Cost, CER Datapoints, Government	19					1.377	1.829	Lognormal (1.0000, 1.8287)	Lognormal (2.0843, 3.8115)	Lognormal (9.0544, 16.5579)
Metrics from Entire Dataset										
NR Cost per Lb, New Design	8	NR	1207.31 - 8777.86	Weight	9.04 - 284.79	0.771	0.698	Triangular (0.0000, 0.0249, 2.9751)	Triangular (0.0000, 0.0281, 3.3643)	Triangular (0.0000, 1.0000, 119.6980)
NR Cost per Lb, Modified Design	7	NR	62.16 - 1957.86	Weight	1.8 - 85.64	0.817	0.662	Triangular (0.0000, 0.1283, 2.8717)	Triangular (0.0000, 0.1446, 3.2377)	Triangular (0.0000, 1.0000, 22.3883)
T1 Cost per Lb, Commercial	10	T1	207.11 - 4216.27	Weight	6.84 - 91.24	0.151	0.139	Triangular (0.6075, 1.1906, 1.2019)	Triangular (0.5937, 1.1635, 1.1746)	Triangular (0.5103, 1.0000, 1.0095)
T1 Cost per Lb, Government	22	T1	20.78 - 13262.27	Weight	1.8 - 284.79	0.635	0.665	Lognormal (1.0000, 0.6651)	Lognormal (1.2010, 0.7988)	Lognormal (1.7323, 1.1522)
NR to T1 Ratio, All	22	NR	25.92 - 8777.86	T1	20.78 - 13262.27	1.256	1.229	Beta (0.0113, 5.7088, 0.3615, 1.7218)	Beta (0.0248, 12.4794, 0.3615, 1.7218)	Beta (, , 0.3615, 1.7218)
NR Cost per Lb, All	21	NR	25.92 - 8777.86	Weight	1.8 - 284.79	1.180	1.118	Beta (0.0125, 4.1031, 0.3503, 1.1006)	Beta (0.0241, 7.9532, 0.3503, 1.1006)	Beta (, , 0.3503, 1.1006)
T1 Cost per Lb, All	33	T1	20.78 - 13262.27	Weight	1.8 - 284.79	0.544	0.563	Lognormal (1.0000, 0.5632)	Lognormal (1.1477, 0.6463)	Lognormal (1.5116, 0.8513)
NR Typical Cost, New Design	9					0.682	0.773	Lognormal (1.0000, 0.7730)	Lognormal (1.2639, 0.9770)	Lognormal (2.0191, 1.5607)
NR Typical Cost, Modified Design	7					0.712	0.656	Triangular (0.0000, 0.1452, 2.8548)	Triangular (0.0000, 0.1635, 3.2142)	Triangular (0.0000, 1.0000, 19.6562)
Recurring Typical Cost, New Design	9					1.247	1.211	Beta (0.0504, 3.6588, 0.1898, 0.5314)	Beta (0.1653, 12.0124, 0.1898, 0.5314)	Beta (, , 0.1898, 0.5314)
Recurring Typical Cost, Modified Design	7					1.038	1.253	Lognormal (1.0000, 1.2533)	Lognormal (1.6033, 2.0094)	Lognormal (4.1217, 5.1656)
Recurring Typical Cost, Commercial	10					0.779	0.929	Lognormal (1.0000, 0.9286)	Lognormal (1.3647, 1.2673)	Lognormal (2.5416, 2.3602)
Recurring Typical Cost, Government	23					1.231	1.269	Lognormal (1.0000, 1.2695)	Lognormal (1.6160, 2.0516)	Lognormal (4.2205, 5.3579)
T1 Typical Cost, Commercial	10					0.348	0.285	Normal (1.0000, 0.2848)	Normal (1.0000, 0.2848)	Normal (1.0000, 0.2848)
T1 Typical Cost, Government	23					1.392	1.519	Lognormal (1.0000, 1.5189)	Lognormal (1.8186, 2.7623)	Lognormal (6.0142, 9.1352)
NR Typical Cost, All	22					1.142	1.294	Lognormal (1.0000, 1.2938)	Lognormal (1.6352, 2.1156)	Lognormal (4.3724, 5.6570)
Recurring Typical Cost, All	34					1.223	1.283	Lognormal (1.0000, 1.2832)	Lognormal (1.6269, 2.0877)	Lognormal (4.3059, 5.5255)
T1 Typical Cost, All	34					1.131	1.192	Lognormal (1.0000, 1.1915)	Lognormal (1.5555, 1.8534)	Lognormal (3.7639, 4.4848)
Cost Driver Metrics from CER Datasets										
Weight, T1 CER Datapoints, Commercial	10					0.348	0.321	Triangular (0.1005, 1.3408, 1.5586)	Triangular (0.0957, 1.2767, 1.4840)	Triangular (0.0750, 1.0000, 1.1624)
Weight, T1 CER Datapoints, Government	16					0.742	0.844	Lognormal (1.0000, 0.8440)	Lognormal (1.3086, 1.1045)	Lognormal (2.2408, 1.8913)
Cost Driver Metrics from Entire Dataset										
Weight, All	34					1.191	1.196	Lognormal (1.0000, 1.1955)	Lognormal (1.5586, 1.8634)	Lognormal (3.7864, 4.5268)

Figure 4.2-17. 1.2.6.3 Thrusters

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER	5	NR	1278.39 - 9682.02	Weight	17.93 - 170.47	0.596	0.533	Beta (0.3238, 1.7042, 0.3314, 0.3451)	Beta (0.3297, 1.7352, 0.3314, 0.3451)	Beta (, , 0.3314, 0.3451)
NR Cost per Lb, All	5	NR	1278.39 - 9682.02	Weight	17.93 - 170.47	0.637	0.676	Lognormal (1.0000, 0.6755)	Lognormal (1.2068, 0.8152)	Lognormal (1.7575, 1.1872)
NR Typical Cost, All	5					0.952	1.615	Lognormal (1.0000, 1.6153)	Lognormal (1.8998, 3.0687)	Lognormal (6.8567, 11.0755)
T1 CER	5	T1	199.31 - 1784.01	Weight	17.93 - 170.47	0.205	0.184	Beta (0.6708, 1.1661, 0.4036, 0.2036)	Beta (0.6128, 1.0651, 0.4036, 0.2036)	Beta (, , 0.4036, 0.2036)
T1 Cost per Lb, All	5	T1	199.31 - 1784.01	Weight	17.93 - 170.47	0.205	0.184	Beta (0.6687, 1.1664, 0.4126, 0.2072)	Beta (0.6113, 1.0661, 0.4126, 0.2072)	Beta (, , 0.4126, 0.2072)
T1 Typical Cost, All	5					0.693	0.619	Beta (0.1854, 1.6595, 0.2230, 0.1806)	Beta (0.1588, 1.4214, 0.2230, 0.1806)	Beta (, , 0.2230, 0.1806)
Metrics from Entire Dataset										
NR Cost per Lb, All	14	NR	0.59 - 9682.02	Weight	1.08 - 701.69	1.458	2.047	Lognormal (1.0000, 2.0474)	Lognormal (2.2785, 4.6650)	Lognormal (11.8297, 24.2198)
NR to T1 Ratio, All	14	NR	0.59 - 9682.02	T1	9.75 - 8778.9	1.164	1.524	Lognormal (1.0000, 1.5243)	Lognormal (1.8230, 2.7789)	Lognormal (6.0589, 9.2356)
T1 Cost per Lb, All	14	T1	9.75 - 5239.62	Weight	1.08 - 701.69	1.108	1.388	Lognormal (1.0000, 1.3875)	Lognormal (1.7103, 2.3732)	Lognormal (5.0032, 6.9422)
NR Typical Cost, All	14					1.318	2.042	Lognormal (1.0000, 2.0424)	Lognormal (2.2741, 4.6447)	Lognormal (11.7607, 24.0204)
Recurring Typical Cost, All	14					1.600	1.967	Lognormal (1.0000, 1.9674)	Lognormal (2.2070, 4.3420)	Lognormal (10.7494, 21.1484)
T1 Typical Cost, All	15					1.508	2.306	Lognormal (1.0000, 2.3064)	Lognormal (2.5139, 5.7980)	Lognormal (15.8863, 36.6401)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, All	5					0.613	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Weight, T1 CER Datapoints, All	5					0.611	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Cost Driver Metrics from Entire Dataset										
Weight, All	15					1.110	1.158	Lognormal (1.0000, 1.1580)	Lognormal (1.5300, 1.7718)	Lognormal (3.5817, 4.1476)

Figure 4.2-18. 1.2.6.4 Solid Rocket Motors

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Fitted Samples										
NR CER	19	NR	5868.38 - 30915.8	Weight	27.82 - 245.9	0.248	0.242	Triangular (0.5820, 0.7410, 1.6770)	Triangular (0.6055, 0.7709, 1.7449)	Triangular (0.7854, 1.0000, 2.2633)
NR Cost per Lb, New Design	19	NR	5868.38 - 30915.8	Weight	27.82 - 245.9	0.531	0.550	Lognormal (1.0000, 0.5499)	Lognormal (1.1412, 0.6276)	Lognormal (1.4864, 0.8174)
NR Typical Cost, New Design	19		-		-	0.440	0.430	Triangular (0.1089, 0.7300, 2.1611)	Triangular (0.1148, 0.7690, 2.2765)	Triangular (0.1492, 1.0000, 2.9606)
T1 CER	45	T1	1199.8 - 48369.05	Weight	27.82 - 635.8	0.468	0.486	Lognormal (1.0000, 0.4863)	Lognormal (1.1120, 0.5407)	Lognormal (1.3749, 0.6686)
T1 Cost per Lb, Commsat	11	T1	2748.92 - 15366.95	Weight	99.52 - 162.1	0.423	0.443	Lognormal (1.0000, 0.4433)	Lognormal (1.0938, 0.4848)	Lognormal (1.3087, 0.5801)
T1 Cost per Lb, Govtsat	34	T1	1199.8 - 48369.05	Weight	27.82 - 635.8	0.483	0.490	Lognormal (1.0000, 0.4897)	Lognormal (1.1135, 0.5452)	Lognormal (1.3804, 0.6760)
T1 Typical Cost, Commsat	11		-		-	0.602	0.675	Lognormal (1.0000, 0.6748)	Lognormal (1.2064, 0.8140)	Lognormal (1.7557, 1.1847)
T1 Typical Cost, Govtsat	34		-		-	1.030	1.291	Lognormal (1.0000, 1.2914)	Lognormal (1.6333, 2.1092)	Lognormal (4.3570, 5.6265)
Metrics from Larger Samples										
NR Cost per Lb, New (Military)	27	NR	170.68 - 47359.39	Weight	27.82 - 201.5	1.011	0.990	Beta (0.0158, 3.2598, 0.3850, 0.8840)	Beta (0.0249, 5.1281, 0.3850, 0.8840)	Beta (, , 0.3850, 0.8840)
NR Cost per Lb, New (NASA)	27	NR	170.68 - 47359.39	Weight	27.82 - 201.5	1.011	1.022	Beta (0.0157, 3.2446, 0.3402, 0.7759)	Beta (0.0265, 5.4684, 0.3402, 0.7759)	Beta (, , 0.3402, 0.7759)
NR Cost per Lb, New (Unique)	12	NR	3412.34 - 65317.54	Weight	19.2 - 635.8	0.544	0.580	Lognormal (1.0000, 0.5804)	Lognormal (1.1562, 0.6711)	Lognormal (1.5457, 0.8972)
NR to T1 Ratio, New (Military)	27	NR	170.68 - 47359.39	T1	2748.92 - 21655.49	1.111	1.187	Lognormal (1.0000, 1.1874)	Lognormal (1.5524, 1.8433)	Lognormal (3.7410, 4.4420)
NR to T1 Ratio, New (NASA)	27	NR	170.68 - 47359.39	T1	2748.92 - 21655.49	1.111	1.187	Lognormal (1.0000, 1.1874)	Lognormal (1.5524, 1.8433)	Lognormal (3.7410, 4.4420)
NR to T1 Ratio, New (Unique)	12	NR	3412.34 - 65317.54	T1	2540.88 - 28022.55	0.860	0.680	Lognormal (1.0000, 0.6803)	Lognormal (1.2094, 0.8227)	Lognormal (1.7691, 1.2035)
T1 Cost per Lb, Commsat	13	T1	2748.92 - 15366.95	Weight	99.52 - 162.1	0.419	0.443	Lognormal (1.0000, 0.4433)	Lognormal (1.0938, 0.4848)	Lognormal (1.3087, 0.5801)
T1 Cost per Lb, Govtsat	19	T1	2540.88 - 48369.05	Weight	19.2 - 635.8	0.595	0.631	Lognormal (1.0000, 0.6308)	Lognormal (1.1824, 0.7459)	Lognormal (1.6529, 1.0427)
T1 Cost per Lb, All	55	T1	1199.8 - 48369.05	Weight	10.24 - 635.8	0.635	0.670	Lognormal (1.0000, 0.6703)	Lognormal (1.2039, 0.8069)	Lognormal (1.7447, 1.1695)
NR Typical Cost, New (Military)	27		-		-	1.064	1.028	Beta (0.0144, 3.9853, 0.4426, 1.3404)	Beta (0.0234, 6.4862, 0.4426, 1.3404)	Beta (, , 0.4426, 1.3404)
NR Typical Cost, New (NASA)	27		-		-	1.064	1.028	Beta (0.0144, 3.9853, 0.4426, 1.3404)	Beta (0.0234, 6.4862, 0.4426, 1.3404)	Beta (, , 0.4426, 1.3404)
NR Typical Cost, New (Unique)	12		-		-	0.834	0.807	Lognormal (1.0000, 0.8075)	Lognormal (1.2853, 1.0379)	Lognormal (2.1233, 1.7145)
T1 Typical Cost, Commsat	13		-		-	0.584	0.675	Lognormal (1.0000, 0.6748)	Lognormal (1.2064, 0.8140)	Lognormal (1.7557, 1.1847)
T1 Typical Cost, Govtsat	19		-		-	0.936	1.084	Lognormal (1.0000, 1.0841)	Lognormal (1.4749, 1.5989)	Lognormal (3.2082, 3.4780)
Recurring Typical Cost, Govtsat	19		-		-	0.728	0.659	Triangular (0.0000, 0.1386, 2.8614)	Triangular (0.0000, 0.1561, 3.2234)	Triangular (0.0000, 1.0000, 20.6489)
Recurring Typical Cost, Commsat	13		-		-	0.902	1.230	Lognormal (1.0000, 1.2298)	Lognormal (1.5850, 1.9492)	Lognormal (3.9822, 4.8972)
NR Typical Cost, All	54		-		-	1.193	1.193	Lognormal (1.0000, 1.1934)	Lognormal (1.5570, 1.8582)	Lognormal (3.7746, 4.5048)
T1 Typical Cost, All	55		-		-	0.964	1.104	Lognormal (1.0000, 1.1039)	Lognormal (1.4895, 1.6442)	Lognormal (3.3044, 3.6477)
Recurring Typical Cost, All	55		-		-	0.959	0.914	Lognormal (1.0000, 0.9143)	Lognormal (1.3549, 1.2388)	Lognormal (2.4875, 2.2742)
Cost Driver Metrics from Fitted Samples										
Weight, NR CER Datapoints, New Design	19		-		-	0.499	0.464	Triangular (0.0000, 0.7651, 2.2349)	Triangular (0.0000, 0.8026, 2.3443)	Triangular (0.0000, 1.0000, 2.9210)
Weight,T1 US=in comm	11		-		-	0.163	0.155	Triangular (0.7651, 0.7973, 1.4376)	Triangular (0.7858, 0.8189, 1.4766)	Triangular (0.9596, 1.0000, 1.8032)
Weight, T1 CER Datapoints, Govtsat	34		-		-	0.910	1.038	Lognormal (1.0000, 1.0380)	Lognormal (1.4413, 1.4960)	Lognormal (2.9941, 3.1078)
Cost Driver Metrics from Larger Samples										
Weight,(All)	55		-		-	0.789	0.866	Lognormal (1.0000, 0.8655)	Lognormal (1.3225, 1.1447)	Lognormal (2.3132, 2.0021)

Figure 4.2-19. 1.2.7 TT&C

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	16	NR	648.52 - 9718.81	Weight	18.95 - 86.45	0.422	0.439	Lognormal (1.0000, 0.4387)	Lognormal (1.0920, 0.4791)	Lognormal (1.3022, 0.5713)
NR Cost Per Lb, New Design	6	NR	3111.15 - 9718.81	Weight	18.95 - 86.45	0.393	0.369	Triangular (0.3581, 0.6082, 2.0336)	Triangular (0.3791, 0.6439, 2.1527)	Triangular (0.5888, 1.0000, 3.3434)
NR Cost per Lb, Modified	11	NR	648.52 - 3320.01	Weight	22.48 - 79.3	0.491	0.489	Lognormal (1.0000, 0.4892)	Lognormal (1.1133, 0.5446)	Lognormal (1.3797, 0.6750)
NR Cost, New Design	6		-		-	0.419	0.413	Normal (1.0000, 0.4130)	Normal (1.0000, 0.4130)	Normal (1.0000, 0.4130)
NR Cost, Modified Design	11		-		-	0.591	0.548	Triangular (0.0788, 0.3806, 2.5406)	Triangular (0.0866, 0.4182, 2.7918)	Triangular (0.2070, 1.0000, 6.6750)
T1 CER Residuals	39	T1	597.44 - 13791.56	Weight	18.27 - 86.45	0.395	0.393	Lognormal (1.0000, 0.3932)	Lognormal (1.0745, 0.4225)	Lognormal (1.2406, 0.4878)
T1 Cost per Lb, Govt	29	T1	597.44 - 13791.56	Weight	18.27 - 86.45	0.431	0.432	Lognormal (1.0000, 0.4324)	Lognormal (1.0895, 0.4711)	Lognormal (1.2932, 0.5591)
T1 Cost per Lb, Commsat	10	T1	1133.59 - 4087.48	Weight	24.65 - 48.94	0.281	0.259	Triangular (0.5640, 0.7092, 1.7267)	Triangular (0.5884, 0.7399, 1.8013)	Triangular (0.7953, 1.0000, 2.4346)
T1 Cost, Commsat	10		-		-	0.368	0.361	Lognormal (1.0000, 0.3610)	Lognormal (1.0632, 0.3838)	Lognormal (1.2018, 0.4339)
T1 Cost, Govtsat	29		-		-	0.731	0.835	Lognormal (1.0000, 0.8353)	Lognormal (1.3030, 1.0884)	Lognormal (2.2122, 1.8479)
Metrics from Entire Dataset										
NR Cost per Lb, New Design, All	23	NR	313.89 - 26226.62	Weight	7.07 - 230.7	0.858	0.872	Lognormal (1.0000, 0.8724)	Lognormal (1.3270, 1.1577)	Lognormal (2.3370, 2.0387)
NR Cost per Lb, Modified Design, All	18	NR	152.3 - 3320.01	Weight	22.48 - 79.3	0.680	0.652	Triangular (0.0033, 0.1534, 2.8433)	Triangular (0.0037, 0.1725, 3.1959)	Triangular (0.0215, 1.0000, 18.5295)
NR Cost Per Lb, Existing Design, All	6	NR	0.29 - 497.42	Weight	11.24 - 64.94	0.868	0.706	Triangular (0.0000, 0.0024, 2.9976)	Triangular (0.0000, 0.0028, 3.3823)	Triangular (0.0000, 1.0000, 1227.1945)
NR to T1 Ratio, New Design, All	22	NR	313.89 - 18645.96	T1	0 - 13791.56	0.902	0.908	Beta (0.1864, 10.4370, 0.6594, 7.6486)	Beta (0.2733, 15.3032, 0.6594, 7.6486)	Beta (, , 0.6594, 7.6486)
NR to T1 Ratio, Modified Design, All	18	NR	152.3 - 3320.01	T1	1015.98 - 7216.91	0.820	0.826	Lognormal (1.0000, 0.8257)	Lognormal (1.2968, 1.0707)	Lognormal (2.1809, 1.8007)
NR to T1 Ratio, Existing Design, All	7	NR	0.29 - 497.42	T1	160.2 - 4484.04	1.214	1.176	Beta (0.0009, 3.3777, 0.2126, 0.5060)	Beta (0.0025, 9.0980, 0.2126, 0.5060)	Beta (, , 0.2126, 0.5060)
T1 Cost per Lb, Govtsat	39	T1	229.68 - 13791.56	Weight	0.99 - 230.7	0.566	0.567	Lognormal (1.0000, 0.5674)	Lognormal (1.1498, 0.6524)	Lognormal (1.5200, 0.8625)
T1 Cost per Lb, Commstat	11	T1	160.2 - 4087.48	Weight	11.24 - 48.94	0.373	0.361	Normal (1.0000, 0.3610)	Normal (1.0000, 0.3610)	Normal (1.0000, 0.3610)
NR Cost per Lb, All	47	NR	0.29 - 26226.62	Weight	0.99 - 230.7	1.346	1.453	Beta (0.0001, 6.3598, 0.2419, 1.2966)	Beta (0.0005, 24.7297, 0.2419, 1.2966)	Beta (, , 0.2419, 1.2966)
T1 Cost per Lb, All	50	T1	160.2 - 13791.56	Weight	0.99 - 230.7	0.597	0.604	Lognormal (1.0000, 0.6039)	Lognormal (1.1682, 0.7055)	Lognormal (1.5942, 0.9628)
NR Cost, New Design, All	23		-		-	0.730	0.695	Triangular (0.0000, 0.0352, 2.9648)	Triangular (0.0000, 0.0400, 3.3658)	Triangular (0.0000, 1.0000, 84.2082)
NR Cost, Modified Design, All	18		-		-	0.751	0.667	Triangular (0.0000, 0.1149, 2.8851)	Triangular (0.0000, 0.1296, 3.2532)	Triangular (0.0000, 1.0000, 25.1008)
NR Cost, Existing, All	7		-		-	1.080	0.953	Lognormal (1.0000, 0.9527)	Lognormal (1.3812, 1.3158)	Lognormal (2.6347, 2.5100)
T1 Cost, Govtsat	39		-		-	0.764	0.789	Lognormal (1.0000, 0.7892)	Lognormal (1.2739, 1.0053)	Lognormal (2.0672, 1.6313)
T1 Cost, Commsat	11		-		-	0.487	0.463	Lognormal (1.0000, 0.4635)	Lognormal (1.1022, 0.5108)	Lognormal (1.3389, 0.6206)
Recurring, Govt	38		-		-	1.058	1.089	Lognormal (1.0000, 1.0894)	Lognormal (1.4788, 1.6109)	Lognormal (3.2337, 3.5226)
Recurring, Commsat	11		-		-	0.784	0.828	Lognormal (1.0000, 0.8277)	Lognormal (1.2981, 1.0744)	Lognormal (2.1874, 1.8105)
NR Cost, All	47		-		-	1.264	1.277	Beta (0.0001, 5.6275, 0.3267, 1.5117)	Beta (0.0002, 13.7749, 0.3267, 1.5117)	Beta (, , 0.3267, 1.5117)
T1 Cost, All	50		-		-	0.792	0.827	Lognormal (1.0000, 0.8268)	Lognormal (1.2975, 1.0727)	Lognormal (2.1844, 1.8060)
Recurring Cost, All	49		-		-	1.174	1.215	Lognormal (1.0000, 1.2152)	Lognormal (1.5738, 1.9125)	Lognormal (3.8979, 4.7369)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals, New Design	6		-		-	0.504	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Weight, NR CER Residuals, Modified Desig	11		-		-	0.387	0.397	Lognormal (1.0000, 0.3968)	Lognormal (1.0758, 0.4269)	Lognormal (1.2452, 0.4941)
Weight, T1 CER Residuals, Govt	29		-		-	0.487	0.467	Triangular (0.2421, 0.4416, 2.3163)	Triangular (0.2626, 0.4790, 2.5124)	Triangular (0.5482, 1.0000, 5.2450)
Weight, T1 CER Residuals, Commsat	10		-		-	0.209	0.201	Triangular (0.4424, 1.1875, 1.3701)	Triangular (0.4297, 1.1534, 1.3308)	Triangular (0.3725, 1.0000, 1.1537)
Cost Driver Metrics from Entire Dataset										
Weight, All	49		-		-	0.498	0.487	Lognormal (1.0000, 0.4869)	Lognormal (1.1122, 0.5415)	Lognormal (1.3759, 0.6699)

Figure 4.2-20. 1.2.7.1 TT&C RF

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER	18	NR	2678.35 - 25181.57	Weight	22.2 - 214.4	0.319	0.309	Triangular (0.2779, 0.9329, 1.7892)	Triangular (0.2821, 0.9470, 1.8163)	Triangular (0.2979, 1.0000, 1.9179)
NR Cost per Lb, New Design	15	NR	2678.35 - 25181.57	Weight	22.2 - 214.4	0.404	0.414	Lognormal (1.0000, 0.4140)	Lognormal (1.0823, 0.4481)	Lognormal (1.2678, 0.5249)
NR Typical Cost, New Design	15					0.617	0.594	Triangular (0.0839, 0.2370, 2.6791)	Triangular (0.0933, 0.2636, 2.9802)	Triangular (0.3541, 1.0000, 11.3051)
T1 CER	38	T1	706.6 - 11279.47	Weight	16 - 214.4	0.394	0.387	Triangular (0.2669, 0.6619, 2.0713)	Triangular (0.2828, 0.7013, 2.1948)	Triangular (0.4032, 1.0000, 3.1295)
T1 Cost per Lb, Commsat	22	T1	706.6 - 5266.77	Weight	16 - 132.7	0.341	0.349	Lognormal (1.0000, 0.3494)	Lognormal (1.0593, 0.3701)	Lognormal (1.1886, 0.4152)
T1 Cost per Lb, NON-Commsat	16	T1	889.55 - 11279.47	Weight	28.41 - 214.4	0.544	0.518	Triangular (0.1524, 0.3896, 2.4580)	Triangular (0.1666, 0.4260, 2.6876)	Triangular (0.3911, 1.0000, 6.3090)
T1 Typical Cost, Commsat	22					0.496	0.467	Triangular (0.0000, 0.7520, 2.2480)	Triangular (0.0000, 0.7902, 2.3623)	Triangular (0.0000, 1.0000, 2.9894)
T1 Typical Cost, NON-Commsat	16					0.615	0.636	Lognormal (1.0000, 0.6364)	Lognormal (1.1854, 0.7544)	Lognormal (1.6655, 1.0600)
Metrics from Entire Dataset										
NR Cost per Lb, New Design	19	NR	2678.35 - 50073.9	Weight	7.55 - 390.2	0.762	0.907	Lognormal (1.0000, 0.9075)	Lognormal (1.3504, 1.2255)	Lognormal (2.4625, 2.2347)
NR to T1 Ratio, New Design	18	NR	2678.35 - 50073.9	T1	742.17 - 23681.07	0.579	0.553	Triangular (0.1630, 0.2732, 2.5638)	Triangular (0.1799, 0.3015, 2.8291)	Triangular (0.5966, 1.0000, 9.3844)
T1 Cost per Lb, Commsat	25	T1	706.6 - 15782.25	Weight	7.55 - 142.84	0.500	0.535	Lognormal (1.0000, 0.5352)	Lognormal (1.1342, 0.6070)	Lognormal (1.4591, 0.7809)
T1 Cost per Lb, NON-Commsat	23	T1	889.55 - 43160.07	Weight	9.25 - 412.89	0.808	0.889	Lognormal (1.0000, 0.8888)	Lognormal (1.3379, 1.1891)	Lognormal (2.3948, 2.1285)
NR Cost per Lb, All	45	NR	30.83 - 50073.9	Weight	7.55 - 412.89	1.257	1.380	Lognormal (1.0000, 1.3798)	Lognormal (1.7041, 2.3514)	Lognormal (4.9486, 6.8283)
T1 Cost per Lb, All	48	T1	706.6 - 43160.07	Weight	7.55 - 412.89	0.839	0.947	Lognormal (1.0000, 0.9470)	Lognormal (1.3773, 1.3043)	Lognormal (2.6125, 2.4741)
NR Typical Cost, New Design	19					0.809	0.909	Lognormal (1.0000, 0.9090)	Lognormal (1.3514, 1.2284)	Lognormal (2.4680, 2.2433)
T1 Typical Cost, Commsat	25					0.924	1.104	Lognormal (1.0000, 1.1036)	Lognormal (1.4893, 1.6436)	Lognormal (3.3032, 3.6454)
T1 Typical Cost, NON-Commsat	23					1.139	1.428	Lognormal (1.0000, 1.4283)	Lognormal (1.7435, 2.4902)	Lognormal (5.3002, 7.5700)
Recurring Typical Cost, Commsat	25					1.254	1.335	Lognormal (1.0000, 1.3353)	Lognormal (1.6682, 2.2275)	Lognormal (4.6426, 6.1992)
Recurring Typical Cost, NON-Commsat	23					0.826	0.857	Lognormal (1.0000, 0.8568)	Lognormal (1.3169, 1.1283)	Lognormal (2.2837, 1.9567)
NR Typical Cost, All	45					1.353	1.461	Lognormal (1.0000, 1.4610)	Lognormal (1.7704, 2.5866)	Lognormal (5.5495, 8.1077)
T1 Typical Cost, All	48					1.296	1.647	Lognormal (1.0000, 1.6470)	Lognormal (1.9268, 3.1734)	Lognormal (7.1534, 11.7816)
Recurring Typical Cost, All	48					1.040	1.009	Lognormal (1.0000, 1.0088)	Lognormal (1.4204, 1.4329)	Lognormal (2.8658, 2.8910)
Cost Driver Metrics from CER Dataset										
Weight, NR CER Datapoints, New Design	15					0.540	0.509	Triangular (0.0000, 0.6039, 2.3961)	Triangular (0.0000, 0.6488, 2.5743)	Triangular (0.0000, 1.0000, 3.9677)
Weight, T1 CER Datapoints, Commsat	22					0.467	0.411	Triangular (0.0000, 0.9890, 2.0110)	Triangular (0.0000, 0.9916, 2.0161)	Triangular (0.0000, 1.0000, 2.0333)
Weight, T1 CER Datapoints, NON-Commsat	16					0.558	0.585	Lognormal (1.0000, 0.5854)	Lognormal (1.1587, 0.6783)	Lognormal (1.5558, 0.9108)
Cost Driver Metrics from Entire Dataset										
Weight,(All)	49					0.837	0.889	Lognormal (1.0000, 0.8891)	Lognormal (1.3381, 1.1897)	Lognormal (2.3958, 2.1301)

Figure 4.2-21. 1.2.7.2 TT&C Digital

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	**Count**	**Label**	**Range**	**Label**	**Range**	**CV**	**CV**	**Mean**	**Median**	**Mode**
Metrics from CER Dataset										
NR CER, Govt ComSats	14	NR	38364.42 - 817778.38	Weight	124.3 - 3626.58	0.443	0.424	Triangular (0.0318, 0.8720, 2.0962)	Triangular (0.0327, 0.8964, 2.1548)	Triangular (0.0364, 1.0000, 2.4039)
NR Cost per Lb	14	NR	38364.42 - 817778.38	Weight	124.3 - 3626.58	0.501	0.482	Triangular (0.2532, 0.3871, 2.3597)	Triangular (0.2755, 0.4211, 2.5671)	Triangular (0.6542, 1.0000, 6.0967)
NR Typical Cost	14					0.905	1.103	Lognormal (1.0000, 1.1034)	Lognormal (1.4891, 1.6431)	Lognormal (3.3021, 3.6435)
T1 CER	29	T1	3715.88 - 322559.5	Weight	51.44 - 3626.58	0.374	0.366	Triangular (0.2743, 0.7245, 2.0012)	Triangular (0.2884, 0.7616, 2.1037)	Triangular (0.3787, 1.0000, 2.7622)
T1 Cost per Lb, (CER) Commsat	10	T1	3715.88 - 121227.68	Weight	51.44 - 2199.91	0.294	0.294	Lognormal (1.0000, 0.2941)	Lognormal (1.0423, 0.3065)	Lognormal (1.1325, 0.3331)
T1 Cost per Lb, (CER) Govtsat	19	T1	6806.4 - 322559.5	Weight	82.72 - 3626.58	0.486	0.492	Lognormal (1.0000, 0.4918)	Lognormal (1.1144, 0.5480)	Lognormal (1.3838, 0.6805)
T1 Typical Cost (CER), Commsat	10					0.886	1.179	Lognormal (1.0000, 1.1795)	Lognormal (1.5463, 1.8238)	Lognormal (3.6975, 4.3611)
T1 Typical Cost (CER), Govtsat	19					1.021	1.024	Beta (0.0697, 3.3012, 0.2995, 0.7408)	Beta (0.1282, 6.0762, 0.2995, 0.7408)	Beta (, , 0.2995, 0.7408)
Metrics from Entire Dataset										
NR Cost per Lb, Modified Design	15	NR	2141.07 - 96972.93	Weight	146.53 - 2199.91	1.056	1.256	Lognormal (1.0000, 1.2564)	Lognormal (1.6058, 2.0176)	Lognormal (4.1408, 5.2026)
NR Cost per Lb, New Design	20	NR	2428.41 - 817778.38	Weight	31.08 - 3626.58	0.688	0.752	Lognormal (1.0000, 0.7520)	Lognormal (1.2512, 0.9409)	Lognormal (1.9588, 1.4730)
NR to T1 Ratio, Modified Design	15	NR	2141.07 - 96972.93	T1	11727.15 - 280868.6	0.771	0.892	Lognormal (1.0000, 0.8922)	Lognormal (1.3402, 1.1958)	Lognormal (2.4071, 2.1477)
NR to T1 Ratio, New Design	20	NR	2428.41 - 817778.38	T1	3715.88 - 295451.15	0.586	0.593	Lognormal (1.0000, 0.5934)	Lognormal (1.1628, 0.6901)	Lognormal (1.5723, 0.9331)
T1 Cost per Lb, Commsat	10	T1	3715.88 - 121227.68	Weight	51.44 - 2199.91	0.294	0.294	Lognormal (1.0000, 0.2941)	Lognormal (1.0423, 0.3065)	Lognormal (1.1325, 0.3331)
T1 Cost per Lb, Govtsat	30	T1	3558.84 - 322559.5	Weight	29.53 - 3626.58	0.765	0.884	Lognormal (1.0000, 0.8843)	Lognormal (1.3349, 1.1804)	Lognormal (2.3787, 2.1034)
T1 Cost per Lb, Modified Design	16	T1	11727.15 - 280868.6	Weight	146.53 - 2199.91	0.628	0.714	Lognormal (1.0000, 0.7136)	Lognormal (1.2285, 0.8767)	Lognormal (1.8542, 1.3232)
T1 Cost per Lb, New Design	20	T1	3715.88 - 295451.15	Weight	31.08 - 3626.58	0.931	1.267	Lognormal (1.0000, 1.2670)	Lognormal (1.6141, 2.0451)	Lognormal (4.2053, 5.3282)
NR Cost per Lb, All	39	NR	340.25 - 817778.38	Weight	29.53 - 3626.58	1.257	1.309	Beta (0.0228, 56.2822, 0.5303, 30.0000)	Beta (0.0456, 112.4953, 0.5303, 30.0000)	Beta (, , 0.5303, 30.0000)
T1 Cost per Lb, All	40	T1	3558.84 - 322559.5	Weight	29.53 - 3626.58	0.791	0.925	Lognormal (1.0000, 0.9251)	Lognormal (1.3623, 1.2603)	Lognormal (2.5282, 2.3389)
NR Typical Cost, Modified Design	16					1.478	2.569	Lognormal (1.0000, 2.5688)	Lognormal (2.7566, 7.0810)	Lognormal (20.9461, 53.8058)
NR Typical Cost, New Design	20					1.142	1.344	Lognormal (1.0000, 1.3436)	Lognormal (1.6749, 2.2504)	Lognormal (4.6985, 6.3128)
T1 Typical Cost, Modified Design	16					1.149	1.560	Lognormal (1.0000, 1.5599)	Lognormal (1.8529, 2.8903)	Lognormal (6.3614, 9.9230)
T1 Typical Cost, New Design	20					1.122	1.262	Lognormal (1.0000, 1.2625)	Lognormal (1.6106, 2.0333)	Lognormal (4.1776, 5.2742)
T1 Typical Cost, Commsat	10					0.886	1.179	Lognormal (1.0000, 1.1795)	Lognormal (1.5463, 1.8238)	Lognormal (3.6975, 4.3611)
T1 Typical Cost, Govtsat	30					1.130	1.178	Beta (0.0480, 4.3490, 0.2876, 1.0118)	Beta (0.1115, 10.1065, 0.2876, 1.0118)	Beta (, , 0.2876, 1.0118)
Recurring Typical Cost, Commsat	10					0.830	0.861	Lognormal (1.0000, 0.8609)	Lognormal (1.3196, 1.1361)	Lognormal (2.2976, 1.9781)
Recurring Typical Cost, Govtsat	30					0.920	0.918	Lognormal (1.0000, 0.9185)	Lognormal (1.3578, 1.2470)	Lognormal (2.5031, 2.2990)
NR Typical Cost, All	39					1.571	1.859	Lognormal (1.0000, 1.8592)	Lognormal (2.1111, 3.9248)	Lognormal (9.4081, 17.4913)
T1 Typical Cost, All	40					1.184	1.178	Lognormal (1.0000, 1.1778)	Lognormal (1.5451, 1.8199)	Lognormal (3.6886, 4.3446)
Recurring Typical Cost, All	40					1.069	1.054	Beta (0.0213, 4.8795, 0.4872, 1.9313)	Beta (0.0352, 8.0746, 0.4872, 1.9313)	Beta (, , 0.4872, 1.9313)
Cost Driver Metrics from CER Dataset										
Weight, NR New Design	14					0.760	0.678	Triangular (0.0000, 0.0837, 2.9163)	Triangular (0.0000, 0.0945, 3.2943)	Triangular (0.0000, 1.0000, 34.8635)
Weight,T1 Commsat	10					0.685	0.768	Lognormal (1.0000, 0.7676)	Lognormal (1.2607, 0.9677)	Lognormal (2.0035, 1.5379)
Weight,T1 Govtsat	19					0.824	0.789	Beta (0.0607, 2.6595, 0.5442, 0.9614)	Beta (0.0742, 3.2552, 0.5442, 0.9614)	Beta (, , 0.5442, 0.9614)

Figure 4.2-22. 1.3.1 Communication Payload

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	20	NR	58.7 - 111472.7	Comm HW + I&T NR	3123.8 - 706305.7	0.715	0.717	Lognormal (1.0000, 0.7168)	Lognormal (1.2304, 0.8819)	Lognormal (1.8626, 1.3351)
Comm PL SEPM NR cost per Comm HW + I&T NR cost	20	NR	58.7 - 111472.7	Comm HW + I&T NR	3123.8 - 706305.7	0.715	0.717	Lognormal (1.0000, 0.7168)	Lognormal (1.2304, 0.8819)	Lognormal (1.8626, 1.3351)
NR Cost	20		-		-	1.269	1.174	Beta (0.0026, 4.9535, 0.3747, 1.4854)	Beta (0.0052, 9.9731, 0.3747, 1.4854)	Beta (, , 0.3747, 1.4854)
REC CER Residuals	15	REC	1573.3 - 98818.9	Comm HW + I&T Rec	15733.2 - 718327.1	0.409	0.425	Lognormal (1.0000, 0.4249)	Lognormal (1.0865, 0.4617)	Lognormal (1.2828, 0.5451)
Comm PL SEPM REC cost per Comm HW + I&T REC cost	15	REC	1573.3 - 98818.9	Comm HW + I&T Rec	15733.2 - 718327.1	0.409	0.425	Lognormal (1.0000, 0.4250)	Lognormal (1.0865, 0.4617)	Lognormal (1.2828, 0.5451)
Recurring Cost	15		-		-	1.178	1.092	Lognormal (1.0000, 1.0919)	Lognormal (1.4806, 1.6168)	Lognormal (3.2460, 3.5445)
Metrics from Entire Dataset										
Comm PL SEPM NR cost per Comm HW + I&T NR cost, New Commsa	11	NR	11141.2 - 111472.7	Comm HW + I&T NR	44509.3 - 706305.7	0.303	0.305	Lognormal (1.0000, 0.3055)	Lognormal (1.0456, 0.3194)	Lognormal (1.1432, 0.3492)
Comm PL SEPM NR cost per Comm HW + I&T NR cost, Modified Com	10	NR	58.7 - 4047.9	Comm HW + I&T NR	7308.7 - 95293.8	0.924	0.703	Triangular (0.0000, 0.0121, 2.9879)	Triangular (0.0000, 0.0137, 3.3874)	Triangular (0.0000, 1.0000, 247.4764)
Comm PL SEPM NR cost per Comm HW + I&T NR cost, All	27	NR	58.7 - 111472.7	Comm HW + I&T NR	340.4 - 706305.7	0.932	0.989	Lognormal (1.0000, 0.9894)	Lognormal (1.4068, 1.3919)	Lognormal (2.7840, 2.7545)
Comm PL SEPM REC cost per Comm HW + I&T REC cost, All	27	REC	125.3 - 146204	Comm HW + I&T Rec	4683.7 - 718327.1	0.907	0.879	Lognormal (1.0000, 0.8785)	Lognormal (1.3311, 1.1694)	Lognormal (2.3584, 2.0719)
NR Cost, New Commsats	11		-		-	0.715	0.806	Lognormal (1.0000, 0.8063)	Lognormal (1.2846, 1.0357)	Lognormal (2.1197, 1.7091)
NR Cost, Modified Commsats	10		-		-	0.919	0.695	Triangular (0.0000, 0.0339, 2.9661)	Triangular (0.0000, 0.0384, 3.3577)	Triangular (0.0000, 1.0000, 87.5383)
NR Cost, All	27		-		-	1.530	1.448	Beta (0.0035, 6.5622, 0.2497, 1.3939)	Beta (0.0129, 24.4177, 0.2497, 1.3939)	Beta (, , 0.2497, 1.3939)
Recurring Cost, All	27		-		-	1.323	1.347	Beta (0.0045, 5.2933, 0.2548, 1.0990)	Beta (0.0145, 16.9740, 0.2548, 1.0990)	Beta (, , 0.2548, 1.0990)
Cost Driver Metrics from CER Datasets										
Comm HW + I&T REC Cost, Recurring CER	15		-		-	1.042	1.313	Lognormal (1.0000, 1.3125)	Lognormal (1.6501, 2.1658)	Lognormal (4.4927, 5.8969)
Comm HW + I&T NR Cost, NR CER	20		-		-	1.313	1.188	Lognormal (1.0000, 1.1880)	Lognormal (1.5529, 1.8449)	Lognormal (3.7446, 4.4487)
Cost Driver Metrics from Entire Dataset			-		-					
Comm HW + I&T NR Cost, All	35		-		-	1.700	1.813	Beta (0.0044, 9.1792, 0.1605, 1.3183)	Beta (0.0507, 105.2476, 0.1605, 1.3183)	Beta (, , 0.1605, 1.3183)
Comm HW + I&T REC Cost, All	36		-		-	1.146	1.235	Lognormal (1.0000, 1.2348)	Lognormal (1.5890, 1.9621)	Lognormal (4.0119, 4.9540)

Figure 4.2-23. 1.3.1.1.1 Communication Payload SEPM

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Fitted Samples										
NR CER	13	NR	1569.48 - 42171.14	Comm HW NR	26615.11 - 664134.56	0.450	0.467	Lognormal (1.0000, 0.4668)	Lognormal (1.1036, 0.5151)	Lognormal (1.3440, 0.6273)
NR, I&T per HW Cost, New Design	11	NR	1758.53 - 42171.14	Comm HW NR	33718.95 - 664134.56	0.464	0.483	Lognormal (1.0000, 0.4832)	Lognormal (1.1106, 0.5366)	Lognormal (1.3699, 0.6619)
NR Typical Cost, New Design	11					1.086	1.538	Lognormal (1.0000, 1.5376)	Lognormal (1.8342, 2.8203)	Lognormal (6.1708, 9.4884)
T1 CER	23	T1	153.58 - 28407.94	Comm HW T1	11088.64 - 241726.92	0.620	0.606	Triangular (0.0000, 0.2955, 2.7045)	Triangular (0.0000, 0.3284, 3.0063)	Triangular (0.0000, 1.0000, 9.1534)
T1, I&T per HW Cost, Military	13	T1	206.29 - 28407.94	Comm HW T1	11088.64 - 241726.92	0.697	0.748	Lognormal (1.0000, 0.7477)	Lognormal (1.2486, 0.9336)	Lognormal (1.9467, 1.4555)
T1, I&T per HW Cost, NON-Military	10	T1	153.58 - 13941.93	Comm HW T1	14157.13 - 129378.3	0.686	0.653	Triangular (0.0151, 0.1379, 2.8470)	Triangular (0.0170, 0.1548, 3.1956)	Triangular (0.1097, 1.0000, 20.6456)
T1 Typical Cost, Military	13					1.162	1.086	Beta (0.0259, 3.5610, 0.3078, 0.8092)	Beta (0.0502, 6.9183, 0.3078, 0.8092)	Beta (, , 0.3078, 0.8092)
T1 Typical Cost, NON-Military	10					1.176	1.804	Lognormal (1.0000, 1.8045)	Lognormal (2.0630, 3.7226)	Lognormal (8.7804, 15.8438)
Metrics from Larger Samples										
NR, I&T per HW Cost, New Commsats	13	NR	29.8 - 42171.14	Comm HW NR	33718.95 - 664134.56	0.657	0.619	Triangular (0.0000, 0.2556, 2.7444)	Triangular (0.0000, 0.2851, 3.0617)	Triangular (0.0000, 1.0000, 10.7389)
NR to T1 Ratio, New Commsats	11	NR	395.5 - 42171.14	T1	776.95 - 28407.94	0.698	0.693	Lognormal (1.0000, 0.6934)	Lognormal (1.2169, 0.8438)	Lognormal (1.8020, 1.2496)
T1, I&T per HW Cost, New Commsats	27	T1	0.46 - 28407.94	Comm HW T1	5238.47 - 241726.92	0.810	0.707	Triangular (0.0000, 0.0014, 2.9986)	Triangular (0.0000, 0.0016, 3.4123)	Triangular (0.0000, 1.0000, 2173.9624)
NR, I&T per HW Costs, All	21	NR	10.16 - 42171.14	Comm HW NR	3779 - 664134.56	0.789	0.701	Triangular (0.0000, 0.0183, 2.9817)	Triangular (0.0000, 0.0208, 3.3891)	Triangular (0.0000, 1.0000, 162.9922)
T1, I&T per HW Costs, All	31	T1	0.46 - 28407.94	Comm HW T1	2344.6 - 241726.92	1.296	1.688	Lognormal (1.0000, 1.6879)	Lognormal (1.9619, 3.3115)	Lognormal (7.5515, 12.7462)
NR Typical Cost, New Commsats	13					1.246	1.770	Lognormal (1.0000, 1.7699)	Lognormal (2.0329, 3.5980)	Lognormal (8.4009, 14.8687)
T1 Typical Cost, New Commsats	27					1.425	1.445	Beta (0.0001, 5.7288, 0.2208, 1.0444)	Beta (0.0004, 24.4905, 0.2208, 1.0444)	Beta (, , 0.2208, 1.0444)
Recurring Typical Cost, New Commsats	27					1.385	3.849	Lognormal (1.0000, 3.8492)	Lognormal (3.9769, 15.3078)	Lognormal (62.8990, 242.1079)
NR Typical Cost, All	21					1.659	2.526	Lognormal (1.0000, 2.5261)	Lognormal (2.7168, 6.8630)	Lognormal (20.0534, 50.6569)
T1 Typical Cost, All	31					1.514	1.576	Beta (0.0001, 6.5207, 0.1873, 1.0343)	Beta (0.0007, 42.4156, 0.1873, 1.0343)	Beta (, , 0.1873, 1.0343)
Recurring Typical Cost, All	30					1.394	1.637	Lognormal (1.0000, 1.6368)	Lognormal (1.9181, 3.1395)	Lognormal (7.0567, 11.5503)
Cost Driver Metrics from Fitted Samples										
Common HW NR (CER), New Design	11					0.935	1.138	Lognormal (1.0000, 1.1380)	Lognormal (1.5150, 1.7241)	Lognormal (3.4771, 3.9570)
Common HW T1 (CER), Military	13					0.914	0.919	Lognormal (1.0000, 0.9190)	Lognormal (1.3581, 1.2480)	Lognormal (2.5050, 2.3020)
Common HW T1 (CER), NON-military	10					0.753	0.828	Lognormal (1.0000, 0.8281)	Lognormal (1.2984, 1.0752)	Lognormal (2.1888, 1.8126)
Cost Driver Metrics from Larger Samples										
Common Payload Weight, All	32					0.916	0.918	Beta (0.0279, 3.4231, 0.5148, 1.2833)	Beta (0.0392, 4.8172, 0.5148, 1.2833)	Beta (, , 0.5148, 1.2833)
Common HW NR, All	31					1.569	1.968	Lognormal (1.0000, 1.9682)	Lognormal (2.2077, 4.3453)	Lognormal (10.7604, 21.1790)
Common HW T1, All	32					1.103	1.117	Lognormal (1.0000, 1.1171)	Lognormal (1.4993, 1.6750)	Lognormal (3.3705, 3.7653)

Figure 4.2-24. 1.3.1.1.2 Communication Payload I&T

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	**Count**	**Label**	**Range**	**Label**	**Range**	**CV**	**CV**	**Mean**	**Median**	**Mode**
Metrics from CER Dataset										
NR CER Residuals	14	NR	21472.68 - 128858.54	Weight	102.29 - 827.11	0.622	0.581	Triangular (0.0013, 0.3697, 2.6289)	Triangular (0.0015, 0.4076, 2.8978)	Triangular (0.0036, 1.0000, 7.1101)
NR Cost per lb	14	NR	21472.68 - 128858.54	Weight	102.29 - 827.11	0.612	0.591	Triangular (0.0872, 0.2433, 2.6696)	Triangular (0.0968, 0.2701, 2.9638)	Triangular (0.3583, 1.0000, 10.9736)
NR Cost	14		-		-	0.622	0.581	Triangular (0.0013, 0.3697, 2.6289)	Triangular (0.0015, 0.4076, 2.8978)	Triangular (0.0036, 1.0000, 7.1101)
T1 CER Residuals for Govt or Commercial	36	T1	1736.59 - 115002.37	Weight	24.57 - 1029.94	0.502	0.504	Lognormal (1.0000, 0.5045)	Lognormal (1.1201, 0.5651)	Lognormal (1.4051, 0.7089)
T1 Cost per lb, Govt	26	T1	2745.81 - 115002.37	Weight	37.99 - 827.11	0.787	0.873	Lognormal (1.0000, 0.8729)	Lognormal (1.3274, 1.1586)	Lognormal (2.3387, 2.0413)
T1 Cost per lb, Commer	10	T1	1736.59 - 54904.34	Weight	24.57 - 1029.94	0.336	0.336	Normal (1.0000, 0.3361)	Normal (1.0000, 0.3361)	Normal (1.0000, 0.3361)
T1 Cost, Govt	26		-		-	0.855	0.951	Lognormal (1.0000, 0.9511)	Lognormal (1.3800, 1.3125)	Lognormal (2.6283, 2.4997)
T1 Cost, Commer	10		-		-	0.616	0.651	Lognormal (1.0000, 0.6514)	Lognormal (1.1935, 0.7775)	Lognormal (1.6999, 1.1074)
Metrics from Entire Dataset										
NR Cost per lb, New Design Commsats	16	NR	15666.97 - 128858.54	Weight	102.29 - 1029.94	0.714	0.649	Triangular (0.0000, 0.1657, 2.8343)	Triangular (0.0000, 0.1861, 3.1826)	Triangular (0.0000, 1.0000, 17.1022)
NR Cost per lb, Existing Design Commsats	21	NR	15.84 - 14769.58	Weight	24.57 - 747.61	1.286	1.275	Beta (0.0056, 5.0952, 0.2939, 1.2106)	Beta (0.0147, 13.2877, 0.2939, 1.2106)	Beta (, , 0.2939, 1.2106)
NR to T1 Ratio, New Design Commsats	16	NR	15666.97 - 128858.54	T1	8049.04 - 75959.7	0.544	0.523	Triangular (0.0000, 0.5545, 2.4455)	Triangular (0.0000, 0.5991, 2.6419)	Triangular (0.0000, 1.0000, 4.4100)
NR to T1 Ratio, Existing Design Commsats	22	NR	15.84 - 40550.18	T1	1655.84 - 60553.08	1.378	1.428	Beta (0.0118, 18.0954, 0.3984, 6.8913)	Beta (0.0291, 44.7953, 0.3984, 6.8913)	Beta (, , 0.3984, 6.8913)
T1 Cost per lb, Govt, All	29	T1	1655.84 - 115002.37	Weight	25.12 - 827.11	0.764	0.804	Beta (0.3760, 33.7265, 0.5720, 30.0000)	Beta (0.5373, 48.1974, 0.5720, 30.0000)	Beta (, , 0.5720, 30.0000)
T1 Cost per lb, Commer, All	10	T1	1736.59 - 54904.34	Weight	24.57 - 1029.94	0.336	0.336	Normal (1.0000, 0.3361)	Normal (1.0000, 0.3361)	Normal (1.0000, 0.3361)
NR Cost per lb, All	37	NR	15.84 - 128858.54	Weight	24.57 - 1029.94	1.124	1.109	Beta (0.0000, 7.2979, 0.5652, 3.5598)	Beta (0.0000, 12.2883, 0.5652, 3.5598)	Beta (, , 0.5652, 3.5598)
T1 Cost per lb, All	39	T1	1655.84 - 115002.37	Weight	24.57 - 1029.94	0.813	0.912	Lognormal (1.0000, 0.9117)	Lognormal (1.3532, 1.2338)	Lognormal (2.4781, 2.2594)
NR Cost, New Design Commsats	16		-		-	0.675	0.663	Beta (0.2999, 2.4669, 0.4326, 0.9065)	Beta (0.3798, 3.1234, 0.4326, 0.9065)	Beta (, , 0.4326, 0.9065)
NR Cost, Existing Design Commsats	21		-		-	1.042	1.051	Beta (0.0038, 3.5613, 0.3669, 0.9432)	Beta (0.0066, 6.1337, 0.3669, 0.9432)	Beta (, , 0.3669, 0.9432)
T1 Cost, Govt, All	29		-		-	0.919	1.012	Lognormal (1.0000, 1.0123)	Lognormal (1.4229, 1.4405)	Lognormal (2.8811, 2.9166)
T1 Cost, Commer, All	10		-		-	0.616	0.651	Lognormal (1.0000, 0.6514)	Lognormal (1.1935, 0.7775)	Lognormal (1.6999, 1.1074)
Recurring Cost, Govt	29		-		-	0.767	0.700	Triangular (0.0000, 0.0209, 2.9791)	Triangular (0.0000, 0.0237, 3.3856)	Triangular (0.0000, 1.0000, 142.8305)
Recurring Cost, Commer	10		-		-	0.898	0.898	Lognormal (1.0000, 0.8982)	Lognormal (1.3442, 1.2073)	Lognormal (2.4285, 2.1813)
NR Cost, All	38		-		-	1.296	1.319	Beta (0.0006, 5.2000, 0.2715, 1.1409)	Beta (0.0019, 15.1754, 0.2715, 1.1409)	Beta (, , 0.2715, 1.1409)
T1 Cost, All	39		-		-	0.859	0.922	Lognormal (1.0000, 0.9217)	Lognormal (1.3600, 1.2534)	Lognormal (2.5152, 2.3182)
Recurring Cost, All	39		-		-	0.843	0.699	Triangular (0.0000, 0.0234, 2.9766)	Triangular (0.0000, 0.0265, 3.3821)	Triangular (0.0000, 1.0000, 127.4457)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals	14		-		-	0.603	0.556	Triangular (0.0502, 0.3884, 2.5614)	Triangular (0.0551, 0.4265, 2.8127)	Triangular (0.1292, 1.0000, 6.5951)
Weight, T1 CER Residuals, Govt	26		-		-	0.730	0.674	Triangular (0.0000, 0.0950, 2.9050)	Triangular (0.0000, 0.1074, 3.2821)	Triangular (0.0000, 1.0000, 30.5689)
Weight, T1 CER Residuals, Commer	10		-		-	0.458	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Cost Driver Metrics from Entire Dataset										
Weight, All	39		-		-	0.703	0.677	Triangular (0.0096, 0.0755, 2.9149)	Triangular (0.0108, 0.0854, 3.2975)	Triangular (0.1269, 1.0000, 38.6157)

Figure 4.2-25. 1.3.1.2 Communication Payload RF AnalogElectronics

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	16	NR	471.67 - 19175.42	Weight	4.63 - 264	0.832	0.844	Beta (0.1431, 3.0005, 0.4212, 0.9834)	Beta (0.2019, 4.2356, 0.4212, 0.9834)	Beta (, , 0.4212, 0.9834)
NR Cost per lb	16	NR	471.67 - 19175.42	Weight	4.63 - 264	0.832	0.844	Beta (0.1431, 3.0001, 0.4211, 0.9829)	Beta (0.2020, 4.2352, 0.4211, 0.9829)	Beta (, , 0.4211, 0.9829)
NR Cost	16		-		-	0.951	1.013	Lognormal (1.0000, 1.0133)	Lognormal (1.4237, 1.4426)	Lognormal (2.8855, 2.9240)
T1 CER Residuals for RF Plumbing Suite Wei	32	T1	338.59 - 10706	Weight	4.88 - 332.62	0.518	0.510	Triangular (0.0148, 0.5793, 2.4059)	Triangular (0.0159, 0.6240, 2.5917)	Triangular (0.0255, 1.0000, 4.1533)
T1 Cost per RF Plumbing Suite lb	32	T1	338.59 - 10706	Weight	4.88 - 332.62	1.118	1.559	Lognormal (1.0000, 1.5591)	Lognormal (1.8522, 2.8878)	Lognormal (6.3544, 9.9071)
T1 Cost per Payload lb	32	T1	338.59 - 10706	Comm Payload Wt	126.84 - 3626.58	0.656	0.640	Triangular (0.0326, 0.1580, 2.8094)	Triangular (0.0366, 0.1773, 3.1532)	Triangular (0.2065, 1.0000, 17.7854)
T1 Cost	32		-		-	0.646	0.616	Beta (0.0732, 2.3145, 0.9149, 1.2975)	Beta (0.0784, 2.4788, 0.9149, 1.2975)	Beta (, , 0.9149, 1.2975)
Metrics from Entire Dataset			-		-					
NR Cost per lb, New Design	17	NR	471.67 - 19175.42	Weight	4.63 - 264	0.888	0.905	Beta (0.0450, 3.3535, 0.5029, 1.2393)	Beta (0.0633, 4.7176, 0.5029, 1.2393)	Beta (, , 0.5029, 1.2393)
NR Cost per lb, Modified Design	8	NR	2.38 - 259.03	Weight	6.86 - 332.62	0.962	1.148	Lognormal (1.0000, 1.1477)	Lognormal (1.5223, 1.7472)	Lognormal (3.5276, 4.0487)
NR to T1 Ratio, New Design	17	NR	471.67 - 19175.42	T1	439.27 - 7629.25	1.149	1.557	Lognormal (1.0000, 1.5567)	Lognormal (1.8503, 2.8804)	Lognormal (6.3343, 9.8609)
NR to T1 Ratio, Modified Design	10	NR	2.38 - 1063.32	T1	338.59 - 9153.97	1.496	1.700	Beta (0.0229, 5.4886, 0.0927, 0.4258)	Beta (0.4875, 117.0738, 0.0927, 0.4258)	Beta (, , 0.0927, 0.4258)
T1 Cost per RF Plumbing Suite lb, Govt	27	T1	338.59 - 10706	Weight	2.64 - 264	1.040	1.329	Lognormal (1.0000, 1.3293)	Lognormal (1.6634, 2.2111)	Lognormal (4.6025, 6.1180)
T1 Cost per RF Plumbing Suite lb, Commer	9	T1	16.24 - 8221.08	Weight	2.37 - 332.62	1.185	1.007	Lognormal (1.0000, 1.0070)	Lognormal (1.4191, 1.4290)	Lognormal (2.8581, 2.8780)
T1 Cost per Payload lb, Govt	27	T1	338.59 - 10706	Comm Payload Wt	29.53 - 3626.58	0.884	0.960	Lognormal (1.0000, 0.9603)	Lognormal (1.3864, 1.3313)	Lognormal (2.6648, 2.5589)
T1 Cost per Payload lb, Commer	9	T1	16.24 - 8221.08	Comm Payload Wt	51.44 - 2199.91	0.527	0.479	Beta (0.0000, 1.6158, 1.0452, 0.6437)	Beta (0.0000, 1.4860, 1.0452, 0.6437)	Beta (, , 1.0452, 0.6437)
NR Cost per lb, All	30	NR	2.38 - 19175.42	Weight	2.37 - 332.62	1.426	1.433	Beta (0.0004, 5.5363, 0.2183, 0.9905)	Beta (0.0016, 23.3791, 0.2183, 0.9905)	Beta (, , 0.2183, 0.9905)
T1 Cost per RF Plumbing Suite lb, All	36	T1	16.24 - 10706	Weight	2.37 - 332.62	1.087	1.333	Lognormal (1.0000, 1.3327)	Lognormal (1.6662, 2.2205)	Lognormal (4.6254, 6.1643)
T1 Cost per Payload lb, All	36	T1	16.24 - 10706	Comm Payload Wt	29.53 - 3626.58	0.780	0.775	Lognormal (1.0000, 0.7754)	Lognormal (1.2654, 0.9813)	Lognormal (2.0264, 1.5713)
NR Cost, New Design	17		-		-	0.998	1.063	Lognormal (1.0000, 1.0628)	Lognormal (1.4593, 1.5509)	Lognormal (3.1075, 3.3025)
NR Cost, Modified Design	9		-		-	0.875	0.699	Triangular (0.0000, 0.0217, 2.9783)	Triangular (0.0000, 0.0247, 3.3843)	Triangular (0.0000, 1.0000, 136.9624)
T1 Cost, Govt	27		-		-	0.845	0.825	Beta (0.0906, 2.8650, 0.4888, 1.0025)	Beta (0.1191, 3.7659, 0.4888, 1.0025)	Beta (, , 0.4888, 1.0025)
T1 Cost, Commer	9		-		-	0.452	0.421	Normal (1.0000, 0.4214)	Normal (1.0000, 0.4214)	Normal (1.0000, 0.4214)
Recurring Cost, Govt	27		-		-	0.970	1.037	Lognormal (1.0000, 1.0369)	Lognormal (1.4405, 1.4937)	Lognormal (2.9893, 3.0996)
Recurring Cost, Commer	9		-		-	0.693	0.775	Lognormal (1.0000, 0.7750)	Lognormal (1.2651, 0.9805)	Lognormal (2.0250, 1.5693)
NR Cost, All	31		-		-	1.470	1.441	Beta (0.0008, 6.1485, 0.2400, 1.2365)	Beta (0.0030, 23.7497, 0.2400, 1.2365)	Beta (, , 0.2400, 1.2365)
T1 Cost, All	36		-		-	0.735	0.706	Triangular (0.0000, 0.0039, 2.9961)	Triangular (0.0000, 0.0044, 3.4081)	Triangular (0.0000, 1.0000, 766.7500)
Recurring Cost, All	36		-		-	0.942	0.998	Lognormal (1.0000, 0.9981)	Lognormal (1.4129, 1.4102)	Lognormal (2.8205, 2.8152)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals	16		-		-	0.879	0.854	Beta (0.0501, 3.2780, 0.5791, 1.3887)	Beta (0.0662, 4.3247, 0.5791, 1.3887)	Beta (, , 0.5791, 1.3887)
RF Plumbing Suite Weight, T1 CER Residual	32		-		-	0.733	0.695	Triangular (0.0000, 0.0353, 2.9647)	Triangular (0.0000, 0.0401, 3.3647)	Triangular (0.0000, 1.0000, 83.9649)
Payload Weight, T1 CER Residuals	32		-		-	0.810	0.812	Beta (0.1117, 3.1938, 0.5643, 1.3937)	Beta (0.1469, 4.2010, 0.5643, 1.3937)	Beta (, , 0.5643, 1.3937)
Cost Driver Metrics from Entire Dataset										
RF Plumbing Suite Weight, All	36		-		-	0.821	0.802	Beta (0.0000, 2.7874, 0.6385, 1.1413)	Beta (0.0000, 3.3468, 0.6385, 1.1413)	Beta (, , 0.6385, 1.1413)
Payload Weight, All	36		-		-	0.896	0.900	Beta (0.0288, 3.5375, 0.5647, 1.4755)	Beta (0.0397, 4.8700, 0.5647, 1.4755)	Beta (, , 0.5647, 1.4755)

Figure 4.2-26. 1.3.1.2.1 Communication Payload RF Plumbing

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	36	NR	26.77 - 4411.9	T1	0 - 1802.7	0.642	0.643	Lognormal (1.0000, 0.6434)	Lognormal (1.1891, 0.7651)	Lognormal (1.6814, 1.0819)
NR Cost per lb	36	NR	26.77 - 4411.9	Weight	1.25 - 15.31	0.885	0.909	Beta (0.0257, 3.0685, 0.4602, 0.9771)	Beta (0.0358, 4.2715, 0.4602, 0.9771)	Beta (, , 0.4602, 0.9771)
NR Cost	36					0.936	0.924	Beta (0.0198, 3.2604, 0.4817, 1.1107)	Beta (0.0280, 4.6083, 0.4817, 1.1107)	Beta (, , 0.4817, 1.1107)
T1 CER Residuals	53	T1	55.95 - 2553.46	Weight	1.25 - 20.83	0.580	0.588	Lognormal (1.0000, 0.5882)	Lognormal (1.1602, 0.6824)	Lognormal (1.5616, 0.9186)
T1 Cost per lb	53	T1	55.95 - 2553.46	Weight	1.25 - 20.83	0.580	0.588	Lognormal (1.0000, 0.5882)	Lognormal (1.1602, 0.6824)	Lognormal (1.5616, 0.9186)
T1 Cost	53					0.976	0.997	Lognormal (1.0000, 0.9971)	Lognormal (1.4121, 1.4080)	Lognormal (2.8160, 2.8078)
Metrics from Entire Dataset										
NR Cost per lb, New Govt	21	NR	578.11 - 38168.51	Weight	0.52 - 84.4	0.905	0.906	Lognormal (1.0000, 0.9064)	Lognormal (1.3497, 1.2234)	Lognormal (2.4586, 2.2286)
NR Cost per lb, New Commerical	5	NR	885.25 - 2087.09	Weight	3.05 - 10.67	0.353	0.353	Normal (1.0000, 0.3528)	Normal (1.0000, 0.3528)	Normal (1.0000, 0.3528)
NR to T1 Ratio, New Govt	21	NR	578.11 - 38168.51	T1	141.31 - 22661.89	0.749	0.679	Triangular (0.0000, 0.0805, 2.9195)	Triangular (0.0000, 0.0911, 3.3035)	Triangular (0.0000, 1.0000, 36.2552)
NR to T1 Ratio, New Commerical	5	NR	885.25 - 2087.09	T1	229.35 - 1076.71	0.459	0.497	Lognormal (1.0000, 0.4975)	Lognormal (1.1169, 0.5556)	Lognormal (1.3933, 0.6931)
NR Cost per lb, All	56	NR	1.24 - 38168.51	Weight	0.52 - 84.4	1.964	1.357	Beta (0.0010, 10.4204, 0.3944, 3.7193)	Beta (0.0023, 24.7824, 0.3944, 3.7193)	Beta (, , 0.3944, 3.7193)
T1 Cost per lb, All	72	T1	0 - 22661.89	Weight	0.52 - 84.4	0.936	1.000	Lognormal (1.0000, 1.0002)	Lognormal (1.4144, 1.4147)	Lognormal (2.8293, 2.8299)
NR Cost, New Govt	22					1.371	1.860	Lognormal (1.0000, 1.8603)	Lognormal (2.1120, 3.9289)	Lognormal (9.4207, 17.5249)
NR Cost, New Commerical	5					0.325	0.341	Lognormal (1.0000, 0.3405)	Lognormal (1.0564, 0.3597)	Lognormal (1.1789, 0.4014)
NR Cost, All	54					1.817	1.307	Beta (0.0005, 8.6736, 0.4022, 3.0883)	Beta (0.0012, 19.5547, 0.4022, 3.0883)	Beta (, , 0.4022, 3.0883)
T1 Cost, All	72					2.448	2.261	Lognormal (1.0000, 2.2606)	Lognormal (2.4719, 5.5880)	Lognormal (15.1040, 34.1441)
Recurring Cost, All										
Cost Driver Metrics from CER Datasets										
Weight, T1 CER Residuals	53					0.771	0.798	Lognormal (1.0000, 0.7980)	Lognormal (1.2794, 1.0209)	Lognormal (2.0940, 1.6710)
Cost Driver Metrics from Entire Dataset										
Weight, All	70					1.001	0.844	Lognormal (1.0000, 0.8438)	Lognormal (1.3085, 1.1041)	Lognormal (2.2402, 1.8904)

Figure 4.2-27. 1.3.1.2.2 Communication Payload Receivers and Downconverters

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	11	NR	331.29 - 4027.41	Weight	0.31 - 14.41	0.648	0.624	Triangular (0.0190, 0.2195, 2.7615)	Triangular (0.0212, 0.2454, 3.0872)	Triangular (0.0864, 1.0000, 12.5802)
NR Cost per Lb, CER Datapoints, All	11	NR	331.29 - 4027.41	Weight	0.31 - 14.41	1.352	2.394	Lognormal (1.0000, 2.3939)	Lognormal (2.5943, 6.2105)	Lognormal (17.4614, 41.8001)
NR Typical Cost, CER Datapoints, All	11					0.648	0.624	Triangular (0.0189, 0.2196, 2.7615)	Triangular (0.0212, 0.2455, 3.0872)	Triangular (0.0862, 1.0000, 12.5764)
T1 CER, All	9	T1	99.94 - 1448.28	Weight	0.27 - 5.97	0.609	0.661	Lognormal (1.0000, 0.6613)	Lognormal (1.1989, 0.7929)	Lognormal (1.7232, 1.1396)
T1 Cost per Lb, CER Datapoints, All	9	T1	99.94 - 1448.28	Weight	0.27 - 5.97	0.766	0.886	Lognormal (1.0000, 0.8862)	Lognormal (1.3362, 1.1841)	Lognormal (2.3854, 2.1139)
T1 Typical Cost, CER Datapoints, All	9					0.914	1.082	Lognormal (1.0000, 1.0817)	Lognormal (1.4731, 1.5935)	Lognormal (3.1969, 3.4582)
Metrics from Entire Dataset										
NR to T1 Ratio, New	13	NR	45.67 - 11277.09	T1	30.97 - 1448.28	0.453	0.354	Triangular (0.0000, 1.4782, 1.5218)	Triangular (0.0000, 1.3938, 1.4350)	Triangular (0.0000, 1.0000, 1.0295)
NR_T1,Govt v=govt	14	NR	1.18 - 11277.09	T1	30.97 - 3110.82	0.655	0.616	Beta (0.0000, 1.8315, 0.6507, 0.5410)	Beta (0.0000, 1.7338, 0.6507, 0.5410)	Beta (, , 0.6507, 0.5410)
NR Cost per Lb, New	13	NR	45.67 - 8764.18	Weight	0.31 - 14.41	1.310	1.936	Lognormal (1.0000, 1.9358)	Lognormal (2.1788, 4.2178)	Lognormal (10.3435, 20.0229)
NR Cost per Lb, Government	13	NR	1.18 - 8764.18	Weight	0.85 - 16.32	1.145	1.159	Beta (0.0004, 3.5797, 0.2573, 0.6640)	Beta (0.0008, 8.3316, 0.2573, 0.6640)	Beta (, , 0.2573, 0.6640)
T1 Cost per Lb, New	15	T1	23.31 - 1448.28	Weight	0.27 - 14.41	1.784	5.226	Lognormal (1.0000, 5.2258)	Lognormal (5.3206, 27.8047)	Lognormal (150.6227, 787.1265)
T1 Cost per Lb, Government	16	T1	30.97 - 3110.82	Weight	0.27 - 16.32	1.732	4.694	Lognormal (1.0000, 4.6938)	Lognormal (4.7991, 22.5261)	Lognormal (110.5318, 518.8129)
NR to T1 Ratio, All	15	NR	1.18 - 11277.09	T1	30.97 - 3110.82	0.623	0.585	Beta (0.0000, 1.7714, 0.7093, 0.5472)	Beta (0.0000, 1.6508, 0.7093, 0.5472)	Beta (, , 0.7093, 0.5472)
NR Cost per Lb, All	15	NR	1.18 - 8764.18	Weight	0.31 - 16.32	1.447	2.176	Lognormal (1.0000, 2.1762)	Lognormal (2.3949, 5.2118)	Lognormal (13.7367, 29.8935)
T1 Cost per Lb, All	17	T1	23.31 - 3110.82	Weight	0.27 - 16.32	1.033	1.175	Lognormal (1.0000, 1.1746)	Lognormal (1.5426, 1.8119)	Lognormal (3.6709, 4.3118)
NR Typical Cost, New	15					1.337	1.857	Lognormal (1.0000, 1.8572)	Lognormal (2.1093, 3.9173)	Lognormal (9.3844, 17.4284)
NR Typical Cost, Government	15					1.365	1.884	Lognormal (1.0000, 1.8836)	Lognormal (2.1326, 4.0170)	Lognormal (9.6992, 18.2696)
Recurring Typical Cost, New	15					1.464	2.188	Lognormal (1.0000, 2.1881)	Lognormal (2.4057, 5.2639)	Lognormal (13.9234, 30.4651)
Recurring Typical Cost, Government	16					1.379	1.880	Lognormal (1.0000, 1.8797)	Lognormal (2.1292, 4.0022)	Lognormal (9.6521, 18.1431)
T1 Typical Cost, New	15					1.131	1.176	Lognormal (1.0000, 1.1764)	Lognormal (1.5440, 1.8164)	Lognormal (3.6808, 4.3302)
T1 Typical Cost, Government	16					1.283	1.749	Lognormal (1.0000, 1.7487)	Lognormal (2.0145, 3.5228)	Lognormal (8.1748, 14.2956)
NR Typical Cost, All	17					1.431	2.018	Lognormal (1.0000, 2.0178)	Lognormal (2.2520, 4.5440)	Lognormal (11.4207, 23.0443)
Recurring Typical Cost, All	18					1.468	2.036	Lognormal (1.0000, 2.0364)	Lognormal (2.2687, 4.6200)	Lognormal (11.6770, 23.7793)
T1 Typical Cost, All	18					1.389	1.912	Lognormal (1.0000, 1.9122)	Lognormal (2.1579, 4.1262)	Lognormal (10.0480, 19.2135)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints	11					0.983	1.112	Lognormal (1.0000, 1.1124)	Lognormal (1.4958, 1.6640)	Lognormal (3.3469, 3.7232)
Weight, T1 CER Datapoints	9					0.628	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Cost Driver Metrics from Entire Dataset										
Weight, All	17					0.894	0.929	Lognormal (1.0000, 0.9293)	Lognormal (1.3651, 1.2686)	Lognormal (2.5440, 2.3641)

Figure 4.2-28. 1.3.1.2.2.1 Communication Payload Low Noise Amplifier

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER	22	NR	546.97 - 10081.69	Weight	1.63 - 19.66	0.785	0.779	Beta (0.1540, 3.5102, 0.6308, 1.8717)	Beta (0.2005, 4.5706, 0.6308, 1.8717)	Beta (, , 0.6308, 1.8717)
NR Cost per Lb, NR CER Datapoints, All	22	NR	546.97 - 10081.69	Weight	1.63 - 19.66	0.800	0.826	Lognormal (1.0000, 0.8257)	Lognormal (1.2968, 1.0708)	Lognormal (2.1810, 1.8009)
NR Typical Cost, NR CER Datapoints, All	22					0.785	0.776	Beta (0.1570, 2.8930, 0.5091, 1.1432)	Beta (0.2043, 3.7653, 0.5091, 1.1432)	Beta (, , 0.5091, 1.1432)
T1 CER	58	T1	65.48 - 1457.19	Weight	1.2 - 12.65	0.589	0.614	Lognormal (1.0000, 0.6143)	Lognormal (1.1736, 0.7210)	Lognormal (1.6166, 0.9931)
T1 Cost per Lb, T1 CER Datapoints, All	58	T1	65.48 - 1457.19	Weight	1.2 - 12.65	0.587	0.612	Lognormal (1.0000, 0.6116)	Lognormal (1.1722, 0.7168)	Lognormal (1.6106, 0.9849)
T1 Typical Cost, T1 CER Datapoints, All	58					0.817	0.852	Lognormal (1.0000, 0.8524)	Lognormal (1.3140, 1.1200)	Lognormal (2.2687, 1.9338)
Metrics from Entire Dataset										
NR to T1 Ratio, New System	39	NR	105.59 - 10081.69	T1	14.78 - 1457.19	1.102	1.107	Beta (0.0443, 8.2739, 0.5427, 4.1303)	Beta (0.0760, 14.1996, 0.5427, 4.1303)	Beta (, , 0.5427, 4.1303)
NR to T1 Ratio, Existing System	13	NR	0.29 - 465.38	T1	26.81 - 1289.64	1.359	2.089	Lognormal (1.0000, 2.0886)	Lognormal (2.3156, 4.8364)	Lognormal (12.4170, 25.9341)
NR to T1 Ratio, Government	47	NR	0.29 - 10081.69	T1	14.78 - 1457.19	1.365	1.393	Beta (0.0003, 9.5099, 0.3558, 3.0283)	Beta (0.0007, 24.8730, 0.3558, 3.0283)	Beta (, , 0.3558, 3.0283)
NR to T1 Ratio, Commercial	8	NR	36.46 - 9134.43	T1	116.73 - 1008.92	1.513	2.847	Lognormal (1.0000, 2.8466)	Lognormal (3.0171, 8.5885)	Lognormal (27.4650, 78.1814)
NR Cost per Lb, New System	42	NR	105.59 - 10081.69	Weight	0.48 - 19.66	1.001	1.004	Beta (0.0465, 7.1418, 0.6460, 4.1612)	Beta (0.0710, 10.9059, 0.6460, 4.1612)	Beta (, , 0.6460, 4.1612)
NR Cost per Lb, Existing System	13	NR	0.29 - 465.38	Weight	2.1 - 9.5	1.044	0.998	Beta (0.0000, 3.6222, 0.4511, 1.1829)	Beta (0.0000, 5.5894, 0.4511, 1.1829)	Beta (, , 0.4511, 1.1829)
NR Cost per Lb, Government	50	NR	0.29 - 10081.69	Weight	0.48 - 19.66	1.243	1.246	Beta (0.0003, 10.4465, 0.4867, 4.5996)	Beta (0.0007, 20.6071, 0.4867, 4.5996)	Beta (, , 0.4867, 4.5996)
NR Cost per Lb, Commercial	8	NR	36.46 - 9134.43	Weight	2.78 - 10.88	1.709	5.028	Lognormal (1.0000, 5.0277)	Lognormal (5.1261, 25.7725)	Lognormal (134.7016, 677.2342)
T1 Cost per Lb, Government	55	T1	0.5 - 1457.19	Weight	0.48 - 19.67	0.770	0.766	Lognormal (1.0000, 0.7658)	Lognormal (1.2595, 0.9646)	Lognormal (1.9982, 1.5302)
T1 Cost per Lb, Commercial	14	T1	116.73 - 1008.92	Weight	2.33 - 10.88	0.380	0.361	Triangular (0.0001, 1.3220, 1.6779)	Triangular (0.0001, 1.2561, 1.5942)	Triangular (0.0001, 1.0000, 1.2692)
NR Cost per Lb, All	58	NR	0.29 - 10081.69	Weight	0.48 - 19.66	1.285	1.291	Beta (0.0004, 8.4207, 0.4094, 3.0389)	Beta (0.0008, 18.5638, 0.4094, 3.0389)	Beta (, , 0.4094, 3.0389)
T1 Cost per Lb, All	69	T1	0.5 - 1457.19	Weight	0.48 - 19.67	0.715	0.714	Lognormal (1.0000, 0.7136)	Lognormal (1.2285, 0.8766)	Lognormal (1.8540, 1.3230)
NR Typical Cost, New System	42					1.118	1.143	Beta (0.0494, 4.7149, 0.3467, 1.3547)	Beta (0.1010, 9.6430, 0.3467, 1.3547)	Beta (, , 0.3467, 1.3547)
NR Typical Cost, Existing System	13					1.231	1.233	Beta (0.0025, 8.2801, 0.4553, 3.3228)	Beta (0.0051, 16.5709, 0.4553, 3.3228)	Beta (, , 0.4553, 3.3228)
NR Typical Cost, Government	51					1.363	1.413	Beta (0.0002, 6.5926, 0.2729, 1.5265)	Beta (0.0006, 21.6466, 0.2729, 1.5265)	Beta (, , 0.2729, 1.5265)
NR Typical Cost, Commercial	8					1.706	4.972	Lognormal (1.0000, 4.9719)	Lognormal (5.0715, 25.2148)	Lognormal (130.4368, 648.5181)
Recurring Typical Cost, Government	55					1.317	1.465	Lognormal (1.0000, 1.4649)	Lognormal (1.7737, 2.5983)	Lognormal (5.5799, 8.1740)
Recurring Typical Cost, Commercial	12					0.742	0.902	Lognormal (1.0000, 0.9016)	Lognormal (1.3464, 1.2140)	Lognormal (2.4410, 2.2009)
T1 Typical Cost, Government	55					0.905	0.920	Lognormal (1.0000, 0.9196)	Lognormal (1.3586, 1.2494)	Lognormal (2.5075, 2.3060)
T1 Typical Cost, Commercial	14					0.755	0.947	Lognormal (1.0000, 0.9470)	Lognormal (1.3772, 1.3042)	Lognormal (2.6123, 2.4737)
NR Typical Cost, All	58					1.364	1.407	Beta (0.0002, 6.4094, 0.2700, 1.4609)	Beta (0.0007, 21.0701, 0.2700, 1.4609)	Beta (, , 0.2700, 1.4609)
Recurring Typical Cost, All	69					1.379	1.467	Lognormal (1.0000, 1.4671)	Lognormal (1.7755, 2.6047)	Lognormal (5.5967, 8.2106)
T1 Typical Cost, All	69					0.875	0.896	Lognormal (1.0000, 0.8956)	Lognormal (1.3424, 1.2023)	Lognormal (2.4191, 2.1666)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, All	22					0.657	0.735	Lognormal (1.0000, 0.7350)	Lognormal (1.2410, 0.9121)	Lognormal (1.9114, 1.4048)
Weight, T1 CER Datapoints, All	58					0.534	0.536	Lognormal (1.0000, 0.5359)	Lognormal (1.1345, 0.6080)	Lognormal (1.4603, 0.7825)
Cost Driver Metrics from Entire Dataset										
Weight, All	71					0.707	0.735	Lognormal (1.0000, 0.7353)	Lognormal (1.2412, 0.9127)	Lognormal (1.9123, 1.4061)

Figure 4.2-29. 1.3.1.2.3 Communication Payload Transmitters and Upconverters

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	20	NR	859.96 - 10646.41	Weight	2.16 - 20.5	0.390	0.370	Triangular (0.1880, 0.8345, 1.9775)	Triangular (0.1945, 0.8634, 2.0460)	Triangular (0.2253, 1.0000, 2.3697)
NR Cost per lb	20	NR	859.96 - 10646.41	Weight	2.16 - 20.5	0.390	0.370	Triangular (0.1881, 0.8345, 1.9775)	Triangular (0.1946, 0.8634, 2.0460)	Triangular (0.2254, 1.0000, 2.3698)
NR Cost	20		-		-	0.581	0.600	Lognormal (1.0000, 0.6002)	Lognormal (1.1663, 0.6999)	Lognormal (1.5863, 0.9520)
T1 CER Residuals for Govt or Commer	27	T1	207.1 - 2433.24	Weight	2.16 - 20.5	0.483	0.473	Triangular (0.0762, 0.6245, 2.2993)	Triangular (0.0815, 0.6679, 2.4595)	Triangular (0.1221, 1.0000, 3.6821)
T1 Cost per lb, Govt	16	T1	256.89 - 2433.24	Weight	2.16 - 20.5	0.750	0.871	Lognormal (1.0000, 0.8714)	Lognormal (1.3264, 1.1559)	Lognormal (2.3337, 2.0336)
T1 Cost per lb, Commer	11	T1	207.1 - 944.61	Weight	5.72 - 9.8	0.353	0.343	Normal (1.0000, 0.3429)	Normal (1.0000, 0.3429)	Normal (1.0000, 0.3429)
T1 Cost, Govt	16		-		-	0.660	0.619	Triangular (0.0000, 0.2544, 2.7456)	Triangular (0.0000, 0.2835, 3.0602)	Triangular (0.0000, 1.0000, 10.7940)
T1 Cost, Commer	11		-		-	0.380	0.371	Triangular (0.0352, 1.1267, 1.8381)	Triangular (0.0343, 1.0969, 1.7896)	Triangular (0.0312, 1.0000, 1.6315)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	23	NR	446.57 - 22058.45	Weight	2.16 - 20.5	0.637	0.651	Lognormal (1.0000, 0.6509)	Lognormal (1.1932, 0.7767)	Lognormal (1.6988, 1.1058)
NR Cost per lb, Govt, All (Orig)	24	NR	1.1 - 22058.45	Weight	2.16 - 20.5	1.025	0.953	Lognormal (1.0000, 0.9527)	Lognormal (1.3812, 1.3159)	Lognormal (2.6349, 2.5104)
NR Cost per lb, Commer, All	11	NR	306.18 - 3884.85	Weight	5.72 - 9.8	0.635	0.595	Triangular (0.0000, 0.3263, 2.6737)	Triangular (0.0000, 0.3617, 2.9634)	Triangular (0.0000, 1.0000, 8.1934)
NR to T1 Ratio, New Design, All	23	NR	446.57 - 22058.45	T1	76.31 - 2433.24	0.770	0.787	Lognormal (1.0000, 0.7873)	Lognormal (1.2727, 1.0021)	Lognormal (2.0617, 1.6232)
NR to T1 Ratio, Govt, All	24	NR	1.1 - 22058.45	T1	143.7 - 2433.24	0.999	0.707	Triangular (0.0000, 0.0009, 2.9991)	Triangular (0.0000, 0.0010, 3.4112)	Triangular (0.0000, 1.0000, 3489.9397)
NR to T1 Ratio, Commercial, All	11	NR	306.18 - 3884.85	T1	76.31 - 944.61	1.335	1.389	Lognormal (1.0000, 1.3888)	Lognormal (1.7113, 2.3766)	Lognormal (5.0119, 6.9604)
T1 Cost per lb, Govt, All	26	T1	143.7 - 4956.56	Weight	2.16 - 20.5	0.877	0.971	Lognormal (1.0000, 0.9712)	Lognormal (1.3940, 1.3538)	Lognormal (2.7087, 2.6306)
T1 Cost per lb, Commer, All	12	T1	76.31 - 944.61	Weight	5.72 - 9.8	0.452	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Cost per lb, All	35	NR	1.1 - 22058.45	Weight	2.16 - 20.5	1.018	0.971	Lognormal (1.0000, 0.9713)	Lognormal (1.3941, 1.3540)	Lognormal (2.7092, 2.6314)
T1 Cost per lb, All	38	T1	76.31 - 4956.56	Weight	2.16 - 20.5	0.872	0.975	Lognormal (1.0000, 0.9745)	Lognormal (1.3963, 1.3607)	Lognormal (2.7223, 2.6529)
NR Cost, New Design, All	22		-		-	0.663	0.667	Lognormal (1.0000, 0.6666)	Lognormal (1.2018, 0.8012)	Lognormal (1.7359, 1.1572)
NR Cost, Govt, All	23		-		-	1.091	1.009	Beta (0.0004, 3.5953, 0.4298, 1.1159)	Beta (0.0006, 5.6692, 0.4298, 1.1159)	Beta (, , 0.4298, 1.1159)
NR Cost, Commer, All	11		-		-	0.666	0.630	Triangular (0.0000, 0.2238, 2.7762)	Triangular (0.0000, 0.2503, 3.1057)	Triangular (0.0000, 1.0000, 12.4068)
T1 Cost, Govt, All	26		-		-	1.004	1.250	Lognormal (1.0000, 1.2502)	Lognormal (1.6010, 2.0016)	Lognormal (4.1034, 5.1301)
T1 Cost, Commer, All	12		-		-	0.476	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Recurring Cost, Govt	26		-		-	0.847	0.823	Lognormal (1.0000, 0.8225)	Lognormal (1.2948, 1.0651)	Lognormal (2.1709, 1.7856)
Recurring Cost, Commer	12		-		-	1.156	1.098	Lognormal (1.0000, 1.0982)	Lognormal (1.4853, 1.6312)	Lognormal (3.2767, 3.5986)
NR Cost, All	34		-		-	1.050	1.003	Beta (0.0004, 4.1069, 0.5085, 1.5804)	Beta (0.0006, 6.2956, 0.5085, 1.5804)	Beta (, , 0.5085, 1.5804)
T1 Cost, All	37		-		-	0.707	0.728	Lognormal (1.0000, 0.7276)	Lognormal (1.2367, 0.8998)	Lognormal (1.8914, 1.3761)
Recurring Cost, All	38		-		-	0.968	1.018	Lognormal (1.0000, 1.0176)	Lognormal (1.4267, 1.4518)	Lognormal (2.9041, 2.9552)
Cost Driver Metrics from CER Datasets										
Weight, NR CER	20		-		-	0.484	0.503	Lognormal (1.0000, 0.5034)	Lognormal (1.1196, 0.5636)	Lognormal (1.4032, 0.7064)
Weight, T1 CER, Govt	16		-		-	0.599	0.613	Lognormal (1.0000, 0.6131)	Lognormal (1.1730, 0.7191)	Lognormal (1.6139, 0.9894)
Weight, T1 CER , Commercial	11		-		-	0.152	0.153	Lognormal (1.0000, 0.1533)	Lognormal (1.0117, 0.1551)	Lognormal (1.0355, 0.1588)
Cost Driver Metrics from Entire Dataset			-		-					
Weight, All	38		-		-	0.464	0.478	Lognormal (1.0000, 0.4782)	Lognormal (1.1085, 0.5300)	Lognormal (1.3619, 0.6512)

Figure 4.2-30. 1.3.1.2.4.1 Communication Payload Travelling Wave Tube Assembly

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset			-		-	1.085				
NR CER Residuals	15	NR	157.13 - 7105.86	Weight	2.19 - 13.33	0.679	0.632	Triangular (0.0000, 0.2162, 2.7838)	Triangular (0.0000, 0.2421, 3.1161)	Triangular (0.0000, 1.0000, 12.8729)
NR Cost per lb	15	NR	157.13 - 7105.86	Weight	2.19 - 13.33	0.872	0.685	Triangular (0.0000, 0.0639, 2.9361)	Triangular (0.0000, 0.0724, 3.3263)	Triangular (0.0000, 1.0000, 45.9335)
NR Cost	15		-		-	0.679	0.632	Triangular (0.0000, 0.2162, 2.7838)	Triangular (0.0000, 0.2421, 3.1161)	Triangular (0.0000, 1.0000, 12.8729)
AUC CER Residuals	42	AUC	58.18 - 4044.73	Weight	1.73 - 23.04	0.729	0.659	Triangular (0.0000, 0.1370, 2.8630)	Triangular (0.0000, 0.1543, 3.2252)	Triangular (0.0000, 1.0000, 20.9051)
AUC Cost per lb	42	AUC	58.18 - 4044.73	Weight	1.73 - 23.04	1.127	1.193	Beta (0.1091, 4.2478, 0.2226, 0.8113)	Beta (0.3050, 11.8776, 0.2226, 0.8113)	Beta (, , 0.2226, 0.8113)
AUC Cost per Total Qty Produced Over All Flights	42	AUC	58.18 - 4044.73	Total Qty Produced Over All Flights	1 - 256	2.151	16.353	Lognormal (1.0000, 16.3529)	Lognormal (16.3834, 267.9165)	Lognormal (4397.5923, 71913.3392)
AUC Cost	42	REC	282.83 - 24618.12	Total Qty Produced Over All Flights	1 - 256	1.315	1.599	Lognormal (1.0000, 1.5993)	Lognormal (1.8862, 3.0166)	Lognormal (6.7108, 10.7326)
Metrics from Entire Dataset			-		-					
NR Cost per lb, New Design	23	NR	65.53 - 15479.54	Weight	2.19 - 22.1	1.550	2.227	Lognormal (1.0000, 2.2269)	Lognormal (2.4411, 5.4362)	Lognormal (14.5469, 32.3945)
NR Cost per lb, Modified Design	5	NR	64.56 - 404.99	Weight	1.92 - 23.04	0.463	0.428	Beta (0.0000, 1.4549, 1.0215, 0.4647)	Beta (0.0000, 1.2819, 1.0215, 0.4647)	Beta (, , 1.0215, 0.4647)
NR to T1 Ratio, New Design	22	NR	65.53 - 7105.86	T1	72.88 - 3101.3	1.107	1.185	Beta (0.1481, 4.2272, 0.1998, 0.7568)	Beta (0.4313, 12.3079, 0.1998, 0.7568)	Beta (, , 0.1998, 0.7568)
NR to T1 Ratio, Modified Design	5	NR	64.56 - 404.99	T1	331.91 - 921.63	0.932				
NR Cost per lb, All	34	NR	10.21 - 7105.86	Weight	1.73 - 23.04	1.605	1.663	Beta (0.0047, 6.3160, 0.1441, 0.7696)	Beta (0.0569, 75.7665, 0.1441, 0.7696)	Beta (, , 0.1441, 0.7696)
AUC Cost per lb, All	45	AUC	22.4 - 4044.73	Weight	1.73 - 23.04	1.171	1.054	Lognormal (1.0000, 1.0545)	Lognormal (1.4532, 1.5324)	Lognormal (3.0691, 3.2362)
AUC Cost per Total Qty Produced Over All Flights, All	43	AUC	22.4 - 4044.73	Total Qty Produced Over All Flights	1 - 256	2.286	2.414	Beta (0.0015, 12.0177, 0.0738, 0.8139)	Beta (0.5122, 4202.9904, 0.0738, 0.8139)	Beta (, , 0.0738, 0.8139)
NR Cost, New Design	23		-		-	1.112	1.203	Lognormal (1.0000, 1.2027)	Lognormal (1.5642, 1.8813)	Lognormal (3.8268, 4.6026)
NR Cost, Modified Design	5		-		-	0.876	0.828	Lognormal (1.0000, 0.8281)	Lognormal (1.2984, 1.0752)	Lognormal (2.1888, 1.8126)
Recurring Cost, Govt	39		-		-	0.996	0.962	Lognormal (1.0000, 0.9619)	Lognormal (1.3875, 1.3347)	Lognormal (2.6713, 2.5695)
Recurring Cost, Commer	6		-		-	0.912	0.699	Triangular (0.0000, 0.0224, 2.9776)	Triangular (0.0000, 0.0253, 3.3554)	Triangular (0.0000, 1.0000, 132.6732)
NR Cost, All	35		-		-	1.511	1.288	Beta (0.0050, 7.5065, 0.3851, 2.5181)	Beta (0.0112, 17.0062, 0.3851, 2.5181)	Beta (, , 0.3851, 2.5181)
AUC Cost, All	45	REC	224.04 - 24618.12	Total Qty Produced Over All Flights	1 - 256	1.363	1.285	Lognormal (1.0000, 1.2855)	Lognormal (1.6286, 2.0935)	Lognormal (4.3197, 5.5528)
Recurring Cost, All	45		-		-	1.027	1.028	Beta (0.0350, 3.8457, 0.4044, 1.1926)	Beta (0.0587, 6.4517, 0.4044, 1.1926)	Beta (, , 0.4044, 1.1926)
Cost Driver Metrics from CER Datasets			-		-					
Weight, NR CER	15		-		-	0.646	0.730	Lognormal (1.0000, 0.7304)	Lognormal (1.2383, 0.9044)	Lognormal (1.8989, 1.3869)
Weight, AUC CER	42		-		-	0.806	0.842	Lognormal (1.0000, 0.8419)	Lognormal (1.3072, 1.1006)	Lognormal (2.2339, 1.8808)
Total Qty Produced Over All Flights, AUC CER Residuals	42		-		-	1.765	2.574	Lognormal (1.0000, 2.5737)	Lognormal (2.7612, 7.1066)	Lognormal (21.0517, 54.1817)
Cost Driver Metrics from Entire Dataset			-		-					
Weight, All	45		-		-	0.815	0.843	Beta (0.2590, 5.0666, 0.4991, 2.7388)	Beta (0.3954, 7.7353, 0.4991, 2.7388)	Beta (, , 0.4991, 2.7388)
Total Qty Produced Over All Flights, All	45		-		-	1.776	2.622	Lognormal (1.0000, 2.6215)	Lognormal (2.8058, 7.3553)	Lognormal (22.0877, 57.9029)

Figure 4.2-31. 1.3.1.2.4.2 Communication Payload Solid State Power Amplifiers

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	15	NR	1545.99 - 10180.7	Weight	5.57 - 28.62	0.460	0.466	Lognormal (1.0000, 0.4660)	Lognormal (1.1032, 0.5141)	Lognormal (1.3428, 0.6257)
NR Cost per lb	15	NR	1545.99 - 10180.7	Weight	5.57 - 28.62	0.711	0.767	Lognormal (1.0000, 0.7665)	Lognormal (1.2600, 0.9658)	Lognormal (2.0002, 1.5332)
NR Cost	15		-		-	0.460	0.466	Lognormal (1.0000, 0.4660)	Lognormal (1.1032, 0.5141)	Lognormal (1.3428, 0.6257)
T1 CER Residuals	29	T1	432.7 - 4499.78	Weight	6.12 - 54.67	0.390	0.387	Lognormal (1.0000, 0.3867)	Lognormal (1.0722, 0.4146)	Lognormal (1.2325, 0.4766)
T1 Cost per lb, TT&C Transponder	26	T1	432.7 - 4499.78	Weight	6.12 - 54.67	0.468	0.453	Triangular (0.3433, 0.3761, 2.2806)	Triangular (0.3721, 0.4076, 2.4719)	Triangular (0.9130, 1.0000, 6.0642)
T1 Cost, TT&C Transponder	26		-		-	0.784	0.882	Lognormal (1.0000, 0.8821)	Lognormal (1.3334, 1.1762)	Lognormal (2.3709, 2.0912)
Metrics from Entire Dataset										
NR Cost per lb, New Design	18	NR	1545.99 - 16128.74	Weight	5.57 - 54.67	0.735	0.750	Lognormal (1.0000, 0.7504)	Lognormal (1.2503, 0.9382)	Lognormal (1.9543, 1.4666)
NR Cost per lb, Modified Design	5	NR	276.62 - 2353.19	Weight	7.1 - 25.1	1.157	1.125	Lognormal (1.0000, 1.1253)	Lognormal (1.5055, 1.6941)	Lognormal (3.4119, 3.8396)
NR to T1 Ratio, New Design	18	NR	1545.99 - 16128.74	T1	432.7 - 4499.78	0.970	1.093	Lognormal (1.0000, 1.0932)	Lognormal (1.4816, 1.6196)	Lognormal (3.2520, 3.5550)
NR to T1 Ratio, Modified Design	5	NR	276.62 - 2353.19	T1	446.33 - 2324.81	0.799	1.011	Lognormal (1.0000, 1.0107)	Lognormal (1.4218, 1.4370)	Lognormal (2.8742, 2.9050)
T1 Cost per lb, TT&C Transponder, All	30	T1	432.7 - 4499.78	Weight	5.57 - 54.67	0.461	0.449	Triangular (0.2525, 0.4851, 2.2624)	Triangular (0.2727, 0.5238, 2.4428)	Triangular (0.5206, 1.0000, 4.6638)
NR Cost per lb, All	27	NR	10.37 - 16128.74	Weight	5.57 - 54.67	1.053	1.039	Beta (0.0038, 3.9206, 0.4311, 1.2638)	Beta (0.0062, 6.4497, 0.4311, 1.2638)	Beta (, , 0.4311, 1.2638)
T1 Cost per lb, All	33	T1	432.7 - 4499.78	Weight	5.57 - 54.67	0.469	0.463	Triangular (0.3347, 0.3549, 2.3104)	Triangular (0.3636, 0.3855, 2.5098)	Triangular (0.9433, 1.0000, 6.5105)
NR Cost, New Design, All	18		-		-	0.658	0.690	Lognormal (1.0000, 0.6904)	Lognormal (1.2152, 0.8390)	Lognormal (1.7944, 1.2389)
NR Cost, Modified Design, All	5		-		-	0.926	0.971	Lognormal (1.0000, 0.9709)	Lognormal (1.3938, 1.3533)	Lognormal (2.7077, 2.6290)
T1 Cost, TT&C Transponder, All	30		-		-	0.765	0.866	Lognormal (1.0000, 0.8663)	Lognormal (1.3231, 1.1462)	Lognormal (2.3161, 2.0065)
Recurring Cost, TT&C Transponder	30		-		-	1.188	1.412	Lognormal (1.0000, 1.4124)	Lognormal (1.7306, 2.4442)	Lognormal (5.1827, 7.3200)
NR Cost, All	27		-		-	0.987	0.973	Lognormal (1.0000, 0.9726)	Lognormal (1.3950, 1.3568)	Lognormal (2.7147, 2.6405)
T1 Cost, All	33		-		-	0.754	0.844	Lognormal (1.0000, 0.8436)	Lognormal (1.3083, 1.1037)	Lognormal (2.2395, 1.8893)
Recurring Cost, All	33		-		-	1.165	1.104	Lognormal (1.0000, 1.1037)	Lognormal (1.4893, 1.6437)	Lognormal (3.3034, 3.6458)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals	15		-		-	0.593	0.619	Beta (0.5001, 5.9807, 0.5024, 5.0058)	Beta (0.6599, 7.8912, 0.5024, 5.0058)	Beta (, , 0.5024, 5.0058)
Weight, T1 CER Residuals, TT&C Transponde	25		-		-	0.536	0.564	Beta (0.5865, 5.3685, 0.4045, 4.2731)	Beta (0.7701, 7.0497, 0.4045, 4.2731)	Beta (, , 0.4045, 4.2731)
Cost Driver Metrics from Entire Dataset										
Weight, All	32		-		-	0.594	0.633	Beta (0.5173, 3.0553, 0.2807, 1.1951)	Beta (0.7509, 4.4351, 0.2807, 1.1951)	Beta (, , 0.2807, 1.1951)

Figure 4.2-32. 1.3.1.2.5 Communication Payload Transponders

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for New Design	13	NR	3757.1 - 27832.01	Weight	13.2 - 111.83	0.607	0.639	Lognormal (1.0000, 0.6392)	Lognormal (1.1868, 0.7586)	Lognormal (1.6717, 1.0685)
NR Cost per lb	13	NR	3757.1 - 27832.01	Weight	13.2 - 111.83	0.816	0.901	Lognormal (1.0000, 0.9010)	Lognormal (1.3461, 1.2129)	Lognormal (2.4389, 2.1976)
NR Cost	13					0.607	0.639	Lognormal (1.0000, 0.6392)	Lognormal (1.1868, 0.7586)	Lognormal (1.6717, 1.0685)
T1 CER Residuals for EHF and non-EHF	24	T1	255.49 - 51683.07	Weight	7 - 279.4	0.494	0.446	Triangular (0.0000, 0.8338, 2.1662)	Triangular (0.0000, 0.8639, 2.2445)	Triangular (0.0000, 1.0000, 2.5982)
T1 Cost per lb, EHF	12	T1	798.28 - 51683.07	Weight	12.7 - 279.4	0.699	0.657	Triangular (0.0000, 0.1439, 2.8561)	Triangular (0.0000, 0.1617, 3.2099)	Triangular (0.0000, 1.0000, 19.8466)
T1 Cost per lb, Non-EHF	12	T1	255.49 - 5804.37	Weight	7 - 111.83	0.328	0.313	Triangular (0.4272, 0.7015, 1.8713)	Triangular (0.4483, 0.7360, 1.9635)	Triangular (0.6090, 1.0000, 2.6677)
T1 Cost, EHF	12					1.292	1.603	Lognormal (1.0000, 1.6029)	Lognormal (1.8892, 3.0282)	Lognormal (6.7429, 10.8080)
T1 Cost, Non-EHF	12					0.647	0.612	Triangular (0.0000, 0.2767, 2.7233)	Triangular (0.0000, 0.3076, 3.0270)	Triangular (0.0000, 1.0000, 9.8418)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	14	NR	3757.1 - 27832.01	Weight	13.2 - 111.83	0.854	0.948	Lognormal (1.0000, 0.9475)	Lognormal (1.3776, 1.3054)	Lognormal (2.6145, 2.4774)
NR to T1 Ratio, New Design, All	13	NR	3757.1 - 27832.01	T1	1370.48 - 11508.51	0.730	0.876	Lognormal (1.0000, 0.8760)	Lognormal (1.3294, 1.1646)	Lognormal (2.3497, 2.0584)
NR Cost per lb, All	22	NR	8.58 - 27832.01	Weight	13.17 - 271.36	1.238	1.343	Lognormal (1.0000, 1.3433)	Lognormal (1.6747, 2.2497)	Lognormal (4.6968, 6.3094)
T1 Cost per lb, All	24	T1	255.49 - 51683.07	Weight	7 - 279.4	0.859	0.901	Lognormal (1.0000, 0.9014)	Lognormal (1.3463, 1.2135)	Lognormal (2.4400, 2.1993)
NR Cost, New Design, All	14					0.613	0.650	Lognormal (1.0000, 0.6503)	Lognormal (1.1928, 0.7757)	Lognormal (1.6973, 1.1037)
NR Cost, Existing Design, All	6					1.184	1.862	Lognormal (1.0000, 1.8620)	Lognormal (2.1136, 3.9355)	Lognormal (9.4415, 17.5801)
Recurring Cost, EHF	12					0.915	0.853	Beta (0.1302, 2.8312, 0.3833, 0.8069)	Beta (0.1839, 3.9990, 0.3833, 0.8069)	Beta (, , 0.3833, 0.8069)
Recurring Cost, Non-EHF	13					1.746	1.562	Lognormal (1.0000, 1.5616)	Lognormal (1.8543, 2.8957)	Lognormal (6.3762, 9.9570)
NR Cost, All	22					1.047	0.985	Beta (0.0012, 3.8488, 0.5015, 1.4305)	Beta (0.0018, 5.7772, 0.5015, 1.4305)	Beta (, , 0.5015, 1.4305)
T1 Cost, All	24					1.605	1.811	Lognormal (1.0000, 1.8114)	Lognormal (2.0691, 3.7478)	Lognormal (8.8577, 16.0444)
Recurring Cost, All	25					1.361	1.424	Lognormal (1.0000, 1.4239)	Lognormal (1.7399, 2.4774)	Lognormal (5.2674, 7.5001)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, New Design	13					0.478	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Weight, T1 CER Datapoints, EHF	12					1.063	1.069	Beta (0.1373, 3.0208, 0.1572, 0.3683)	Beta (0.3745, 8.2397, 0.1572, 0.3683)	Beta (, , 0.1572, 0.3683)
Weight, T1 CER Datapoints, Non-EHF	12					0.595	0.562	Triangular (0.0000, 0.4291, 2.5709)	Triangular (0.0000, 0.4700, 2.8156)	Triangular (0.0000, 1.0000, 5.9912)
Cost Driver Metrics from Entire Dataset										
Weight, All	25					1.067	1.085	Lognormal (1.0000, 1.0854)	Lognormal (1.4758, 1.6018)	Lognormal (3.2145, 3.4889)

Figure 4.2-33. 1.3.1.2.6 Communication Payload Timing and Frequency

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	18	NR	433.31 - 30209.38	Weight	1.11 - 220.79	0.534	0.512	Triangular (0.1968, 0.3585, 2.4447)	Triangular (0.2153, 0.3923, 2.6746)	Triangular (0.5489, 1.0000, 6.8184)
NR Cost per Lb, NR CER Datapoints, All	18	NR	433.31 - 30209.38	Weight	1.11 - 220.79	0.715	0.775	Lognormal (1.0000, 0.7754)	Lognormal (1.2654, 0.9813)	Lognormal (2.0263, 1.5713)
NR Typical Cost, NR CER Datapoints, All	18					1.267	1.457	Lognormal (1.0000, 1.4570)	Lognormal (1.7671, 2.5746)	Lognormal (5.5182, 8.0398)
T1 CER, All	44	T1	8.89 - 13449.15	Weight	0.16 - 220.79	0.541	0.545	Triangular (0.0353, 0.4408, 2.5239)	Triangular (0.0386, 0.4822, 2.7613)	Triangular (0.0801, 1.0000, 5.7262)
T1 Cost per Lb, T1 CER Datapoints, All	44	T1	8.89 - 13449.15	Weight	0.16 - 220.79	0.557	0.548	Triangular (0.0270, 0.4425, 2.5305)	Triangular (0.0296, 0.4841, 2.7688)	Triangular (0.0611, 1.0000, 5.7190)
T1 Typical Cost, T1 CER Datapoints, All	44					1.612	2.152	Lognormal (1.0000, 2.1520)	Lognormal (2.3729, 5.1065)	Lognormal (13.3618, 28.7540)
Metrics from Entire Dataset										
NR to T1 Ratio, New System	24	NR	185.25 - 30209.38	T1	118.23 - 13449.15	1.229	1.583	Lognormal (1.0000, 1.5827)	Lognormal (1.8721, 2.9631)	Lognormal (6.5618, 10.3853)
NR to T1 Ratio, Existing System	13	NR	1.79 - 392.89	T1	8.89 - 5642.2	1.262	1.465	Lognormal (1.0000, 1.4653)	Lognormal (1.7740, 2.5994)	Lognormal (5.5828, 8.1803)
NR to T1 Ratio, Government	39	NR	12.86 - 30209.38	T1	8.89 - 13449.15	1.886	2.718	Lognormal (1.0000, 2.7183)	Lognormal (2.8964, 7.8731)	Lognormal (24.2976, 66.0473)
NR Cost per Lb, New System	24	NR	185.25 - 30209.38	Weight	1.11 - 220.79	0.781	0.788	Beta (0.2070, 3.0967, 0.4596, 1.2152)	Beta (0.2852, 4.2677, 0.4596, 1.2152)	Beta (, , 0.4596, 1.2152)
NR Cost per Lb, Existing System	13	NR	1.79 - 392.89	Weight	0.8 - 84.3	0.874	1.055	Lognormal (1.0000, 1.0553)	Lognormal (1.4539, 1.5343)	Lognormal (3.0730, 3.2430)
NR Cost per Lb, Government	36	NR	12.86 - 30209.38	Weight	0.8 - 220.79	1.178	1.175	Beta (0.0089, 4.1640, 0.3031, 0.9675)	Beta (0.0198, 9.2449, 0.3031, 0.9675)	Beta (, , 0.3031, 0.9675)
T1 Cost per Lb, New System	24	T1	118.23 - 13449.15	Weight	1.11 - 220.79	0.561	0.547	Triangular (0.1855, 0.2691, 2.5454)	Triangular (0.2046, 0.2967, 2.8068)	Triangular (0.6896, 1.0000, 9.4605)
T1 Cost per Lb, Existing System	13	T1	8.89 - 5642.2	Weight	0.8 - 84.3	0.783	0.825	Lognormal (1.0000, 0.8254)	Lognormal (1.2966, 1.0703)	Lognormal (2.1800, 1.7994)
T1 Cost per Lb, Government	47	T1	8.89 - 13449.15	Weight	0.16 - 220.79	0.594	0.576	Triangular (0.0000, 0.3861, 2.6139)	Triangular (0.0000, 0.4254, 2.8802)	Triangular (0.0000, 1.0000, 6.7709)
T1 Cost per Lb, Commercial	7	T1	76.56 - 776.24	Weight	2.7 - 10	0.822	1.229	Lognormal (1.0000, 1.2286)	Lognormal (1.5842, 1.9463)	Lognormal (3.9755, 4.8844)
NR Cost per Lb, All	41	NR	1.79 - 30209.38	Weight	0.8 - 220.79	1.255	1.272	Beta (0.0017, 5.3178, 0.3126, 1.3520)	Beta (0.0042, 13.2832, 0.3126, 1.3520)	Beta (, , 0.3126, 1.3520)
T1 Cost per Lb, All	55	T1	8.89 - 13449.15	Weight	0.16 - 220.79	0.625	0.612	Triangular (0.0000, 0.2761, 2.7239)	Triangular (0.0000, 0.3075, 3.0331)	Triangular (0.0000, 1.0000, 9.8646)
NR Typical Cost, New System	25					1.102	1.058	Lognormal (1.0000, 1.0582)	Lognormal (1.4559, 1.5407)	Lognormal (3.0863, 3.2659)
NR Typical Cost, Existing System	13					0.943	1.043	Lognormal (1.0000, 1.0432)	Lognormal (1.4451, 1.5076)	Lognormal (3.0179, 3.1485)
NR Typical Cost, Government	40					1.558	1.609	Beta (0.0027, 6.2499, 0.1633, 0.8595)	Beta (0.0229, 53.8257, 0.1633, 0.8595)	Beta (, , 0.1633, 0.8595)
Recurring Typical Cost, New System	25					1.064	1.122	Lognormal (1.0000, 1.1217)	Lognormal (1.5027, 1.6855)	Lognormal (3.3933, 3.8061)
Recurring Typical Cost, Existing System	13					1.065	1.156	Lognormal (1.0000, 1.1565)	Lognormal (1.5289, 1.7681)	Lognormal (3.5736, 4.1327)
Recurring Typical Cost, Government	50					1.487	1.586	Lognormal (1.0000, 1.5860)	Lognormal (1.8749, 2.9735)	Lognormal (6.5908, 10.4527)
Recurring Typical Cost, Commercial	7					0.933	1.269	Lognormal (1.0000, 1.2691)	Lognormal (1.6157, 2.0504)	Lognormal (4.2178, 5.3526)
T1 Typical Cost, New System	24					1.603	2.561	Lognormal (1.0000, 2.5613)	Lognormal (2.7496, 7.0427)	Lognormal (20.7883, 53.2456)
T1 Typical Cost, Existing System	12					0.771	0.749	Beta (0.0241, 2.1798, 0.4753, 0.5746)	Beta (0.0261, 2.3631, 0.4753, 0.5746)	Beta (, , 0.4753, 0.5746)
T1 Typical Cost, Government	49					1.687	2.274	Lognormal (1.0000, 2.2739)	Lognormal (2.4841, 5.6487)	Lognormal (15.3290, 34.8572)
T1 Typical Cost, Commercial	7					0.613	0.652	Lognormal (1.0000, 0.6519)	Lognormal (1.1937, 0.7782)	Lognormal (1.7011, 1.1090)
NR Typical Cost, All	45					1.675	1.738	Beta (0.0004, 7.0123, 0.1412, 0.8494)	Beta (0.0062, 104.7918, 0.1412, 0.8494)	Beta (, , 0.1412, 0.8494)
Recurring Typical Cost, All	54					1.224	1.291	Beta (0.0083, 5.7269, 0.3146, 1.4996)	Beta (0.0212, 14.5631, 0.3146, 1.4996)	Beta (, , 0.3146, 1.4996)
T1 Typical Cost, All	57					1.773	2.435	Lognormal (1.0000, 2.4351)	Lognormal (2.6325, 6.4105)	Lognormal (18.2430, 44.4244)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, All	18					1.517	2.508	Lognormal (1.0000, 2.5077)	Lognormal (2.6998, 6.7704)	Lognormal (19.6781, 49.3478)
Weight, T1 CER Datapoints, All	44					1.494	2.023	Lognormal (1.0000, 2.0225)	Lognormal (2.2563, 4.5634)	Lognormal (11.4860, 23.2309)
Cost Driver Metrics from Entire Dataset										
Weight, All	57					1.659	2.012	Lognormal (1.0000, 2.0123)	Lognormal (2.2471, 4.5219)	Lognormal (11.3467, 22.8333)

Figure 4.2-34. 1.3.1.2.7 Communication Payload Misc RF/Analog Electronic Equipment

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for Commer/lower than ka-band or Govt ka-band/higher	29	NR	1209.54 - 59644.97	Weight	3.32 - 233.15	0.350	0.345	Normal (1.0000, 0.3448)	Normal (1.0000, 0.3448)	Normal (1.0000, 0.3448)
NR Cost per lb, Govt ka-band or higher	17	NR	6210.33 - 59644.97	Weight	7.21 - 210.12	0.608	0.580	Triangular (0.1380, 0.2213, 2.6407)	Triangular (0.1532, 0.2457, 2.9317)	Triangular (0.6237, 1.0000, 11.9323)
NR Cost per lb, Commer or lower than ka-band	12	NR	1209.54 - 47756.47	Weight	3.32 - 233.15	0.442	0.458	Lognormal (1.0000, 0.4585)	Lognormal (1.1001, 0.5044)	Lognormal (1.3314, 0.6104)
NR Cost, Govt ka-band or higher	17		-		-	0.731	0.626	Triangular (0.0000, 0.2336, 2.7664)	Triangular (0.0000, 0.2611, 3.0921)	Triangular (0.0000, 1.0000, 11.8440)
NR Cost, Commer or lower than ka-band	12		-		-	1.026	0.957	Lognormal (1.0000, 0.9569)	Lognormal (1.3841, 1.3244)	Lognormal (2.6515, 2.5372)
T1 CER Residuals for Commer/lower than ka-band or Govt ka-band/higher	37	T1	583.41 - 21155.81	Weight	7.59 - 244.01	0.453	0.442	Triangular (0.1806, 0.5913, 2.2281)	Triangular (0.1934, 0.6334, 2.3865)	Triangular (0.3053, 1.0000, 3.7680)
T1 Cost per lb, Govt ka-band or higher	24	T1	749.31 - 21155.81	Weight	7.59 - 210.12	0.495	0.483	Triangular (0.0731, 0.5958, 2.3312)	Triangular (0.0796, 0.6493, 2.5406)	Triangular (0.1226, 1.0000, 3.9128)
T1 Cost per lb, Commer or lower than ka-band	13	T1	583.41 - 10779.6	Weight	16.65 - 244.01	0.384	0.383	Lognormal (1.0000, 0.3828)	Lognormal (1.0708, 0.4099)	Lognormal (1.2277, 0.4700)
T1 Cost, Govt ka-band or higher	24		-		-	0.844	0.674	Triangular (0.0000, 0.0951, 2.9049)	Triangular (0.0000, 0.1074, 3.2818)	Triangular (0.0000, 1.0000, 30.5454)
T1 Cost, Commer or lower than ka-band	13		-		-	1.109	1.116	Beta (0.1852, 3.4217, 0.1471, 0.4373)	Beta (0.6005, 11.0958, 0.1471, 0.4373)	Beta (, , 0.1471, 0.4373)
Metrics from Entire Dataset										
NR Cost per lb, New Design, All	34	NR	36.5 - 101085.72	Weight	1.57 - 244.01	0.758	0.735	Lognormal (1.0000, 0.7345)	Lognormal (1.2408, 0.9114)	Lognormal (1.9102, 1.4031)
NR Cost per lb, Existing Design, All	11	NR	1.89 - 194.76	Weight	18.1 - 39.28	0.664	0.624	Triangular (0.0000, 0.2394, 2.7606)	Triangular (0.0000, 0.2674, 3.0841)	Triangular (0.0000, 1.0000, 11.5332)
NR to T1 Ratio, New Design, All	34	NR	36.5 - 101085.72	T1	7.8 - 21155.81	0.662	0.646	Triangular (0.0000, 0.1763, 2.8237)	Triangular (0.0000, 0.1980, 3.1706)	Triangular (0.0000, 1.0000, 16.0164)
NR to T1 Ratio, Existing Design, All	11	NR	1.89 - 194.76	T1	382.66 - 3231.24	0.868	0.696	Triangular (0.0000, 0.0314, 2.9686)	Triangular (0.0000, 0.0356, 3.3711)	Triangular (0.0000, 1.0000, 94.5878)
T1 Cost per lb, Govt EHF Only	53	T1	266.32 - 33793.46	Weight	7.21 - 210.12	0.751	0.819	Lognormal (1.0000, 0.8191)	Lognormal (1.2927, 1.0588)	Lognormal (2.1600, 1.7693)
T1 Cost per lb, NonGovt NonEHF	31	T1	7.8 - 10779.6	Weight	1.57 - 244.01	0.654	0.672	Lognormal (1.0000, 0.6717)	Lognormal (1.2046, 0.8091)	Lognormal (1.7480, 1.1741)
NR Cost per lb, All	49	NR	1.89 - 101085.72	Weight	1.57 - 244.01	1.101	1.060	Beta (0.0003, 4.2691, 0.4472, 1.4623)	Beta (0.0005, 7.1490, 0.4472, 1.4623)	Beta (, , 0.4472, 1.4623)
T1 Cost per lb, All	84	T1	7.8 - 33793.46	Weight	1.57 - 244.01	0.871	0.936	Lognormal (1.0000, 0.9363)	Lognormal (1.3699, 1.2827)	Lognormal (2.5710, 2.4073)
NR Cost, New Design, All	34		-		-	1.049	1.039	Lognormal (1.0000, 1.0394)	Lognormal (1.4424, 1.4993)	Lognormal (3.0007, 3.1191)
NR Cost, Existing Design, All	11		-		-	0.715	0.677	Triangular (0.0000, 0.0862, 2.9138)	Triangular (0.0000, 0.0975, 3.2956)	Triangular (0.0000, 1.0000, 33.8039)
T1 Cost, Govt EHF Only	53		-		-	1.075	1.107	Lognormal (1.0000, 1.1068)	Lognormal (1.4917, 1.6510)	Lognormal (3.3190, 3.6736)
T1 Cost, NonGovt NonEHF	31		-		-	1.321	1.449	Lognormal (1.0000, 1.4494)	Lognormal (1.7609, 2.5523)	Lognormal (5.4603, 7.9143)
Recurring Cost, Govt EHF Only	44		-		-	1.332	1.334	Lognormal (1.0000, 1.3339)	Lognormal (1.6671, 2.2237)	Lognormal (4.6331, 6.1800)
Recurring Cost, NonGovt NonEHF	27		-		-	1.637	2.078	Lognormal (1.0000, 2.0782)	Lognormal (2.3062, 4.7927)	Lognormal (12.2662, 25.4910)
NR Cost, All	49		-		-	1.394	1.370	Beta (0.0001, 6.5411, 0.2983, 1.6530)	Beta (0.0004, 18.9735, 0.2983, 1.6530)	Beta (, , 0.2983, 1.6530)
T1 Cost, All	84		-		-	1.260	1.269	Lognormal (1.0000, 1.2694)	Lognormal (1.6160, 2.0514)	Lognormal (4.2201, 5.3570)
Recurring Cost, All	71		-		-	1.426	1.657	Lognormal (1.0000, 1.6571)	Lognormal (1.9354, 3.2072)	Lognormal (7.2499, 12.0137)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Residuals, Govt ka-band or higher	17		-		-	0.936	0.920	Beta (0.0925, 2.9048, 0.3360, 0.7053)	Beta (0.1430, 4.4881, 0.3360, 0.7053)	Beta (, , 0.3360, 0.7053)
Weight, NR CER Residuals, Commer or lower than ka-band	12		-		-	1.162	1.064	Lognormal (1.0000, 1.0645)	Lognormal (1.4605, 1.5547)	Lognormal (3.1155, 3.3165)
Weight, T1 CER Residuals, Govt ka-band or higher	24		-		-	0.870	0.868	Beta (0.1058, 3.7454, 0.5552, 1.7045)	Beta (0.1477, 5.2273, 0.5552, 1.7045)	Beta (, , 0.5552, 1.7045)
Weight, T1 CER Residuals, Commer or lower than ka-band	13		-		-	1.094	1.197	Lognormal (1.0000, 1.1972)	Lognormal (1.5599, 1.8676)	Lognormal (3.7959, 4.5446)
Cost Driver Metrics from Entire Dataset										
Weight, All	84		-		-	1.013	1.000	Lognormal (1.0000, 1.0005)	Lognormal (1.4145, 1.4152)	Lognormal (2.8304, 2.8317)

Figure 4.2-35. 1.3.1.3 Communication/Digital Electronics

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	12	NR	7834.07 - 277562.99	Weight	120.5 - 2102.48	0.590	0.557	Triangular (0.0000, 0.4460, 2.5540)	Triangular (0.0000, 0.4876, 2.7921)	Triangular (0.0000, 1.0000, 5.7260)
NR Cost per Lb, NR CER Datapoints, All	12	NR	7834.07 - 277562.99	Weight	120.5 - 2102.48	0.693	0.754	Lognormal (1.0000, 0.7541)	Lognormal (1.2525, 0.9444)	Lognormal (1.9646, 1.4815)
NR Typical Cost, NR CER Datapoints, All	12					0.991	1.170	Lognormal (1.0000, 1.1700)	Lognormal (1.5392, 1.8009)	Lognormal (3.6462, 4.2662)
T1 CER, All	28	T1	290.66 - 78028.74	Weight	20.2 - 2102.48	0.380	0.373	Triangular (0.2610, 0.7182, 2.0208)	Triangular (0.2747, 0.7557, 2.1263)	Triangular (0.3635, 1.0000, 2.8138)
T1 Cost per Lb, T1 CER Datapoints, All	28	T1	290.66 - 78028.74	Weight	20.2 - 2102.48	0.379	0.372	Triangular (0.2599, 0.7230, 2.0171)	Triangular (0.2733, 0.7602, 2.1211)	Triangular (0.3596, 1.0000, 2.7901)
T1 Typical Cost, T1 CER Datapoints, All	28					1.243	1.360	Lognormal (1.0000, 1.3599)	Lognormal (1.6880, 2.2956)	Lognormal (4.8100, 6.5413)
Metrics from Entire Dataset										
NR to T1 Ratio, New Design	20	NR	296.48 - 277562.99	T1	589.25 - 105691.59	0.958	1.121	Lognormal (1.0000, 1.1207)	Lognormal (1.5020, 1.6834)	Lognormal (3.3886, 3.7977)
NR to T1 Ratio, Modified Design	14	NR	38.85 - 43281.65	T1	233.76 - 44405.54	1.030	1.229	Lognormal (1.0000, 1.2289)	Lognormal (1.5843, 1.9469)	Lognormal (3.9769, 4.8871)
NR to T1 Ratio, Commsats	25	NR	38.85 - 277562.99	T1	2339.2 - 105691.59	1.020	1.095	Lognormal (1.0000, 1.0949)	Lognormal (1.4829, 1.6236)	Lognormal (3.2606, 3.5701)
NR Cost per Lb, New Design	19	NR	296.48 - 277562.99	Weight	4.41 - 2102.48	0.793	0.867	Lognormal (1.0000, 0.8667)	Lognormal (1.3233, 1.1469)	Lognormal (2.3173, 2.0083)
NR Cost per Lb, Modified Design	13	NR	38.85 - 43281.65	Weight	23.83 - 1020.95	1.434	3.141	Lognormal (1.0000, 3.1407)	Lognormal (3.2961, 10.3519)	Lognormal (35.8084, 112.4633)
NR Cost per Lb, Commsats	26	NR	38.85 - 277562.99	Weight	86.18 - 2102.48	1.216	1.243	Beta (0.0055, 16.2208, 0.5394, 8.2546)	Beta (0.0104, 30.7974, 0.5394, 8.2546)	Beta (, , 0.5394, 8.2546)
T1 Cost per Lb, New Design	20	T1	589.25 - 105691.59	Weight	1.52 - 2102.48	1.292	1.808	Lognormal (1.0000, 1.8075)	Lognormal (2.0657, 3.7337)	Lognormal (8.8144, 15.9321)
T1 Cost per Lb, Modified Design	14	T1	233.76 - 44405.54	Weight	1.37 - 1020.95	0.948	1.388	Lognormal (1.0000, 1.3876)	Lognormal (1.7104, 2.3734)	Lognormal (5.0039, 6.9435)
T1 Cost per Lb, Commsats	28	T1	2339.2 - 105691.59	Weight	86.18 - 2102.48	0.531	0.566	Lognormal (1.0000, 0.5657)	Lognormal (1.1489, 0.6499)	Lognormal (1.5165, 0.8579)
NR Cost per Lb, All	35	NR	38.85 - 277562.99	Weight	1.37 - 2102.48	1.164	1.176	Beta (0.0039, 8.5858, 0.5180, 3.9448)	Beta (0.0070, 15.6808, 0.5180, 3.9448)	Beta (, , 0.5180, 3.9448)
T1 Cost per Lb, All	39	T1	233.76 - 105691.59	Weight	1.37 - 2102.48	1.289	1.776	Lognormal (1.0000, 1.7760)	Lognormal (2.0382, 3.6199)	Lognormal (8.4672, 15.0380)
NR Typical Cost, New Design	20					1.440	1.728	Lognormal (1.0000, 1.7281)	Lognormal (1.9966, 3.4504)	Lognormal (7.9595, 13.7551)
NR Typical Cost, Modified Design	12					0.681	0.648	Triangular (0.0000, 0.1688, 2.8312)	Triangular (0.0000, 0.1893, 3.1757)	Triangular (0.0000, 1.0000, 16.7769)
Recurring Typical Cost, New Design	20					1.514	1.617	Beta (0.0138, 5.8606, 0.1404, 0.6921)	Beta (0.1478, 62.7437, 0.1404, 0.6921)	Beta (, , 0.1404, 0.6921)
Recurring Typical Cost, Modified Design	14					1.012	1.018	Beta (0.0608, 3.4269, 0.3344, 0.8640)	Beta (0.1055, 5.9475, 0.3344, 0.8640)	Beta (, , 0.3344, 0.8640)
Recurring Typical Cost, Commsats	28					1.428	1.661	Lognormal (1.0000, 1.6606)	Lognormal (1.9384, 3.2189)	Lognormal (7.2836, 12.0948)
T1 Typical Cost, New Design	20					1.539	1.851	Lognormal (1.0000, 1.8514)	Lognormal (2.1042, 3.8957)	Lognormal (9.3166, 17.2487)
T1 Typical Cost, Modified Design	14					1.338	1.693	Lognormal (1.0000, 1.6935)	Lognormal (1.9667, 3.3305)	Lognormal (7.6068, 12.8819)
T1 Typical Cost, Commsats	28					1.238	1.373	Lognormal (1.0000, 1.3734)	Lognormal (1.6989, 2.3331)	Lognormal (4.9031, 6.7336)
NR Typical Cost, All	29					1.479	1.642	Beta (0.0051, 5.6356, 0.1255, 0.5849)	Beta (0.0837, 93.2222, 0.1255, 0.5849)	Beta (, , 0.1255, 0.5849)
Recurring Typical Cost, All	39					1.696	1.999	Lognormal (1.0000, 1.9995)	Lognormal (2.2356, 4.4699)	Lognormal (11.1731, 22.3400)
T1 Typical Cost, All	36					1.306	1.225	Lognormal (1.0000, 1.2254)	Lognormal (1.5816, 1.9381)	Lognormal (3.9565, 4.8482)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, All	12					0.824	0.851	Lognormal (1.0000, 0.8507)	Lognormal (1.3129, 1.1169)	Lognormal (2.2630, 1.9251)
Weight, T1 CER Datapoints, All	28					1.098	1.140	Lognormal (1.0000, 1.1404)	Lognormal (1.5167, 1.7296)	Lognormal (3.4892, 3.9790)
Cost Driver Metrics from Entire Dataset										
Weight, All	39					1.268	1.307	Beta (0.0035, 5.4197, 0.2900, 1.2864)	Beta (0.0097, 14.8766, 0.2900, 1.2864)	Beta (, , 0.2900, 1.2864)

Figure 4.2-36. 1.3.1.4 Communication Antennas

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Fitted Samples										
NR CER	19	NR	671.11 - 33669.41	Weight	2.25 - 251.84	0.745	0.808	Lognormal (1.0000, 0.8082)	Lognormal (1.2857, 1.0391)	Lognormal (2.1255, 1.7178)
NR Cost per Lb, Government	19	NR	671.11 - 33669.41	Weight	2.25 - 251.84	1.305	2.027	Lognormal (1.0000, 2.0266)	Lognormal (2.2599, 4.5800)	Lognormal (11.5419, 23.3910)
NR Typical Cost, Government	19					0.967	0.977	Lognormal (1.0000, 0.9770)	Lognormal (1.3981, 1.3660)	Lognormal (2.7327, 2.6700)
T1 CER, (All)	55	T1	149.45 - 17313.8	Weight	2.25 - 463.21	0.564	0.588	Lognormal (1.0000, 0.5885)	Lognormal (1.1603, 0.6828)	Lognormal (1.5622, 0.9193)
T1 Cost per Lb, Commercial	25	T1	162.74 - 17313.8	Weight	11.96 - 463.21	0.387	0.399	Lognormal (1.0000, 0.3987)	Lognormal (1.0766, 0.4293)	Lognormal (1.2477, 0.4975)
T1 Cost per Lb, Government	29	T1	149.45 - 10233.8	Weight	2.25 - 251.84	0.864	1.022	Lognormal (1.0000, 1.0225)	Lognormal (1.4302, 1.4624)	Lognormal (2.9254, 2.9912)
T1 Typical Cost, Commercial	25					0.442	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Typical Cost, Government	29					0.819	0.692	Triangular (0.0000, 0.0426, 2.9574)	Triangular (0.0000, 0.0484, 3.3556)	Triangular (0.0000, 1.0000, 69.3916)
Metrics from Larger Samples										
NR Cost per Lb, New Design	29	NR	671.11 - 113997.55	Weight	2.25 - 463.21	1.099	1.137	Lognormal (1.0000, 1.1367)	Lognormal (1.5140, 1.7209)	Lognormal (3.4701, 3.9444)
NR Cost per Lb, Modified Design	20	NR	38.31 - 2839.28	Weight	11.96 - 193.82	0.532	0.463	Triangular (0.0000, 0.7668, 2.2332)	Triangular (0.0000, 0.8038, 2.3408)	Triangular (0.0000, 1.0000, 2.9122)
NR to T1 Ratio, New Design	29	NR	671.11 - 113997.55	T1	149.45 - 30098.04	1.087	1.269	Lognormal (1.0000, 1.2692)	Lognormal (1.6158, 2.0508)	Lognormal (4.2187, 5.3543)
NR to T1 Ratio, Modified Design	20	NR	38.31 - 2839.28	T1	162.74 - 9369.6	0.836	0.885	Lognormal (1.0000, 0.8854)	Lognormal (1.3356, 1.1825)	Lognormal (2.3825, 2.1094)
T1 Cost per Lb, (Commercial)	26	T1	162.74 - 17313.8	Weight	11.96 - 463.21	0.482	0.470	Lognormal (1.0000, 0.4700)	Lognormal (1.1049, 0.5193)	Lognormal (1.3490, 0.6340)
T1 Cost per Lb, (Government)	40	T1	149.45 - 30098.04	Weight	2.25 - 263.23	0.810	0.882	Lognormal (1.0000, 0.8817)	Lognormal (1.3332, 1.1755)	Lognormal (2.3697, 2.0895)
T1 Cost per Lb, (All)	67	T1	149.45 - 30098.04	Weight	2.25 - 463.21	0.858	0.937	Lognormal (1.0000, 0.9367)	Lognormal (1.3702, 1.2835)	Lognormal (2.5725, 2.4098)
NR Typical Cost, New Design	29					1.354	1.425	Lognormal (1.0000, 1.4253)	Lognormal (1.7411, 2.4817)	Lognormal (5.2785, 7.5236)
NR Typical Cost, Modified Design	20					0.705	0.717	Lognormal (1.0000, 0.7171)	Lognormal (1.2305, 0.8824)	Lognormal (1.8633, 1.3361)
T1 Typical Cost, (Commercial)	26					0.503	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Typical Cost, (Government)	40					1.251	1.434	Lognormal (1.0000, 1.4336)	Lognormal (1.7479, 2.5058)	Lognormal (5.3403, 7.6559)
Recurring Typical Cost, (Commercial)	26					0.676	0.712	Lognormal (1.0000, 0.7118)	Lognormal (1.2275, 0.8737)	Lognormal (1.8494, 1.3164)
Recurring Typical Cost, (Government)	40					1.613	1.920	Lognormal (1.0000, 1.9203)	Lognormal (2.1651, 4.1577)	Lognormal (10.1491, 19.4896)
T1 Typical Cost, (All)	67					1.456	1.638	Lognormal (1.0000, 1.6377)	Lognormal (1.9189, 3.1425)	Lognormal (7.0652, 11.5706)
Recurring Typical Cost, (All)	67					1.989	2.401	Lognormal (1.0000, 2.4008)	Lognormal (2.6007, 6.2439)	Lognormal (17.5911, 42.2329)
Cost Driver Metrics from Fitted Samples										
Weight, NR CER (Government)	19					0.906	0.907	Beta (0.0253, 3.0886, 0.4696, 1.0063)	Beta (0.0351, 4.2856, 0.4696, 1.0063)	Beta (, , 0.4696, 1.0063)
Weight, T1 CER (Commercial)	25					0.408	0.401	Normal (1.0000, 0.4010)	Normal (1.0000, 0.4010)	Normal (1.0000, 0.4010)
Weight, T1 CER (Government)	29					0.821	0.699	Triangular (0.0000, 0.0238, 2.9762)	Triangular (0.0000, 0.0271, 3.3815)	Triangular (0.0000, 1.0000, 124.9166)
Metrics from Metrics from Larger Samples										
Weight, (All)	67					0.948	0.975	Lognormal (1.0000, 0.9750)	Lognormal (1.3966, 1.3617)	Lognormal (2.7243, 2.6562)

Figure 4.2-37. 1.3.1.4.1 Parabolic Antennas

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	16	NR	706.39 - 110535.25	Weight	12.2 - 1869.29	0.636	0.673	Lognormal (1.0000, 0.6730)	Lognormal (1.2054, 0.8111)	Lognormal (1.7512, 1.1785)
NR Cost per lb	16	NR	706.39 - 110535.25	Weight	12.2 - 1869.29	0.871	1.063	Lognormal (1.0000, 1.0628)	Lognormal (1.4593, 1.5509)	Lognormal (3.1076, 3.3028)
NR Cost	16					1.045	1.098	Lognormal (1.0000, 1.0980)	Lognormal (1.4851, 1.6307)	Lognormal (3.2756, 3.5966)
T1 CER Residuals	29	T1	170.14 - 47930.7	Weight	10.54 - 1869.29	0.507	0.516	Lognormal (1.0000, 0.5156)	Lognormal (1.1251, 0.5801)	Lognormal (1.4242, 0.7343)
T1 Cost per lb	29	T1	170.14 - 47930.7	Weight	10.54 - 1869.29	0.631	0.685	Lognormal (1.0000, 0.6847)	Lognormal (1.2120, 0.8299)	Lognormal (1.7802, 1.2190)
T1 Cost	29					1.210	1.325	Lognormal (1.0000, 1.3248)	Lognormal (1.6598, 2.1989)	Lognormal (4.5729, 6.0580)
Metrics from Entire Dataset										
NR Cost per lb, New Design	20	NR	706.39 - 110535.25	Weight	12.2 - 1869.29	0.984	1.122	Lognormal (1.0000, 1.1222)	Lognormal (1.5031, 1.6868)	Lognormal (3.3961, 3.8112)
NR Cost per lb, Modified Design	5	NR	382.61 - 1133.17	Weight	53.69 - 193.82	0.690	0.806	Lognormal (1.0000, 0.8056)	Lognormal (1.2841, 1.0344)	Lognormal (2.1174, 1.7057)
NR Cost per lb, Multi-Beam	20	NR	218.69 - 101380.43	Weight	12.2 - 463.21	1.443	1.200	Beta (0.0360, 6.3889, 0.3957, 2.2122)	Beta (0.0736, 13.0706, 0.3957, 2.2122)	Beta (, , 0.3957, 2.2122)
NR Cost per lb, Phased-Array	8	NR	11142.06 - 110535.25	Weight	148.36 - 1869.29	0.999	0.987	Beta (0.3466, 3.9205, 0.1753, 0.7836)	Beta (0.7436, 8.4106, 0.1753, 0.7836)	Beta (, , 0.1753, 0.7836)
NR to T1 Ratio, New Design	20	NR	706.39 - 110535.25	T1	170.14 - 47930.7	0.619	0.698	Lognormal (1.0000, 0.6984)	Lognormal (1.2197, 0.8519)	Lognormal (1.8147, 1.2674)
NR to T1 Ratio, Modified Design	5	NR	382.61 - 1133.17	T1	792.13 - 8097.3	0.718	0.654	Triangular (0.0245, 0.1277, 2.8477)	Triangular (0.0276, 0.1438, 3.2060)	Triangular (0.1919, 1.0000, 22.2926)
NR to T1 Ratio, Multi-Beam	20	NR	218.69 - 101380.43	T1	170.14 - 30098.04	1.117	1.326	Lognormal (1.0000, 1.3260)	Lognormal (1.6608, 2.2021)	Lognormal (4.5808, 6.0739)
NR to T1 Ratio, Phased-Array	8	NR	11142.06 - 110535.25	T1	3598.59 - 47930.7	0.458	0.494	Lognormal (1.0000, 0.4942)	Lognormal (1.1155, 0.5513)	Lognormal (1.3880, 0.6860)
T1 Cost per lb, Multi-Beam	26	T1	170.14 - 30098.04	Weight	10.54 - 463.21	0.720	0.769	Lognormal (1.0000, 0.7693)	Lognormal (1.2617, 0.9706)	Lognormal (2.0083, 1.5450)
T1 Cost per lb, Phased-Array	8	T1	3598.59 - 47930.7	Weight	148.36 - 1869.29	0.703	0.739	Beta (0.4214, 5.6581, 0.4347, 3.4993)	Beta (0.5986, 8.0382, 0.4347, 3.4993)	Beta (, , 0.4347, 3.4993)
NR Cost per lb, All	28	NR	218.69 - 110535.25	Weight	12.2 - 1869.29	1.272	1.415	Lognormal (1.0000, 1.4154)	Lognormal (1.7330, 2.4529)	Lognormal (5.2049, 7.3671)
T1 Cost per lb, All	34	T1	170.14 - 47930.7	Weight	10.54 - 1869.29	0.705	0.756	Lognormal (1.0000, 0.7560)	Lognormal (1.2536, 0.9477)	Lognormal (1.9700, 1.4892)
NR Cost, New Design	21					1.005	0.967	Beta (0.0224, 3.5118, 0.4559, 1.1715)	Beta (0.0338, 5.2870, 0.4559, 1.1715)	Beta (, , 0.4559, 1.1715)
NR Cost, Modified Design	5					0.400	0.398	Normal (1.0000, 0.3976)	Normal (1.0000, 0.3976)	Normal (1.0000, 0.3976)
NR Cost, Multi-Beam	20					1.483	1.436	Beta (0.0299, 5.7814, 0.2105, 1.0375)	Beta (0.1260, 24.3505, 0.2105, 1.0375)	Beta (, , 0.2105, 1.0375)
NR Cost, Phased-Array	8					0.540	0.566	Lognormal (1.0000, 0.5657)	Lognormal (1.1489, 0.6499)	Lognormal (1.5166, 0.8579)
T1 Cost, Multi-Beam	26					1.295	1.736	Lognormal (1.0000, 1.7356)	Lognormal (2.0030, 3.4764)	Lognormal (8.0365, 13.9478)
T1 Cost, Phased-Array	8					0.700	0.790	Lognormal (1.0000, 0.7897)	Lognormal (1.2742, 1.0063)	Lognormal (2.0690, 1.6340)
Recurring Cost, Multi-Beam	20					1.160	1.398	Lognormal (1.0000, 1.3983)	Lognormal (1.7191, 2.4038)	Lognormal (5.0803, 7.1037)
Recurring Cost, Phased-Array	7					0.678	0.766	Lognormal (1.0000, 0.7655)	Lognormal (1.2594, 0.9641)	Lognormal (1.9974, 1.5291)
NR Cost, All	29					1.315	1.265	Beta (0.0094, 4.7734, 0.2781, 1.0595)	Beta (0.0252, 12.7304, 0.2781, 1.0595)	Beta (, , 0.2781, 1.0595)
T1 Cost, All	34					1.256	1.369	Lognormal (1.0000, 1.3687)	Lognormal (1.6951, 2.3201)	Lognormal (4.8707, 6.6665)
Recurring Cost, All	27					1.124	1.207	Lognormal (1.0000, 1.2070)	Lognormal (1.5674, 1.8919)	Lognormal (3.8510, 4.6481)
Cost Driver Metrics from CER Datasets										
Weight, NR CER	16					1.346	1.207	Lognormal (1.0000, 1.2071)	Lognormal (1.5675, 1.8920)	Lognormal (3.8513, 4.6487)
Weight, T1 CER	29					1.466	1.356	Lognormal (1.0000, 1.3561)	Lognormal (1.6849, 2.2850)	Lognormal (4.7836, 6.4870)
Cost Driver Metrics from Entire Dataset										
Weight, All	33					1.164	1.288	Lognormal (1.0000, 1.2879)	Lognormal (1.6306, 2.1001)	Lognormal (4.3353, 5.5836)

Figure 4.2-38. 1.3.1.4.2 Multibeam and Phased Array Antennas

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset						1.085				
NR CER Residuals	17	NR	13.68 - 3993.96	T1	3.76 - 549.02	0.495	0.490	Lognormal (1.0000, 0.4899)	Lognormal (1.1135, 0.5455)	Lognormal (1.3808, 0.6764)
NR Cost per T1 Cost	17	NR	13.68 - 3993.96	T1	3.76 - 549.02	0.495	0.503	Lognormal (1.0000, 0.5025)	Lognormal (1.1192, 0.5624)	Lognormal (1.4018, 0.7045)
NR Cost	17					1.128	1.150	Lognormal (1.0000, 1.1502)	Lognormal (1.5241, 1.7530)	Lognormal (3.5404, 4.0721)
T1 CER Residuals	44	T1	0.57 - 613.92			0.916	0.906	Beta (0.0030, 3.4747, 0.5764, 1.4307)	Beta (0.0040, 4.7265, 0.5764, 1.4307)	Beta (, , 0.5764, 1.4307)
T1 Cost	44					0.916	0.906	Beta (0.0030, 3.4748, 0.5764, 1.4307)	Beta (0.0040, 4.7265, 0.5764, 1.4307)	Beta (, , 0.5764, 1.4307)
Metrics from Entire Dataset										
NR Cost per lb, New Design	44	NR	13.68 - 9413.63	Weight	0.33 - 112.15	1.645	2.250	Lognormal (1.0000, 2.2499)	Lognormal (2.4621, 5.5396)	Lognormal (14.9256, 33.5813)
NR Cost per lb, Modified Design	13	NR	23.35 - 2202.19	Weight	0.2 - 11.91	1.715	2.862	Lognormal (1.0000, 2.8616)	Lognormal (3.0313, 8.6744)	Lognormal (27.8541, 79.7075)
NR to T1 Ratio, New Design	45	NR	13.68 - 9413.63	T1	3.76 - 4060.59	0.820	0.808	Lognormal (1.0000, 0.8084)	Lognormal (1.2859, 1.0395)	Lognormal (2.1263, 1.7189)
NR to T1 Ratio, Modified Design	12	NR	23.35 - 1402.91	T1	69.93 - 613.92	1.075	1.288	Lognormal (1.0000, 1.2880)	Lognormal (1.6306, 2.1002)	Lognormal (4.3356, 5.5842)
NR Cost per lb, All	77	NR	3.18 - 9413.63	Weight	0.2 - 112.15	1.598	4.575	Lognormal (1.0000, 4.5754)	Lognormal (4.6834, 21.4288)	Lognormal (102.7294, 470.0314)
T1 Cost per lb, All	109	T1	0.57 - 4060.59	Weight	0.16 - 112.94	1.575	1.821	Lognormal (1.0000, 1.8207)	Lognormal (2.0772, 3.7820)	Lognormal (8.9630, 16.3188)
NR Cost, New Design	45					1.631	1.746	Lognormal (1.0000, 1.7456)	Lognormal (2.0117, 3.5116)	Lognormal (8.1413, 14.2111)
NR Cost, Modified Design	13					1.349	1.777	Lognormal (1.0000, 1.7767)	Lognormal (2.0388, 3.6223)	Lognormal (8.4746, 15.0569)
NR Cost, All	76					1.596	4.955	Lognormal (1.0000, 4.9550)	Lognormal (5.0549, 25.0470)	Lognormal (129.1628, 640.0016)
T1 Cost, All	109					1.670	3.441	Lognormal (1.0000, 3.4406)	Lognormal (3.5829, 12.3273)	Lognormal (45.9959, 158.2516)
Recurring Cost, All	109					2.127	2.795	Lognormal (1.0000, 2.7953)	Lognormal (2.9688, 8.2987)	Lognormal (26.1661, 73.1424)

Figure 4.2-39. 1.3.1.4.3 Small Antennas

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER, All	6	NR	459.27 - 13287.47	Weight	2.44 - 112.15	0.475	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Cost per Lb, NR CER Datapoints, All	6	NR	459.27 - 13287.47	Weight	2.44 - 112.15	0.543	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Typical Cost, NR CER Datapoints, All	6					1.132	1.027	Beta (0.0966, 2.7957, 0.1802, 0.3583)	Beta (0.1854, 5.3631, 0.1802, 0.3583)	Beta (, , 0.1802, 0.3583)
T1 CER, All	19	T1	100.8 - 3148.61	Weight	2.5 - 112.94	0.214	0.209	Triangular (0.5317, 0.9201, 1.5482)	Triangular (0.5408, 0.9358, 1.5747)	Triangular (0.5779, 1.0000, 1.6827)
T1 Cost per Lb, T1 CER Datapoints, All	19	T1	100.8 - 3148.61	Weight	2.5 - 112.94	0.329	0.320	Triangular (0.4387, 0.6669, 1.8944)	Triangular (0.4622, 0.7026, 1.9958)	Triangular (0.6578, 1.0000, 2.8406)
T1 Typical Cost, T1 CER Datapoints, All	19					0.689	0.668	Triangular (0.0000, 0.1120, 2.8880)	Triangular (0.0000, 0.1264, 3.2601)	Triangular (0.0000, 1.0000, 25.7889)
Metrics from Entire Dataset										
NR to T1 Ratio, New Design	9	NR	459.27 - 21749.72	T1	60.25 - 2374.58	1.054	1.778	Lognormal (1.0000, 1.7779)	Lognormal (2.0399, 3.6268)	Lognormal (8.4880, 15.0912)
NR to T1 Ratio, Existing Design	7	NR	16.35 - 1764.01	T1	140.97 - 1961.38	1.142	1.456	Lognormal (1.0000, 1.4558)	Lognormal (1.7662, 2.5711)	Lognormal (5.5092, 8.0202)
NR Cost per Lb, New Design	9	NR	459.27 - 21749.72	Weight	2.25 - 112.15	1.119	1.531	Lognormal (1.0000, 1.5314)	Lognormal (1.8290, 2.8009)	Lognormal (6.1183, 9.3696)
NR Cost per Lb, Existing Design	7	NR	16.35 - 1764.01	Weight	2.5 - 83.8	1.349	2.859	Lognormal (1.0000, 2.8591)	Lognormal (3.0290, 8.6602)	Lognormal (27.7897, 79.4545)
T1 Cost per Lb, New Design	7	T1	60.25 - 2374.58	Weight	2.44 - 112.15	0.150	0.141	Triangular (0.6009, 1.1821, 1.2170)	Triangular (0.5868, 1.1543, 1.1885)	Triangular (0.5084, 1.0000, 1.0296)
T1 Cost per Lb, Existing Design	7	T1	140.97 - 1961.38	Weight	2.5 - 83.8	0.376	0.360	Triangular (0.3367, 0.6638, 1.9995)	Triangular (0.3561, 0.7019, 2.1143)	Triangular (0.5073, 1.0000, 3.0121)
NR to T1 Ratio, All	25	NR	3.18 - 21749.72	T1	3.76 - 4060.59	1.345	1.744	Lognormal (1.0000, 1.7436)	Lognormal (2.0100, 3.5048)	Lognormal (8.1211, 14.1602)
NR Cost per Lb, All	25	NR	3.18 - 21749.72	Weight	0.36 - 112.15	1.637	2.188	Lognormal (1.0000, 2.1875)	Lognormal (2.4053, 5.2616)	Lognormal (13.9152, 30.4400)
T1 Cost per Lb, All	29	T1	3.76 - 4060.59	Weight	0.36 - 112.94	0.576	0.606	Lognormal (1.0000, 0.6060)	Lognormal (1.1693, 0.7085)	Lognormal (1.5986, 0.9687)
NR Typical Cost, New Design	9					1.133	1.372	Lognormal (1.0000, 1.3724)	Lognormal (1.6980, 2.3303)	Lognormal (4.8961, 6.7192)
NR Typical Cost, Existing Design	7					1.517	3.082	Lognormal (1.0000, 3.0825)	Lognormal (3.2406, 9.9893)	Lognormal (34.0325, 104.9051)
Recurring Typical Cost, New Design	9					1.000	1.128	Lognormal (1.0000, 1.1283)	Lognormal (1.5076, 1.7010)	Lognormal (3.4269, 3.8665)
Recurring Typical Cost, Existing Design	7					0.772	0.954	Lognormal (1.0000, 0.9539)	Lognormal (1.3820, 1.3182)	Lognormal (2.6393, 2.5175)
T1 Typical Cost, New Design	9					0.909	0.688	Triangular (0.0000, 0.0556, 2.9444)	Triangular (0.0000, 0.0631, 3.3377)	Triangular (0.0000, 1.0000, 52.9238)
T1 Typical Cost, Existing Design	7					0.799	0.658	Triangular (0.0000, 0.1402, 2.8598)	Triangular (0.0000, 0.1579, 3.2212)	Triangular (0.0000, 1.0000, 20.3961)
NR Typical Cost, All	25					1.783	1.780	Beta (0.0011, 7.6521, 0.1433, 0.9540)	Beta (0.0169, 115.7189, 0.1433, 0.9540)	Beta (, , 0.1433, 0.9540)
Recurring Typical Cost, All	33					1.336	1.503	Lognormal (1.0000, 1.5030)	Lognormal (1.8053, 2.7134)	Lognormal (5.8835, 8.8430)
T1 Typical Cost, All	33					1.063	1.039	Beta (0.0040, 4.3521, 0.4791, 1.6126)	Beta (0.0065, 7.0428, 0.4791, 1.6126)	Beta (, , 0.4791, 1.6126)
Cost Driver Metrics from CER Datasets										
Weight, NR CER Datapoints, All	6					0.964	0.878	Beta (0.0175, 2.4921, 0.3575, 0.5429)	Beta (0.0219, 3.1144, 0.3575, 0.5429)	Beta (, , 0.3575, 0.5429)
Weight, T1 CER Datapoints, All	19					0.764	0.688	Triangular (0.0000, 0.0556, 2.9444)	Triangular (0.0000, 0.0630, 3.3378)	Triangular (0.0000, 1.0000, 52.9613)
Cost Driver Metrics from Entire Dataset										
Weight, All	31					1.111	1.040	Beta (0.0000, 4.2049, 0.4667, 1.4957)	Beta (0.0000, 6.8228, 0.4667, 1.4957)	Beta (, , 0.4667, 1.4957)

Figure 4.2-40. 1.3.1.4.4 UHF Antennas

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset			-		-	1.085				
NR CER Residuals for Full Development or H	14	NR	4086.27 - 177544.56	Weight	68.3 - 1206.73	0.376	0.392	Lognormal (1.0000, 0.3918)	Lognormal (1.0740, 0.4208)	Lognormal (1.2389, 0.4854)
NR Cost per lb, Full Development	8	NR	14429.04 - 177544.56	Weight	68.3 - 1206.73	0.500	0.469	Triangular (0.1727, 0.5147, 2.3126)	Triangular (0.1861, 0.5544, 2.4911)	Triangular (0.3356, 1.0000, 4.4934)
NR Cost per lb, Heritage Design	6	NR	4086.27 - 66574.24	Weight	89.1 - 1028.6	0.648	0.752	Lognormal (1.0000, 0.7518)	Lognormal (1.2511, 0.9406)	Lognormal (1.9583, 1.4723)
NR Cost per qty, Full Development	8	NR	14429.04 - 177544.56	SV qty	1 - 5	0.690	0.622	Triangular (0.0000, 0.2467, 2.7533)	Triangular (0.0000, 0.2743, 3.0615)	Triangular (0.0000, 1.0000, 11.1623)
NR Cost per qty, Heritage Design	6	NR	4086.27 - 66574.24	SV qty	1 - 5	1.071	0.956	Lognormal (1.0000, 0.9560)	Lognormal (1.3835, 1.3227)	Lognormal (2.6480, 2.5316)
NR Cost, Full Development	8		-		-	0.923	1.103	Lognormal (1.0000, 1.1031)	Lognormal (1.4889, 1.6424)	Lognormal (3.3007, 3.6410)
NR Cost, Heritage Design	6		-		-	1.133	0.989	Lognormal (1.0000, 0.9894)	Lognormal (1.4068, 1.3919)	Lognormal (2.7839, 2.7545)
T1 CER Residuals for EOS or Non-EOS	14	T1	3266.57 - 121806.9	Weight	68.3 - 1206.73	0.334	0.325	Triangular (0.0940, 1.3231, 1.5829)	Triangular (0.0895, 1.2601, 1.5076)	Triangular (0.0710, 1.0000, 1.1964)
T1 Cost per lb, EOS	5	T1	15018.81 - 121806.9	Weight	109.35 - 1206.73	0.238	0.228	Normal (1.0000, 0.2285)	Normal (1.0000, 0.2285)	Normal (1.0000, 0.2285)
T1 Cost per lb, Non-EOS	9	T1	3266.57 - 42559.39	Weight	68.3 - 780.73	0.623	0.588	Triangular (0.0509, 0.2917, 2.6574)	Triangular (0.0564, 0.3236, 2.9477)	Triangular (0.1744, 1.0000, 9.1097)
T1 Cost, EOS	5		-		-	0.532	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, Non-EOS	9		-		-	0.730	0.826	Lognormal (1.0000, 0.8262)	Lognormal (1.2971, 1.0717)	Lognormal (2.1826, 1.8032)
Metrics from Entire Dataset			-		-					
NR Cost per lb, Full Development, All	8	NR	14429.04 - 177544.56	Weight	68.3 - 1206.73	0.500	0.469	Triangular (0.1727, 0.5147, 2.3126)	Triangular (0.1861, 0.5544, 2.4911)	Triangular (0.3356, 1.0000, 4.4934)
NR Cost per lb, Heritage Design, All	6	NR	4086.27 - 66574.24	Weight	89.1 - 1028.6	0.648	0.752	Lognormal (1.0000, 0.7518)	Lognormal (1.2511, 0.9406)	Lognormal (1.9583, 1.4723)
NR to T1 Ratio, Full Development	8	NR	14429.04 - 177544.56	T1	6961.43 - 106777.91	0.242	0.247	Lognormal (1.0000, 0.2474)	Lognormal (1.0301, 0.2548)	Lognormal (1.0932, 0.2704)
NR to T1 Ratio, Heritage Design	6	NR	4086.27 - 66574.24	T1	3266.57 - 121806.9	0.501	0.543	Lognormal (1.0000, 0.5434)	Lognormal (1.1381, 0.6185)	Lognormal (1.4742, 0.8011)
T1 Cost per lb, EOS or Military	5	T1	15018.81 - 121806.9	Weight	109.35 - 1206.73	0.238	0.228	Normal (1.0000, 0.2285)	Normal (1.0000, 0.2285)	Normal (1.0000, 0.2285)
T1 Cost per lb, Not EOS or Military	12	T1	1534.21 - 42559.39	Weight	31.74 - 780.73	0.940	0.899	Lognormal (1.0000, 0.8995)	Lognormal (1.3450, 1.2098)	Lognormal (2.4331, 2.1885)
NR Cost per lb, All	17	NR	2287.33 - 177544.56	Weight	31.74 - 1206.73	0.697	0.656	Triangular (0.0000, 0.1466, 2.8534)	Triangular (0.0000, 0.1651, 3.2123)	Triangular (0.0000, 1.0000, 19.4607)
T1 Cost per lb, All	17	T1	1534.21 - 121806.9	Weight	31.74 - 1206.73	0.736	0.791	Lognormal (1.0000, 0.7915)	Lognormal (1.2753, 1.0094)	Lognormal (2.0743, 1.6418)
NR Cost, Full Development, All	8		-		-	0.923	1.103	Lognormal (1.0000, 1.1031)	Lognormal (1.4889, 1.6424)	Lognormal (3.3007, 3.6410)
NR Cost, Heritage Design, All	6		-		-	1.133	0.989	Lognormal (1.0000, 0.9894)	Lognormal (1.4068, 1.3919)	Lognormal (2.7839, 2.7545)
T1 Cost, EOS or Military	5		-		-	0.532	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, Not EOS or Military	12		-		-	0.790	0.895	Lognormal (1.0000, 0.8951)	Lognormal (1.3421, 1.2014)	Lognormal (2.4175, 2.1641)
Recurring Cost, EOS or Military	5		-		-	0.945	1.045	Lognormal (1.0000, 1.0448)	Lognormal (1.4462, 1.5110)	Lognormal (3.0249, 3.1603)
Recurring Cost, Not EOS or Military	12		-		-	0.649	0.616	Triangular (0.0000, 0.2632, 2.7368)	Triangular (0.0000, 0.2929, 3.0457)	Triangular (0.0000, 1.0000, 10.3999)
NR Cost, All	17		-		-	1.177	1.395	Lognormal (1.0000, 1.3951)	Lognormal (1.7165, 2.3948)	Lognormal (5.0575, 7.0560)
T1 Cost, All	17		-		-	1.123	1.209	Beta (0.0504, 4.0004, 0.2286, 0.7223)	Beta (0.1423, 11.2947, 0.2286, 0.7223)	Beta (, , 0.2286, 0.7223)
Recurring Cost, All	17		-		-	1.746	1.746	Lognormal (1.0000, 1.7462)	Lognormal (2.0123, 3.5140)	Lognormal (8.1485, 14.2292)
Cost Driver Metrics from CER Datasets			-		-					
Weight, NR CER, Full Development	8		-		-	0.794	0.662	Triangular (0.0000, 0.1289, 2.8711)	Triangular (0.0000, 0.1447, 3.2226)	Triangular (0.0000, 1.0000, 22.2691)
Weight, NR CER, Heritage Design	6		-		-	0.858	0.650	Triangular (0.0000, 0.1646, 2.8354)	Triangular (0.0000, 0.1836, 3.1633)	Triangular (0.0000, 1.0000, 17.2307)
Weight, T1 CER	14		-		-	0.789	0.723	Beta (0.1314, 2.3222, 0.4743, 0.7220)	Beta (0.1542, 2.7238, 0.4743, 0.7220)	Beta (, , 0.4743, 0.7220)
Cost Driver Metrics from Entire Dataset			-		-					
Weight, All	17		-		-	0.884	0.853	Beta (0.0333, 2.6971, 0.4559, 0.8004)	Beta (0.0429, 3.4772, 0.4559, 0.8004)	Beta (, , 0.4559, 0.8004)
SV qty, All	17		-		-	0.706	0.662	Beta (0.4547, 2.4063, 0.2091, 0.5392)	Beta (0.9805, 5.1890, 0.2091, 0.5392)	Beta (, , 0.2091, 0.5392)

Figure 4.2-41. 1.3.2 Sensor Payload

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	14	NR	1273.23 -	sensor HW + AGE NR	2846.47 -	0.448	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
NR Cost per (Sensor HW + AGE NR)	14	NR	1273.23 -	sensor HW + AGE NR	2846.47 -	0.576	0.607	Lognormal (1.0000, 0.6072)	Lognormal (1.1699, 0.7104)	Lognormal (1.6013, 0.9724)
NR Cost	14					1.191	1.101	Lognormal (1.0000, 1.1012)	Lognormal (1.4875, 1.6380)	Lognormal (3.2912, 3.6242)
T1 CER Residuals	14	T1	1574.98 -	Sensor HW T1	1691.59 -	0.447	0.429	Triangular (0.1724, 0.6467, 2.1809)	Triangular (0.1833, 0.6877, 2.3190)	Triangular (0.2666, 1.0000, 3.3723)
T1 Cost per Sensor HW T1	14	T1	1574.98 -	Sensor HW T1	1691.59 -	0.728	0.880	Lognormal (1.0000, 0.8795)	Lognormal (1.3318, 1.1713)	Lognormal (2.3620, 2.0774)
T1 Cost	14					1.076	1.204	Lognormal (1.0000, 1.2043)	Lognormal (1.5654, 1.8852)	Lognormal (3.8358, 4.6196)
Cost Driver Metrics from CER Datasets										
(Sensor HW+ AGE NR), NR CER	14					1.143	1.171	Beta (0.0753, 4.1092, 0.2514, 0.8453)	Beta (0.1849, 10.0930, 0.2514, 0.8453)	Beta (, , 0.2514, 0.8453)
Sensor HW T1, T1 CER	14					0.995	0.681	Triangular (0.0000, 0.0744, 2.9256)	Triangular (0.0000, 0.0840, 3.3071)	Triangular (0.0000, 1.0000, 39.3476)

Figure 4.2-42. 1.3.2.1 Sensor Payload SEIT/PM

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Fitted Samples										
NR CER (Cost per Lb)	11	NR	8.68 - 8912.37	Weight	15 - 312.63	0.749	0.658	Triangular (0.0000, 0.1405, 2.8595)	Triangular (0.0000, 0.1582, 3.2208)	Triangular (0.0000, 1.0000, 20.3542)
NR CER (NR to T1 Ratio)	11	NR	8.68 - 8912.37	T1	75.37 - 4369.68	0.696	0.664	Triangular (0.0006, 0.1226, 2.8768)	Triangular (0.0007, 0.1383, 3.2446)	Triangular (0.0049, 1.0000, 23.4593)
NR Cost per Lb, New Design	7	NR	300.42 - 8912.37	Weight	47.95 - 312.63	0.686	0.626	Triangular (0.0000, 0.2337, 2.7663)	Triangular (0.0000, 0.2612, 3.0919)	Triangular (0.0000, 1.0000, 11.8355)
NR Typical Cost, New Design	7					0.877	1.024	Lognormal (1.0000, 1.0237)	Lognormal (1.4311, 1.4650)	Lognormal (2.9308, 3.0003)
T1 CER	12	T1	6.5 - 4369.68	Weight	1.3 - 312.63	0.374	0.362	Triangular (0.3163, 0.6813, 2.0024)	Triangular (0.3337, 0.7187, 2.1123)	Triangular (0.4643, 1.0000, 2.9392)
T1 Cost per Lb, Simple Structure	8					0.397	0.382	Triangular (0.2915, 0.6471, 2.0614)	Triangular (0.3085, 0.6849, 2.1817)	Triangular (0.4505, 1.0000, 3.1856)
T1 Typical Cost, Simple Structure	8					1.105	1.505	Lognormal (1.0000, 1.5054)	Lognormal (1.8072, 2.7205)	Lognormal (5.9026, 8.8856)
Metrics from Larger Samples										
NR Cost per Lb, All	12	NR	0.01 - 8912.37	Weight	1.3 - 312.63	1.061	1.120	Lognormal (1.0000, 1.1203)	Lognormal (1.5017, 1.6823)	Lognormal (3.3864, 3.7938)
NR to T1 Ratio, All	13	NR	0.01 - 8912.37	T1	6.5 - 4369.68	0.767	0.707	Triangular (0.0000, 0.0014, 2.9986)	Triangular (0.0000, 0.0016, 3.4123)	Triangular (0.0000, 1.0000, 2167.8300)
T1 Cost per Lb, All	12	T1	6.5 - 4369.68	Weight	1.3 - 312.63	0.808	0.918	Lognormal (1.0000, 0.9183)	Lognormal (1.3576, 1.2467)	Lognormal (2.5024, 2.2979)
NR Typical Cost, All	13					1.246	1.551	Lognormal (1.0000, 1.5514)	Lognormal (1.8458, 2.8636)	Lognormal (6.2885, 9.7562)
T1 Typical Cost, All	13					0.920	0.706	Triangular (0.0000, 0.0039, 2.9961)	Triangular (0.0000, 0.0045, 3.4088)	Triangular (0.0000, 1.0000, 762.2270)
Recurring Typical Cost, All	13					0.974	1.058	Lognormal (1.0000, 1.0581)	Lognormal (1.4559, 1.5405)	Lognormal (3.0858, 3.2651)
Metrics from Fitted Samples										
Weight, NR CER Datapoints, New Design	7					0.611	0.578	Triangular (0.0682, 0.3034, 2.6285)	Triangular (0.0755, 0.3359, 2.9101)	Triangular (0.2247, 1.0000, 8.6645)
Weight, T1 CER Datapoints, Simple Structur	8					0.811	0.704	Triangular (0.0000, 0.0095, 2.9905)	Triangular (0.0000, 0.0108, 3.3852)	Triangular (0.0000, 1.0000, 314.3293)
Cost Driver Metrics from Larger Samples										
Weight,(All)	12					0.694	0.658	Triangular (0.0000, 0.1393, 2.8607)	Triangular (0.0000, 0.1567, 3.2162)	Triangular (0.0000, 1.0000, 20.5308)

Figure 4.2-43. 1.3.2.2 Sensor Payload Structure

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset			-		-	1.085				
NR CER Residuals	12	NR	96.11 - 16487.2	Weight	6.6 - 272.79	0.395	0.372	Triangular (0.3621, 0.5943, 2.0436)	Triangular (0.3849, 0.6318, 2.1724)	Triangular (0.6092, 1.0000, 3.4387)
NR Cost per lb	11	NR	96.11 - 16487.2	Weight	6.6 - 272.79	0.739	0.866	Lognormal (1.0000, 0.8658)	Lognormal (1.3228, 1.1453)	Lognormal (2.3144, 2.0039)
NR Cost	12					1.400	1.987	Lognormal (1.0000, 1.9867)	Lognormal (2.2241, 4.4186)	Lognormal (11.0024, 21.8580)
T1 CER Residuals	9	T1	261.75 - 6549.92	Weight	6.6 - 272.79	0.402	0.384	Triangular (0.4035, 0.5110, 2.0855)	Triangular (0.4316, 0.5467, 2.2310)	Triangular (0.7896, 1.0000, 4.0812)
T1 Cost per lb	9	T1	261.75 - 6549.92	Weight	6.6 - 272.79	0.614	0.668	Lognormal (1.0000, 0.6683)	Lognormal (1.2028, 0.8038)	Lognormal (1.7400, 1.1628)
T1 Cost	9					0.776	0.676	Triangular (0.0000, 0.0895, 2.9105)	Triangular (0.0000, 0.1012, 3.2911)	Triangular (0.0000, 1.0000, 32.5243)
Metrics from Entire Dataset										
NR Cost per T1 Cost, New Design	5	NR	4532.96 - 16487.2	T1	1912.88 -	0.668	0.828	Lognormal (1.0000, 0.8282)	Lognormal (1.2985, 1.0754)	Lognormal (2.1892, 1.8132)
NR Cost per T1 Cost, Heritage Design	7	NR	96.11 - 814.91	T1	6.38 -	2.231				
NR Cost per lb, New Design	5	NR	4532.96 - 16487.2	Weight	32.99 -	0.861	1.274	Lognormal (1.0000, 1.2741)	Lognormal (1.6197, 2.0636)	Lognormal (4.2489, 5.4135)
NR Cost per lb, Heritage Design	7	NR	96.11 - 814.91	Weight	6.6 - 99.56	0.417	0.412	Normal (1.0000, 0.4122)	Normal (1.0000, 0.4122)	Normal (1.0000, 0.4122)
NR Cost per T1 Cost, All	11	NR	96.11 - 16487.2	T1	102.73 -	1.169	1.551	Lognormal (1.0000, 1.5515)	Lognormal (1.8458, 2.8638)	Lognormal (6.2889, 9.7571)
T1 Cost per lb, All	12	T1	6.38 - 6549.92	Weight	6.6 - 272.79	0.900	0.931	Lognormal (1.0000, 0.9313)	Lognormal (1.3665, 1.2725)	Lognormal (2.5515, 2.3761)
NR Cost, New Design	5					0.645	0.822	Lognormal (1.0000, 0.8216)	Lognormal (1.2942, 1.0633)	Lognormal (2.1677, 1.7809)
NR Cost, Heritage Design	7					0.639	0.599	Triangular (0.0000, 0.3149, 2.6851)	Triangular (0.0000, 0.3494, 2.9793)	Triangular (0.0000, 1.0000, 8.5267)
Recurring Cost, All	12					1.446	2.270	Lognormal (1.0000, 2.2697)	Lognormal (2.4803, 5.6295)	Lognormal (15.2578, 34.6312)
T1 Cost, All	12					1.045	0.994	Beta (0.0030, 3.1102, 0.3630, 0.7684)	Beta (0.0047, 4.8162, 0.3630, 0.7684)	Beta (, , 0.3630, 0.7684)
Cost Driver Metrics from CER Datasets										
Weight,(CER)	9					0.959	0.874	Beta (0.0569, 2.3509, 0.2754, 0.3945)	Beta (0.0759, 3.1372, 0.2754, 0.3945)	Beta (, , 0.2754, 0.3945)
Cost Driver Metrics from Entire Dataset										
Weight,(All)	12					0.954	0.686	Triangular (0.0000, 0.0601, 2.9399)	Triangular (0.0000, 0.0679, 3.3249)	Triangular (0.0000, 1.0000, 48.9563)

Figure 4.2-44. 1.3.2.3 Sensor Payload Thermal

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals for New or Modified Desi	11	NR	294.92 - 42464.19	Payload Required Power	16.9 - 590	0.314	0.296	Triangular (0.5428, 0.6226, 1.8346)	Triangular (0.5715, 0.6554, 1.9315)	Triangular (0.8719, 1.0000, 2.9469)
NR Cost per watt, New Design	6	NR	516.32 - 42464.19	Payload Required Power	16.9 - 307	0.687	0.603	Triangular (0.0000, 0.3043, 2.6957)	Triangular (0.0000, 0.3357, 2.9732)	Triangular (0.0000, 1.0000, 8.8579)
NR Cost per watt, Modified Design	5	NR	294.92 - 10044.49	Payload Required Power	25 - 590	0.450	0.431	Triangular (0.0000, 0.8975, 2.1025)	Triangular (0.0000, 0.9186, 2.1520)	Triangular (0.0000, 1.0000, 2.3426)
NR Cost per FPA count, New Design	6	NR	516.32 - 42464.19	Number of Focal Plane Arrays (FPA)	2 - 6	0.868	0.693	Triangular (0.0000, 0.0391, 2.9609)	Triangular (0.0000, 0.0440, 3.3330)	Triangular (0.0000, 1.0000, 75.8144)
NR Cost per FPA count, Modified Design	5	NR	294.92 - 10044.49	Number of Focal Plane Arrays (FPA)	1 - 3	0.878	0.875	Lognormal (1.0000, 0.8746)	Lognormal (1.3285, 1.1619)	Lognormal (2.3447, 2.0507)
NR Cost, New Design	6					0.931	0.698	Triangular (0.0000, 0.0251, 2.9749)	Triangular (0.0000, 0.0282, 3.3518)	Triangular (0.0000, 1.0000, 118.7542)
NR Cost, Modified Design	5					0.903	0.899	Lognormal (1.0000, 0.8985)	Lognormal (1.3444, 1.2080)	Lognormal (2.4298, 2.1833)
T1 CER Residuals	12	T1	613.44 - 22186.74	Weight	18.3 - 329.45	0.372	0.390	Lognormal (1.0000, 0.3904)	Lognormal (1.0735, 0.4191)	Lognormal (1.2371, 0.4829)
T1 Cost per watt	12	T1	613.44 - 22186.74	Payload Required Power	16.9 - 590	0.547	0.616	Lognormal (1.0000, 0.6162)	Lognormal (1.1746, 0.7237)	Lognormal (1.6205, 0.9985)
T1 Cost per lb	12	T1	613.44 - 22186.74	Weight	18.3 - 329.45	0.513	0.487	Triangular (0.2481, 0.3774, 2.3745)	Triangular (0.2700, 0.4109, 2.5849)	Triangular (0.6572, 1.0000, 6.2910)
T1 Cost	12					0.838	0.684	Triangular (0.0000, 0.0659, 2.9341)	Triangular (0.0000, 0.0745, 3.3169)	Triangular (0.0000, 1.0000, 44.5361)
Metrics from Entire Dataset										
NR Cost per watt, New Design, All	8	NR	516.32 - 42464.19	Payload Required Power	16.9 - 307	0.686	0.628	Triangular (0.0120, 0.2167, 2.7713)	Triangular (0.0133, 0.2414, 3.0874)	Triangular (0.0552, 1.0000, 12.7869)
NR Cost per watt, Modified Design, All	5	NR	294.92 - 10044.49	Payload Required Power	25 - 590	0.450	0.431	Triangular (0.0000, 0.8975, 2.1025)	Triangular (0.0000, 0.9186, 2.1520)	Triangular (0.0000, 1.0000, 2.3426)
NR Cost per FPA count, New Design, All	6	NR	516.32 - 42464.19	Number of Focal Plane Arrays (FPA)	2 - 6	0.868	0.693	Triangular (0.0000, 0.0391, 2.9609)	Triangular (0.0000, 0.0440, 3.3330)	Triangular (0.0000, 1.0000, 75.8144)
NR Cost per FPA count, Modified Design, Al	5	NR	294.92 - 10044.49	Number of Focal Plane Arrays (FPA)	1 - 3	0.878	0.875	Lognormal (1.0000, 0.8746)	Lognormal (1.3285, 1.1619)	Lognormal (2.3447, 2.0507)
NR to T1 Ratio, New Design, All	8	NR	516.32 - 42464.19	T1	613.44 - 22186.74	0.804	1.003	Lognormal (1.0000, 1.0025)	Lognormal (1.4160, 1.4195)	Lognormal (2.8391, 2.8462)
NR to T1 Ratio, Modified Design, All	5	NR	294.92 - 10044.49	T1	1770.21 - 17198.38	0.636	0.571	Triangular (0.0144, 0.3855, 2.6001)	Triangular (0.0158, 0.4246, 2.8635)	Triangular (0.0372, 1.0000, 6.7440)
NR Cost per watt, All	16	NR	294.92 - 42464.19	Payload Required Power	16.9 - 590	1.105	1.190	Beta (0.0994, 3.4827, 0.1545, 0.4258)	Beta (0.3581, 12.5535, 0.1545, 0.4258)	Beta (, , 0.1545, 0.4258)
NR Cost per FPA count, All	11	NR	294.92 - 42464.19	Number of Focal Plane Arrays (FPA)	1 - 6	1.012	0.975	Beta (0.0223, 2.8439, 0.3113, 0.5870)	Beta (0.0351, 4.4793, 0.3113, 0.5870)	Beta (, , 0.3113, 0.5870)
T1 Cost per watt, All	16	T1	112.97 - 22186.74	Payload Required Power	16.9 - 590	0.929	0.918	Lognormal (1.0000, 0.9182)	Lognormal (1.3576, 1.2466)	Lognormal (2.5023, 2.2977)
T1 Cost per lb, All	16	T1	112.97 - 22186.74	Weight	17.68 - 329.45	1.027	0.988	Lognormal (1.0000, 0.9883)	Lognormal (1.4059, 1.3894)	Lognormal (2.7791, 2.7464)
NR Cost, New Design, All	8					0.943	0.999	Lognormal (1.0000, 0.9992)	Lognormal (1.4136, 1.4124)	Lognormal (2.8248, 2.8225)
NR Cost, Modified Design, All	5					0.903	0.899	Lognormal (1.0000, 0.8985)	Lognormal (1.3444, 1.2080)	Lognormal (2.4298, 2.1833)
NR Cost, All	16					1.296	1.392	Beta (0.0331, 4.7612, 0.1794, 0.6980)	Beta (0.1549, 22.3103, 0.1794, 0.6980)	Beta (, , 0.1794, 0.6980)
T1 Cost, All	16					0.932	0.891	Beta (0.0150, 2.9404, 0.4740, 0.9337)	Beta (0.0200, 3.9331, 0.4740, 0.9337)	Beta (, , 0.4740, 0.9337)
Recurring Cost, All	16					1.326	1.180	Lognormal (1.0000, 1.1797)	Lognormal (1.5465, 1.8244)	Lognormal (3.6986, 4.3632)
Cost Driver Metrics from CER Datasets										
Watt, NR CER, New Design	6					0.860	0.843	Lognormal (1.0000, 0.8427)	Lognormal (1.3077, 1.1021)	Lognormal (2.2365, 1.8847)
Watt, NR CER, Modified Design	5					0.940	0.840	Lognormal (1.0000, 0.8398)	Lognormal (1.3058, 1.0966)	Lognormal (2.2267, 1.8699)
Watt, T1 CER	12					0.947	1.092	Lognormal (1.0000, 1.0916)	Lognormal (1.4804, 1.6160)	Lognormal (3.2445, 3.5417)
Weight, T1 CER	12					0.669	0.643	Triangular (0.0000, 0.1859, 2.8141)	Triangular (0.0000, 0.2082, 3.1522)	Triangular (0.0000, 1.0000, 15.1382)
Cost Driver Metrics from Entire Dataset										
Watt, All	16					1.062	1.262	Lognormal (1.0000, 1.2623)	Lognormal (1.6104, 2.0329)	Lognormal (4.1766, 5.2722)
FPA count, All	11					0.517	0.581	Lognormal (1.0000, 0.5811)	Lognormal (1.1566, 0.6720)	Lognormal (1.5471, 0.8990)
Weight, All	16					0.863	0.826	Beta (0.1527, 2.8446, 0.4062, 0.8842)	Beta (0.2123, 3.9552, 0.4062, 0.8842)	Beta (, , 0.4062, 0.8842)

Figure 4.2-45. 1.3.2.4 Sensor Payload Sensor (Optics and FPA)

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER for New Development or Heritage Design	13	NR	522.61 - 78122.02	Weight	11.46 - 556.97	0.311	0.301	Triangular (0.3552, 0.8424, 1.8024)	Triangular (0.3666, 0.8694, 1.8602)	Triangular (0.4217, 1.0000, 2.1397)
NR Cost per lb, New Development	5	NR	1420.3 - 78122.02	Weight	26.1 - 556.97	0.667	0.716	Lognormal (1.0000, 0.7157)	Lognormal (1.2297, 0.8801)	Lognormal (1.8596, 1.3309)
NR Cost per lb, Heritage Design	8	NR	522.61 - 38120.88	Weight	11.46 - 461	0.675	0.703	Lognormal (1.0000, 0.7033)	Lognormal (1.2225, 0.8598)	Lognormal (1.8272, 1.2851)
NR Cost per SV qty, New Development	5	NR	1420.3 - 78122.02	SV Qty	1 - 4	0.738	0.656	Triangular (0.0000, 0.1478, 2.8522)	Triangular (0.0000, 0.1664, 3.2107)	Triangular (0.0000, 1.0000, 19.2964)
NR Cost per SV qty, Heritage Design	8	NR	522.61 - 38120.88	SV Qty	1 - 5	1.417	1.419	Beta (0.0808, 3.9912, 0.0857, 0.2789)	Beta (0.6739, 33.2799, 0.0857, 0.2789)	Beta (, , 0.0857, 0.2789)
NR Cost, New Development	5					1.351	1.102	Lognormal (1.0000, 1.1024)	Lognormal (1.4884, 1.6408)	Lognormal (3.2972, 3.6348)
NR Cost, Heritage Design	8					1.826	1.394	Beta (0.0806, 5.8759, 0.2076, 1.1007)	Beta (0.2810, 20.4937, 0.2076, 1.1007)	Beta (, , 0.2076, 1.1007)
T1 CER for EOS/Military or non-EOS/Military	12	T1	852.35 - 33611.71	Weight	11.46 - 556.97	0.294	0.280	Triangular (0.2079, 1.3672, 1.4249)	Triangular (0.1986, 1.3057, 1.3608)	Triangular (0.1521, 1.0000, 1.0422)
T1 Cost per lb, EOS/Military	5	T1	1530.87 - 33611.71	Weight	11.46 - 556.97	0.376	0.440	Beta (0.7006, 5.3115, 0.3681, 5.3000)	Beta (0.8642, 6.5518, 0.3681, 5.3000)	Beta (, , 0.3681, 5.3000)
T1 Cost per lb, non-EOS/Military	7	T1	852.35 - 5947.63	Weight	16.5 - 229.48	0.481	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, EOS/Military	5					0.627	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, non-EOS/Military	7					0.853	0.816	Lognormal (1.0000, 0.8159)	Lognormal (1.2906, 1.0531)	Lognormal (2.1499, 1.7542)
Metrics from Entire Dataset										
NR Cost per lb, New Development, All	8	NR	1095.44 - 78122.02	Weight	0.83 - 556.97	1.776	2.067	Lognormal (1.0000, 2.0674)	Lognormal (2.2966, 4.7479)	Lognormal (12.1124, 25.0412)
NR Cost per lb, Heritage Design, All	8	NR	522.61 - 38120.88	Weight	11.46 - 461	0.675	0.703	Lognormal (1.0000, 0.7033)	Lognormal (1.2225, 0.8598)	Lognormal (1.8272, 1.2851)
NR Cost per SV qty, New Development, All	7	NR	1095.44 - 78122.02	Weight	8.56 - 556.97	0.857	0.805	Lognormal (1.0000, 0.8049)	Lognormal (1.2837, 1.0332)	Lognormal (2.1153, 1.7025)
NR Cost per SV qty, Heritage Design, All	8	NR	522.61 - 38120.88	SV Qty	1 - 5	1.417	2.046	Lognormal (1.0000, 2.0463)	Lognormal (2.2775, 4.6604)	Lognormal (11.8139, 24.1741)
NR to T1 Ratio, New Development	8	NR	1095.44 - 78122.02	T1	209.72 - 33038.4	0.658	0.748	Lognormal (1.0000, 0.7483)	Lognormal (1.2490, 0.9345)	Lognormal (1.9482, 1.4578)
NR to T1 Ratio, Heritage Design	8	NR	522.61 - 38120.88	T1	816.91 - 33611.71	0.684	0.779	Lognormal (1.0000, 0.7791)	Lognormal (1.2676, 0.9876)	Lognormal (2.0370, 1.5870)
T1 Cost per lb, EOS/Military, All	5	T1	1530.87 - 33611.71	Weight	11.46 - 556.97	0.376	0.440	Beta (0.7006, 5.3115, 0.3681, 5.3000)	Beta (0.8642, 6.5518, 0.3681, 5.3000)	Beta (, , 0.3681, 5.3000)
T1 Cost per lb, non-EOS/Military, All	11	T1	209.72 - 5947.63	Weight	0.83 - 260.17	1.228	1.501	Lognormal (1.0000, 1.5013)	Lognormal (1.8039, 2.7082)	Lognormal (5.8697, 8.8123)
NR Cost per lb, All	15	NR	522.61 - 78122.02	Weight	8.56 - 556.97	1.003	1.296	Lognormal (1.0000, 1.2961)	Lognormal (1.6370, 2.1218)	Lognormal (4.3871, 5.6862)
T1 Cost per lb, All	16	T1	209.72 - 33611.71	Weight	0.83 - 556.97	0.977	1.092	Lognormal (1.0000, 1.0924)	Lognormal (1.4810, 1.6179)	Lognormal (3.2484, 3.5487)
NR Cost, New Development, All	8					1.732	6.330	Lognormal (1.0000, 6.3302)	Lognormal (6.4087, 40.5682)	Lognormal (263.2127, 1666.1854)
NR Cost, Heritage Design, All	8					1.826	1.394	Beta (0.0806, 5.8759, 0.2076, 1.1007)	Beta (0.2810, 20.4937, 0.2076, 1.1007)	Beta (, , 0.2076, 1.1007)
T1 Cost, EOS/Military, All	5					0.627	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, non-EOS/Military, All	11					0.979	0.931	Lognormal (1.0000, 0.9309)	Lognormal (1.3663, 1.2719)	Lognormal (2.5503, 2.3742)
Recurring Cost, EOS/Military	5					0.970	1.003	Lognormal (1.0000, 1.0031)	Lognormal (1.4164, 1.4208)	Lognormal (2.8417, 2.8506)
Recurring Cost, non-EOS/Military	11					0.898	0.968	Lognormal (1.0000, 0.9678)	Lognormal (1.3917, 1.3469)	Lognormal (2.6953, 2.6086)
NR Cost, All	15					1.583	2.450	Lognormal (1.0000, 2.4499)	Lognormal (2.6461, 6.4828)	Lognormal (18.5285, 45.3933)
T1 Cost, All	13					1.469	1.557	Lognormal (1.0000, 1.5575)	Lognormal (1.8509, 2.8828)	Lognormal (6.3408, 9.8758)
Recurring Cost, All	14					1.544	1.919	Lognormal (1.0000, 1.9186)	Lognormal (2.1636, 4.1510)	Lognormal (10.1275, 19.4304)
Cost Driver Metrics from CER Datasets										
Weight, NR CER, New Development	5					0.799	0.988	Lognormal (1.0000, 0.9882)	Lognormal (1.4059, 1.3893)	Lognormal (2.7788, 2.7460)
Weight, NR CER, Heritage Design	8					1.162	1.123	Beta (0.0732, 2.9459, 0.1389, 0.2917)	Beta (0.2096, 8.4307, 0.1389, 0.2917)	Beta (, , 0.1389, 0.2917)
Weight, T1 CER, EOS/Military	5					0.665	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Weight, T1 CER, non-EOS/Military	7					1.035	1.220	Lognormal (1.0000, 1.2199)	Lognormal (1.5774, 1.9243)	Lognormal (3.9248, 4.7878)
Cost Driver Metrics from Entire Dataset										
Weight, T1 CER, non-EOS/Military	16					1.159	1.115	Beta (0.0054, 3.6071, 0.3002, 0.7868)	Beta (0.0107, 7.1924, 0.3002, 0.7868)	Beta (, , 0.3002, 0.7868)

Figure 4.2-46. 1.3.2.5 Sensor Payload Electronics

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		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset						1.085				
NR CER Residuals	5	NR	23.81 - 9981.32	T1	67.04 - 2196.61	0.998	1.077	Lognormal (1.0000, 1.0768)	Lognormal (1.4695, 1.5823)	Lognormal (3.1733, 3.4169)
NR Cost per T1 Cost	5	NR	23.81 - 9981.32	T1	67.04 - 2196.61	0.998	1.077	Lognormal (1.0000, 1.0768)	Lognormal (1.4695, 1.5823)	Lognormal (3.1733, 3.4169)
NR Cost	5					1.704	1.599	Lognormal (1.0000, 1.5990)	Lognormal (1.8860, 3.0158)	Lognormal (6.7083, 10.7269)
Metrics from Entire Dataset										
NR Cost per lb, All	12	NR	23.81 - 9981.32	Weight	9.54 - 3286.6	2.147	1.942	Beta (0.0126, 120.3254, 0.2482, 30.0000)	Beta (0.0649, 618.9011, 0.2482, 30.0000)	Beta (, , 0.2482, 30.0000)
T1 Cost per lb, All	16	T1	0 - 2196.61	Weight	9.54 - 3286.6	1.339	1.312	Beta (0.0000, 4.4234, 0.2236, 0.7653)	Beta (0.0000, 14.7127, 0.2236, 0.7653)	Beta (, , 0.2236, 0.7653)
NR to T1 Ratio, All	15	NR	6.68 - 9981.32	T1	30.86 - 3792.48	1.375	1.459	Beta (0.0106, 39.4095, 0.4233, 16.4335)	Beta (0.0261, 96.6611, 0.4233, 16.4335)	Beta (, , 0.4233, 16.4335)
NR Cost, All	18					1.199	1.160	Beta (0.0070, 4.3801, 0.3397, 1.1563)	Beta (0.0143, 8.9834, 0.3397, 1.1563)	Beta (, , 0.3397, 1.1563)
Cost Driver Metrics from Entire Dataset										
Weight, All	18					0.794	0.676	Triangular (0.0000, 0.0881, 2.9119)	Triangular (0.0000, 0.0996, 3.2901)	Triangular (0.0000, 1.0000, 33.0427)

Figure 4.2-47. 1.4 Booster Adapter

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
T1 CER Residuals	20	T1	540.69 - 31029.4	SV Weight	148.27 - 8630.97	0.390	0.387	Normal (1.0000, 0.3875)	Normal (1.0000, 0.3875)	Normal (1.0000, 0.3875)
T1 Cost per lb	20	T1	540.69 - 31029.4	SV Weight	148.27 - 8630.97	0.390	0.387	Normal (1.0000, 0.3875)	Normal (1.0000, 0.3875)	Normal (1.0000, 0.3875)
T1 Cost	20					1.073	1.420	Lognormal (1.0000, 1.4202)	Lognormal (1.7369, 2.4667)	Lognormal (5.2401, 7.4420)
Metrics from Entire Dataset										
T1 Cost per lb, Military	22	T1	28.67 - 31029.4	SV Weight	148.27 - 8630.97	0.556	0.484	Triangular (0.0000, 0.6891, 2.3109)	Triangular (0.0000, 0.7312, 2.4523)	Triangular (0.0000, 1.0000, 3.3537)
T1 Cost per lb, NASA	16	T1	531.35 - 41320.38	SV Weight	361.58 - 14615.34	0.853	0.947	Lognormal (1.0000, 0.9472)	Lognormal (1.3774, 1.3046)	Lognormal (2.6131, 2.4750)
T1 Cost per lb, All	50	T1	28.67 - 41320.38	SV Weight	148.27 - 14615.34	0.740	0.760	Lognormal (1.0000, 0.7600)	Lognormal (1.2560, 0.9546)	Lognormal (1.9816, 1.5061)
T1 Cost, Military	22					1.182	1.466	Lognormal (1.0000, 1.4662)	Lognormal (1.7747, 2.6021)	Lognormal (5.5899, 8.1958)
T1 Cost, NASA	17					1.045	1.019	Beta (0.0457, 3.5542, 0.3664, 0.9808)	Beta (0.0778, 6.0511, 0.3664, 0.9808)	Beta (, , 0.3664, 0.9808)
T1 Cost, All	51					1.118	1.143	Lognormal (1.0000, 1.1429)	Lognormal (1.5187, 1.7358)	Lognormal (3.5025, 4.0032)
Cost Driver Metrics from CER Datasets										
Weight, T1 CER	20					0.890	0.982	Lognormal (1.0000, 0.9821)	Lognormal (1.4016, 1.3764)	Lognormal (2.7533, 2.7039)
Cost Driver Metrics from Entire Dataset										
Weight, All	51					0.880	0.948	Lognormal (1.0000, 0.9478)	Lognormal (1.3778, 1.3059)	Lognormal (2.6156, 2.4792)

Figure 4.2-48. 1.5 Launch Systems Integration, Launch Operations, Mission Support

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
NR CER Residuals	25	NR	520.01 - 54955.83	SV_IT_NR	253.16 - 56096.38	0.513	0.474	Triangular (0.0000, 0.7281, 2.2719)	Triangular (0.0000, 0.7683, 2.3975)	Triangular (0.0000, 1.0000, 3.1204)
NR Cost per SV IT NR	23	NR	520.01 - 54955.83	SV_IT_NR	614.54 - 56096.38	0.770	0.694	Triangular (0.0000, 0.0382, 2.9618)	Triangular (0.0000, 0.0433, 3.3617)	Triangular (0.0000, 1.0000, 77.5726)
NR Cost per SV qty	25	NR	520.01 - 54955.83	SV Qty	1 - 21	0.585	0.580	Lognormal (1.0000, 0.5801)	Lognormal (1.1561, 0.6706)	Lognormal (1.5450, 0.8962)
NR Cost	25					1.021	1.145	Lognormal (1.0000, 1.1452)	Lognormal (1.5203, 1.7410)	Lognormal (3.5140, 4.0241)
Metrics from Entire Dataset										
NR Cost per SV IT NR, New Design	21	NR	710.42 - 219765.11	SV_IT_NR	1861.58 - 69917.35	0.903	0.924	Lognormal (1.0000, 0.9236)	Lognormal (1.3613, 1.2573)	Lognormal (2.5226, 2.3299)
NR Cost per SV IT NR, Modified Design	18	NR	492.68 - 64911.85	SV_IT_NR	253.16 - 9101.85	1.432	1.616	Lognormal (1.0000, 1.6156)	Lognormal (1.9001, 3.0698)	Lognormal (6.8596, 11.0825)
NR Cost per SV qty, New Design	20	NR	710.42 - 219765.11	SV Qty	1 - 28	1.076	1.134	Lognormal (1.0000, 1.1336)	Lognormal (1.5116, 1.7136)	Lognormal (3.4541, 3.9155)
NR Cost per SV qty, Modified Design	22	NR	492.68 - 64911.85	SV Qty	1 - 7	1.049	1.059	Lognormal (1.0000, 1.0592)	Lognormal (1.4567, 1.5428)	Lognormal (3.0908, 3.2736)
NR Cost per SV IT NR, All	40	NR	492.68 - 219765.11	SV_IT_NR	22.84 - 69917.35	2.098	2.475	Lognormal (1.0000, 2.4746)	Lognormal (2.6690, 6.6046)	Lognormal (19.0125, 47.0478)
NR Cost per SV qty, All	48	NR	492.68 - 219765.11	SV Qty	1 - 28	1.922	1.937	Lognormal (1.0000, 1.9368)	Lognormal (2.1797, 4.2217)	Lognormal (10.3562, 20.0579)
NR Cost, New Design	21					1.341	1.614	Lognormal (1.0000, 1.6145)	Lognormal (1.8991, 3.0661)	Lognormal (6.8493, 11.0583)
NR Cost, Modified Design	21					0.838	0.682	Triangular (0.0000, 0.0703, 2.9297)	Triangular (0.0000, 0.0796, 3.3175)	Triangular (0.0000, 1.0000, 41.6716)
NR Cost, All	48					1.695	2.054	Lognormal (1.0000, 2.0536)	Lognormal (2.2841, 4.6906)	Lognormal (11.9166, 24.4716)
Cost Driver Metrics from CER Datasets										
SV IT NR, NR CER	25					1.467	2.298	Lognormal (1.0000, 2.2978)	Lognormal (2.5060, 5.7583)	Lognormal (15.7376, 36.1623)
SV qty, NR CER	25					1.049	1.036	Lognormal (1.0000, 1.0355)	Lognormal (1.4396, 1.4907)	Lognormal (2.9833, 3.0893)
Cost Driver Metrics from Entire Dataset										
SV IT NR, All	40					1.416	1.595	Lognormal (1.0000, 1.5954)	Lognormal (1.8829, 3.0039)	Lognormal (6.6751, 10.6492)
SV qty, All	48					1.360	1.895	Lognormal (1.0000, 1.8947)	Lognormal (2.1424, 4.0592)	Lognormal (9.8332, 18.6308)

Figure 4.2-49. 1.6 AGE

4.3 CRUAMM SPACE SYSTEMS (FMS) EMPIRICALLY BASED UNCERTIANTY PARAMETERS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from CER Dataset										
Str/Therm Subsystem T1 CER	38	T1	580.11 - 16903.33	Weight	20.46 - 2082.76	0.406	0.399	Triangular (0.0000, 1.0476, 1.9524)	Triangular (0.0000, 1.0360, 1.9308)	Triangular (0.0000, 1.0000, 1.8637)
Str/Therm Subsystem T1 Cost	38	T2	-	Weight	-	0.824	0.781	Lognormal (1.0000, 0.7811)	Lognormal (1.2689, 0.9912)	Lognormal (2.0431, 1.5959)
EPS Subsystem T1 CER	38	T3	875.51 - 35227.96	Weight	68.29 - 2012.99	0.824	0.805	Beta (0.2412, 3.8980, 0.4968, 1.8973)	Beta (0.3431, 5.5454, 0.4968, 1.8973)	Beta (, , 0.4968, 1.8973)
EPS Subsystem T1 Cost	50	T4	-	Weight	-	0.794	0.682	Triangular (0.0000, 0.0727, 2.9273)	Triangular (0.0000, 0.0824, 3.3138)	Triangular (0.0000, 1.0000, 40.2372)
ADCS Subsystem T1 CER	41	T5	991.17 - 29751.03	Weight	262.24 - 10189.13	0.424	0.434	Lognormal (1.0000, 0.4337)	Lognormal (1.0900, 0.4727)	Lognormal (1.2950, 0.5617)
ADCS Subsystem T1 Cost	41	T6	-	Weight	-	0.767	0.874	Lognormal (1.0000, 0.8736)	Lognormal (1.3278, 1.1600)	Lognormal (2.3412, 2.0453)
Propulsion Subsystem T1 CER	46	T7	255.47 - 19966.92	Weight	18.95 - 721.71	0.412	0.422	Lognormal (1.0000, 0.4224)	Lognormal (1.0855, 0.4585)	Lognormal (1.2792, 0.5403)
Propulsion Subsystem T1 Cost	46	T8	-	Weight	-	0.824	0.884	Lognormal (1.0000, 0.8836)	Lognormal (1.3344, 1.1790)	Lognormal (2.3762, 2.0995)
TTC Subsystem T1 CER	42	T9	2357.61 - 24128.54	Weight	10.24 - 201.5	0.295	0.294	Lognormal (1.0000, 0.2941)	Lognormal (1.0424, 0.3066)	Lognormal (1.1325, 0.3331)
TTC Subsystem T1 Cost	42	T10	-	Weight	-	0.689	0.744	Lognormal (1.0000, 0.7438)	Lognormal (1.2463, 0.9270)	Lognormal (1.9358, 1.4399)

Figure 4.3-1 Space Bus CERs

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics From CERs										
Analog Subsystem T1 CER	38	AnalogActual	2763.12 - 171885.39	Weight	24.5 - 1029.94	0.447	0.461	Lognormal (1.0000, 0.4614)	Lognormal (1.1013, 0.5082)	Lognormal (1.3358, 0.6163)
Analog Subsystem T1 Crosscheck CER	38	AnalogxcActual	2763.12 - 171885.39	Weight	24.5 - 1029.94	0.507	0.525	Lognormal (1.0000, 0.5245)	Lognormal (1.1292, 0.5923)	Lognormal (1.4399, 0.7553)
Analog Subsystem T1 Cost	38					0.988	1.099	Lognormal (1.0000, 1.0995)	Lognormal (1.4862, 1.6341)	Lognormal (3.2828, 3.6094)
Antenna Subsystem T1 CER	38	AntennaActual	292.84 - 140740.25	Weight	1.37 - 2102.48	0.541	0.553	Lognormal (1.0000, 0.5534)	Lognormal (1.1429, 0.6325)	Lognormal (1.4929, 0.8262)
Antenna Subsystem T1 Crosscheck CER	38	AntennaxcActual	292.84 - 140740.25	Weight	1.37 - 2102.48	1.060	1.149	Lognormal (1.0000, 1.1489)	Lognormal (1.5232, 1.7500)	Lognormal (3.5338, 4.0600)
Antenna Subsystem T1 Cost	38					1.546	3.335	Lognormal (1.0000, 3.3352)	Lognormal (3.4819, 11.6129)	Lognormal (42.2133, 140.7902)
Digital Electronics Subsystem T1 CER	21	DigElecActual	1080.15 - 111818.47	Weight	7.21 - 624.49	0.747	0.858	Lognormal (1.0000, 0.8577)	Lognormal (1.3174, 1.1299)	Lognormal (2.2866, 1.9612)
Digital Electronics Subsystem T1 Crosscheck CER	25	DigElecxcActual	378.41 - 111818.47	Weight	7.21 - 624.49	0.512	0.510	Lognormal (1.0000, 0.5096)	Lognormal (1.1223, 0.5719)	Lognormal (1.4137, 0.7204)
Digital Electronics Subsystem T1 Cost	16					0.726	0.806	Lognormal (1.0000, 0.8058)	Lognormal (1.2843, 1.0349)	Lognormal (2.1181, 1.7068)

Figure 4.3-2 Space Payload CERs

4.4 CRUAMM SPACE SYSTEMS (GROWTH) EMPIRICALLY BASED UNCERTIANTY PARAMETERS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	17					0.228	0.231	Lognormal (1.0000, 0.2307)	Lognormal (1.0263, 0.2367)	Lognormal (1.0809, 0.2493)
Weight Growth, >50% Design	10					0.210	0.208	Lognormal (1.0000, 0.2082)	Lognormal (1.0214, 0.2127)	Lognormal (1.0657, 0.2219)
Weight Growth, <50% Design	7					0.255	0.228	Triangular (0.6021, 0.7583, 1.6396)	Triangular (0.6249, 0.7871, 1.7017)	Triangular (0.7940, 1.0000, 2.1620)
Design Factor Volatility, All	14					0.700	0.835	Lognormal (1.0000, 0.8350)	Lognormal (1.3028, 1.0878)	Lognormal (2.2111, 1.8462)
Design Factor Volatility, >50% Design	7					0.155	0.159	Lognormal (1.0000, 0.1590)	Lognormal (1.0126, 0.1610)	Lognormal (1.0382, 0.1651)
Design Factor Volatility, <50% Design	7					0.562	0.640	Lognormal (1.0000, 0.6404)	Lognormal (1.1875, 0.7605)	Lognormal (1.6745, 1.0724)
Design Factor, All	14					0.376	0.355	Triangular (0.0000, 1.4272, 1.5728)	Triangular (0.0000, 1.3480, 1.4855)	Triangular (0.0000, 1.0000, 1.1020)
Design Factor, >50% Design	7					0.143	0.142	Normal (1.0000, 0.1424)	Normal (1.0000, 0.1424)	Normal (1.0000, 0.1424)
Design Factor. <50% Design	7					0.528	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)

Figure 4.4-1 1.1 Spacecraft Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	17					0.248	0.219	Triangular (0.6731, 0.7078, 1.6191)	Triangular (0.6993, 0.7354, 1.6821)	Triangular (0.9509, 1.0000, 2.2874)
Weight Growth, >50% Design	5					0.207	0.206	Lognormal (1.0000, 0.2057)	Lognormal (1.0209, 0.2100)	Lognormal (1.0641, 0.2189)
Weight Growth, <50% Design	12					0.272	0.261	Triangular (0.5792, 0.6859, 1.7350)	Triangular (0.6052, 0.7167, 1.8129)	Triangular (0.8444, 1.0000, 2.5296)
Design Factor Volatility, All	14					0.575	0.547	Triangular (0.0902, 0.3703, 2.5394)	Triangular (0.0991, 0.4067, 2.7885)	Triangular (0.2437, 1.0000, 6.8571)
Design Factor Volatility, >50% Design	3					0.191				
Design Factor Volatility, <50% Design	11					0.526	0.507	Triangular (0.1974, 0.3728, 2.4299)	Triangular (0.2158, 0.4076, 2.6569)	Triangular (0.5294, 1.0000, 6.5182)
Design Factor, All	14					0.416	0.402	Triangular (0.0125, 1.0053, 1.9822)	Triangular (0.0125, 1.0042, 1.9798)	Triangular (0.0124, 1.0000, 1.9716)
Design Factor, >50% Design	3					0.108				
Design Factor. <50% Design	11					0.463	0.443	Triangular (0.3199, 0.4297, 2.2504)	Triangular (0.3459, 0.4647, 2.4337)	Triangular (0.7445, 1.0000, 5.2376)

Figure 4.4-2 1.2 Space Bus Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	18					0.497	0.502	Lognormal (1.0000, 0.5019)	Lognormal (1.1189, 0.5616)	Lognormal (1.4008, 0.7031)
Weight Growth, >50% Design	11					0.441	0.465	Lognormal (1.0000, 0.4646)	Lognormal (1.1027, 0.5123)	Lognormal (1.3406, 0.6228)
Weight Growth, <50% Design	7					0.585	0.611	Lognormal (1.0000, 0.6112)	Lognormal (1.1720, 0.7163)	Lognormal (1.6098, 0.9839)
Design Factor Volatility, All	13					0.802	0.890	Lognormal (1.0000, 0.8902)	Lognormal (1.3388, 1.1918)	Lognormal (2.3997, 2.1361)
Design Factor Volatility, >50% Design	7					0.268	0.254	Lognormal (1.0000, 0.2539)	Lognormal (1.0317, 0.2619)	Lognormal (1.0982, 0.2788)
Design Factor Volatility, <50% Design	6					0.482	0.501	Lognormal (1.0000, 0.5007)	Lognormal (1.1184, 0.5600)	Lognormal (1.3988, 0.7004)
Design Factor, All	14					0.415	0.398	Beta (0.1832, 1.3084, 0.4273, 0.1613)	Beta (0.1480, 1.0572, 0.4273, 0.1613)	Beta (, , 0.4273, 0.1613)
Design Factor, >50% Design	8					0.309	0.298	Beta (0.0000, 1.1942, 0.9978, 0.1938)	Beta (0.0000, 1.0339, 0.9978, 0.1938)	Beta (, , 0.9978, 0.1938)
Design Factor. <50% Design	6					0.577	0.532	Beta (0.2103, 1.5224, 0.2768, 0.1831)	Beta (0.1782, 1.2897, 0.2768, 0.1831)	Beta (, , 0.2768, 0.1831)

Figure 4.4-3 1.2.2 Space Bus Structures and Mechanisms Growth

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		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	18					0.399	0.387	Triangular (0.1976, 0.7568, 2.0456)	Triangular (0.2069, 0.7927, 2.1425)	Triangular (0.2610, 1.0000, 2.7028)
Weight Growth, >50% Design	13					0.387	0.376	Triangular (0.3968, 0.5427, 2.0605)	Triangular (0.4236, 0.5793, 2.1994)	Triangular (0.7312, 1.0000, 3.7966)
Weight Growth, <50% Design	5					0.369	0.340	Normal (1.0000, 0.3395)	Normal (1.0000, 0.3395)	Normal (1.0000, 0.3395)
Design Factor Volatility, All	12					0.891	0.903	Lognormal (1.0000, 0.9032)	Lognormal (1.3475, 1.2171)	Lognormal (2.4468, 2.2099)
Design Factor Volatility, >50% Design	8					0.337	0.346	Lognormal (1.0000, 0.3460)	Lognormal (1.0582, 0.3661)	Lognormal (1.1848, 0.4099)
Design Factor Volatility, <50% Design	4					0.253				
Design Factor, All	13					0.300	0.291	Triangular (0.1797, 1.3543, 1.4660)	Triangular (0.1713, 1.2912, 1.3977)	Triangular (0.1327, 1.0000, 1.0825)
Design Factor, >50% Design	9					0.322	0.311	Triangular (0.1267, 1.3538, 1.5195)	Triangular (0.1205, 1.2880, 1.4456)	Triangular (0.0936, 1.0000, 1.1224)
Design Factor. <50% Design	4					0.286				

Figure 4.4-4 1.2.3 Space Bus Thermal Control Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	18					0.297	0.286	Triangular (0.5568, 0.6370, 1.8062)	Triangular (0.5850, 0.6692, 1.8975)	Triangular (0.8742, 1.0000, 2.8357)
Weight Growth, >50% Design	8					0.265	0.248	Triangular (0.5853, 0.7180, 1.6967)	Triangular (0.6092, 0.7474, 1.7662)	Triangular (0.8151, 1.0000, 2.3631)
Weight Growth, <50% Design	10					0.327	0.312	Triangular (0.5043, 0.6168, 1.8789)	Triangular (0.5316, 0.6502, 1.9805)	Triangular (0.8176, 1.0000, 3.0461)
Design Factor Volatility, All	14					0.956	1.248	Lognormal (1.0000, 1.2477)	Lognormal (1.5990, 1.9952)	Lognormal (4.0885, 5.1014)
Design Factor Volatility, >50% Design	4					0.163				
Design Factor Volatility, <50% Design	10					0.841	1.051	Lognormal (1.0000, 1.0511)	Lognormal (1.4508, 1.5250)	Lognormal (3.0538, 3.2100)
Design Factor, All	14					0.457	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Design Factor, >50% Design	4					0.300				
Design Factor. <50% Design	10					0.526	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)

Figure 4.4-5 1.2.4 Space Bus Electrical Power Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	18					0.318	0.310	Normal (1.0000, 0.3103)	Normal (1.0000, 0.3103)	Normal (1.0000, 0.3103)
Weight Growth, >50% Design	5					0.241	0.230	Triangular (0.3540, 1.2516, 1.3944)	Triangular (0.3413, 1.2066, 1.3442)	Triangular (0.2828, 1.0000, 1.1141)
Weight Growth, <50% Design	13					0.353	0.343	Normal (1.0000, 0.3429)	Normal (1.0000, 0.3429)	Normal (1.0000, 0.3429)
Design Factor Volatility, All	13					0.684	0.726	Lognormal (1.0000, 0.7263)	Lognormal (1.2359, 0.8977)	Lognormal (1.8880, 1.3713)
Design Factor Volatility, >50% Design	2					0.097				
Design Factor Volatility, <50% Design	11					0.637	0.667	Lognormal (1.0000, 0.6668)	Lognormal (1.2019, 0.8014)	Lognormal (1.7362, 1.1576)
Design Factor, All	14					0.788	0.704	Triangular (0.0000, 0.0084, 2.9916)	Triangular (0.0000, 0.0096, 3.3974)	Triangular (0.0000, 1.0000, 354.5611)
Design Factor, >50% Design	3					0.875				
Design Factor, <50% Design	11					0.809	0.704	Triangular (0.0000, 0.0085, 2.9915)	Triangular (0.0000, 0.0097, 3.4025)	Triangular (0.0000, 1.0000, 350.6575)

Figure 4.4-6 1.2.5 Space Bus Attitude Control Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	16					0.273	0.277	Lognormal (1.0000, 0.2769)	Lognormal (1.0376, 0.2874)	Lognormal (1.1172, 0.3094)
Weight Growth, >50% Design	7					0.239	0.225	Triangular (0.6268, 0.7416, 1.6316)	Triangular (0.6509, 0.7702, 1.6944)	Triangular (0.8452, 1.0000, 2.2001)
Weight Growth, <50% Design	9					0.300	0.295	Lognormal (1.0000, 0.2950)	Lognormal (1.0426, 0.3076)	Lognormal (1.1334, 0.3344)
Design Factor Volatility, All	10					1.308	2.451	Lognormal (1.0000, 2.4512)	Lognormal (2.6473, 6.4889)	Lognormal (18.5526, 45.4753)
Design Factor Volatility, >50% Design	3					0.776				
Design Factor Volatility, <50% Design	7					1.200	2.140	Lognormal (1.0000, 2.1395)	Lognormal (2.3617, 5.0530)	Lognormal (13.1727, 28.1836)
Design Factor, All	11					0.678	0.629	Triangular (0.0000, 0.2253, 2.7747)	Triangular (0.0000, 0.2520, 3.1036)	Triangular (0.0000, 1.0000, 12.3166)
Design Factor, >50% Design	4					0.775				
Design Factor. <50% Design	7					0.664	0.606	Triangular (0.0000, 0.2949, 2.7051)	Triangular (0.0000, 0.3278, 3.0071)	Triangular (0.0000, 1.0000, 9.1737)

Figure 4.4-7 1.2.6 Space Bus Propulsion Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	17					0.191	0.189	Normal (1.0000, 0.1893)	Normal (1.0000, 0.1893)	Normal (1.0000, 0.1893)
Weight Growth, >50% Design	4					0.128				
Weight Growth, <50% Design	13					0.207	0.204	Normal (1.0000, 0.2043)	Normal (1.0000, 0.2043)	Normal (1.0000, 0.2043)
Design Factor Volatility, All	14					1.135	1.931	Lognormal (1.0000, 1.9313)	Lognormal (2.1749, 4.2004)	Lognormal (10.2871, 19.8677)
Design Factor Volatility, >50% Design	2					0.040				
Design Factor Volatility, <50% Design	12					1.088	1.819	Lognormal (1.0000, 1.8192)	Lognormal (2.0759, 3.7765)	Lognormal (8.9462, 16.2748)
Design Factor, All	14					0.660	0.630	Triangular (0.0000, 0.2242, 2.7758)	Triangular (0.0000, 0.2504, 3.1010)	Triangular (0.0000, 1.0000, 12.3823)
Design Factor, >50% Design	2					0.170				
Design Factor. <50% Design	12					0.699	0.740	Lognormal (1.0000, 0.7400)	Lognormal (1.2440, 0.9205)	Lognormal (1.9251, 1.4245)

Figure 4.4-8 1.2.7 Space Bus TT&C Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	18					0.393	0.405	Lognormal (1.0000, 0.4048)	Lognormal (1.0788, 0.4367)	Lognormal (1.2556, 0.5082)
Weight Growth, >50% Design	8					0.500	0.531	Lognormal (1.0000, 0.5312)	Lognormal (1.1323, 0.6015)	Lognormal (1.4518, 0.7712)
Weight Growth, <50% Design	9					0.199	0.179	Lognormal (1.0000, 0.1791)	Lognormal (1.0159, 0.1819)	Lognormal (1.0485, 0.1877)
Design Factor Volatility, All	12					0.677	0.703	Lognormal (1.0000, 0.7035)	Lognormal (1.2226, 0.8601)	Lognormal (1.8277, 1.2857)
Design Factor Volatility, >50% Design	3					0.459				
Design Factor Volatility, <50% Design	8					0.628	0.620	Normal (1.0000, 0.6202)	Normal (1.0000, 0.6202)	Normal (1.0000, 0.6202)
Design Factor, All	13					0.639	0.569	Triangular (0.0000, 0.4075, 2.5925)	Triangular (0.0000, 0.4481, 2.8502)	Triangular (0.0000, 1.0000, 6.3613)
Design Factor, >50% Design	4					0.673				
Design Factor. <50% Design	8					0.717	0.713	Normal (1.0000, 0.7128)	Normal (1.0000, 0.7128)	Normal (1.0000, 0.7128)

Figure 4.4-9 1.3.1 Space Payload Communication Growth

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	16					0.220	0.211	Triangular (0.6700, 0.7340, 1.5960)	Triangular (0.6946, 0.7610, 1.6547)	Triangular (0.9128, 1.0000, 2.1744)
Weight Growth, >50% Design	10					0.218	0.207	Triangular (0.4157, 1.2458, 1.3385)	Triangular (0.4021, 1.2051, 1.2947)	Triangular (0.3337, 1.0000, 1.0743)
Weight Growth, <50% Design	6					0.116	0.107	Triangular (0.8093, 0.8930, 1.2977)	Triangular (0.8221, 0.9071, 1.3182)	Triangular (0.9063, 1.0000, 1.4532)
Design Factor Volatility, All	11					0.945	1.245	Lognormal (1.0000, 1.2453)	Lognormal (1.5971, 1.9889)	Lognormal (4.0738, 5.0731)
Design Factor Volatility, >50% Design	5					0.361	0.388	Lognormal (1.0000, 0.3884)	Lognormal (1.0728, 0.4167)	Lognormal (1.2346, 0.4795)
Design Factor Volatility, <50% Design	6					0.722	0.895	Lognormal (1.0000, 0.8946)	Lognormal (1.3418, 1.2004)	Lognormal (2.4156, 2.1610)
Design Factor, All	12					0.517	0.714	Lognormal (1.0000, 0.7138)	Lognormal (1.2286, 0.8771)	Lognormal (1.8547, 1.3240)
Design Factor, >50% Design	6					0.577	0.903	Lognormal (1.0000, 0.9030)	Lognormal (1.3474, 1.2167)	Lognormal (2.4461, 2.2089)
Design Factor. <50% Design	6					0.502	0.598	Lognormal (1.0000, 0.5977)	Lognormal (1.1650, 0.6964)	Lognormal (1.5812, 0.9451)

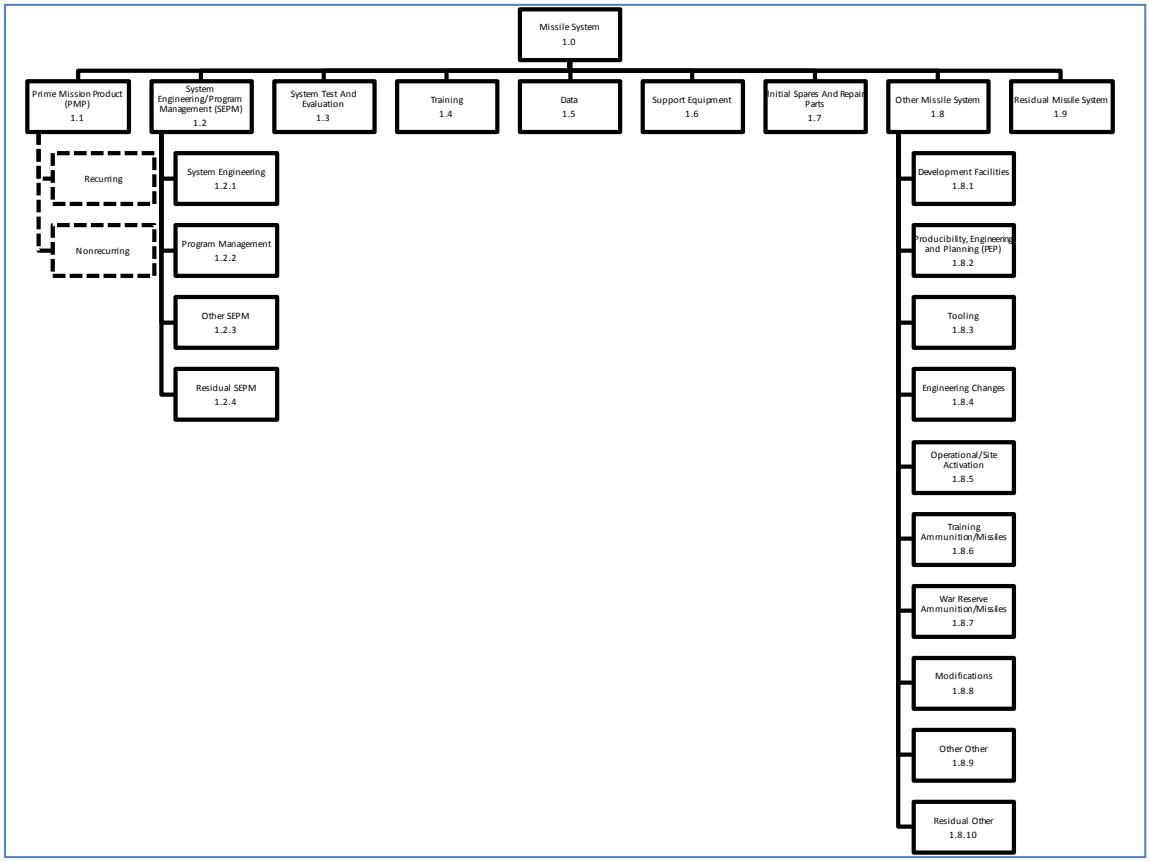
Figure 4.4-10 1.3.1.3 Space Payload Electronics Growth

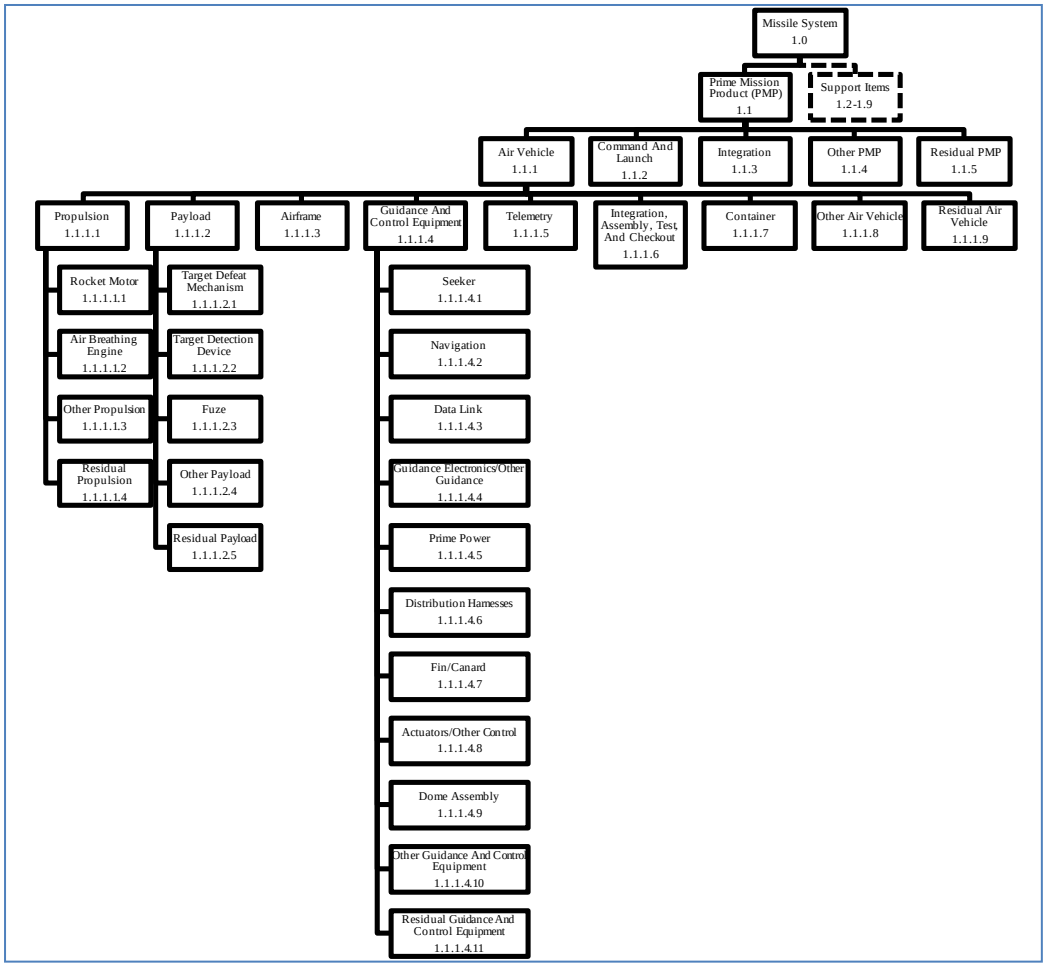
		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Weight Growth, All	13					0.272	0.256	Triangular (0.5730, 0.7084, 1.7185)	Triangular (0.5982, 0.7396, 1.7940)	Triangular (0.8089, 1.0000, 2.4258)
Weight Growth, >50% Design	8					0.279	0.262	Triangular (0.5830, 0.6769, 1.7400)	Triangular (0.6090, 0.7071, 1.8175)	Triangular (0.8613, 1.0000, 2.5704)
Weight Growth, <50% Design	5					0.266	0.270	Lognormal (1.0000, 0.2703)	Lognormal (1.0359, 0.2800)	Lognormal (1.1116, 0.3005)
Design Factor Volatility, All	9					0.800	0.882	Lognormal (1.0000, 0.8816)	Lognormal (1.3331, 1.1753)	Lognormal (2.3694, 2.0889)
Design Factor Volatility, >50% Design	4					0.339				
Design Factor Volatility, <50% Design	5					0.491	0.455	Triangular (0.2027, 0.5235, 2.2738)	Triangular (0.2185, 0.5644, 2.4516)	Triangular (0.3871, 1.0000, 4.3436)
Design Factor, All	10					0.717	0.667	Triangular (0.0000, 0.1149, 2.8851)	Triangular (0.0000, 0.1293, 3.2469)	Triangular (0.0000, 1.0000, 25.1066)
Design Factor, >50% Design	5					0.550	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Design Factor. <50% Design	5					0.983	1.506	Lognormal (1.0000, 1.5057)	Lognormal (1.8075, 2.7216)	Lognormal (5.9054, 8.8917)

Figure 4.4-11 1.3.1.4 Space Payload Antennas Total Growth

5: CRUAMM MISSILES

5.1 CRUAMM MISSILES WORK BREAKDOWN STRUCTURE





5.2 CRUAMM MISSILES EMPIRICALLY BASED UNCERTIANTY PARAMETERS

Empirical risk metrics presented for the Missile commodity are drawn from datasets for the AFCAA Missile Sufficiency Review Handbook, September 2011. Figures 5.2-1 through 5.2-10 correspond to Tables in that Handbook. The fit results are color coded to identify type of data fit.

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

For use in Development Phase factor estimating, Table 2.1 of the MSSRH presents secondary cost elements as a percent of PMP for each system. Their CRUAMM fitted distributions are presented in Figure 5.2-1.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
SEPM	28	SEPM$	9223 - 582640	PMP$	9864 - 1190909	0.419	0.408	Triangular (0.3310, 0.5194, 2.1496)	Triangular (0.3551, 0.5571, 2.3057)	Triangular (0.6373, 1.0000, 4.1385)
Systems Engineering	24	SE$	4704 - 455032	PMP$	9864 - 1154853	0.385	0.376	Triangular (0.1115, 0.9397, 1.9489)	Triangular (0.1130, 0.9529, 1.9761)	Triangular (0.1186, 1.0000, 2.0739)
Program Management	22	PM$	1956 - 127607	PMP$	9864 - 1154853	0.711	0.670	Triangular (0.0000, 0.1056, 2.8944)	Triangular (0.0000, 0.1192, 3.2669)	Triangular (0.0000, 1.0000, 27.3995)
Other SEPM	14	OSEPM$	9 - 480973	PMP$	25866 - 1190909	1.331	1.401	Beta (0.0010, 4.0550, 0.1370, 0.4189)	Beta (0.0076, 29.7267, 0.1370, 0.4189)	Beta (, , 0.1370, 0.4189)
System Test and Evaluation	27	STE$	1153 - 451385	PMP$	9864 - 1190909	0.811	0.931	Lognormal (1.0000, 0.9307)	Lognormal (1.3661, 1.2713)	Lognormal (2.5493, 2.3725)
Training	20	Training$	4 - 67599	PMP$	61479 - 1423376	1.687	3.076	Lognormal (1.0000, 3.0758)	Lognormal (3.2343, 9.9479)	Lognormal (33.8319, 104.0598)
Data	24	Data$	14 - 41361	PMP$	9864 - 1190909	1.331	1.621	Lognormal (1.0000, 1.6205)	Lognormal (1.9042, 3.0858)	Lognormal (6.9048, 11.1894)
Support Equipment	22	SptEq$	47 - 189777	PMP$	36293 - 1423376	0.758	0.705	Triangular (0.0000, 0.0049, 2.9951)	Triangular (0.0000, 0.0056, 3.4053)	Triangular (0.0000, 1.0000, 606.8504)
Initial Spares and Repair Parts	5	InitSp$	1341 - 16926	PMP$	61479 - 1423376	0.873	1.083	Lognormal (1.0000, 1.0826)	Lognormal (1.4738, 1.5955)	Lognormal (3.2010, 3.4653)
Tooling	12	Tooling$	2 - 214340	PMP$	9864 - 1154853	1.159	1.168	Beta (0.0003, 5.8845, 0.4381, 2.1404)	Beta (0.0006, 11.0498, 0.4381, 2.1404)	Beta (, , 0.4381, 2.1404)

Figure 5.2-1 Missile RDTE Cost Element Percentage of PMP Cost

For use in estimating hardware nonrecurring cost (aka Development Engineering) via factors, Table 2.3 of the MSSRH presents nonrecurring costs as a percent of recurring cost for each hardware element. Their CRUAMM fitted distributions are presented in Figure 5.2-2.

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		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
PMP	23	PMP_NonRec	4647 - 1368164	PMP_Rec	2520 - 611531	1.486	2.126	Lognormal (1.0000, 2.1262)	Lognormal (2.3496, 4.9956)	Lognormal (12.9710, 27.5783)
Air Vehicle	22	AV_NonRec	4647 - 334357	AV_Rec	2372 - 456320	1.331	1.869	Lognormal (1.0000, 1.8692)	Lognormal (2.1199, 3.9626)	Lognormal (9.5270, 17.8081)
Propulsion	7	Prop_NonRec	2 - 21830	Prop_Rec	461 - 101011	1.540	4.599	Lognormal (1.0000, 4.5988)	Lognormal (4.7063, 21.6435)	Lognormal (104.2410, 479.3871)
Payload	9	Payload_NonRec	25 - 36629	Payload_Rec	199 - 23808	1.740	1.740	Beta (0.0165, 4.9479, 0.0563, 0.2260)	Beta (0.9513, 284.7239, 0.0563, 0.2260)	Beta (, , 0.0563, 0.2260)
Airframe	15	Airframe_NonRec	120 - 51837	Airframe_Rec	228 - 31145	2.131	15.691	Lognormal (1.0000, 15.6908)	Lognormal (15.7226, 246.7010)	Lognormal (3886.6617, 60984.8725)
Guidance and Control	19	GuidandCont_NonRec	60 - 296948	GuidandCont_Rec	781 - 218365	1.220	1.489	Lognormal (1.0000, 1.4887)	Lognormal (1.7934, 2.6698)	Lognormal (5.7678, 8.5865)
Seeker	11	Seeker_NonRec	49 - 168824	Seeker_Rec	40 - 89161	2.366	42.208	Lognormal (1.0000, 42.2082)	Lognormal (42.2200, 1782.0310)	Lognormal (75258.5150, 3176525.4510)
Navigation	8	Nav_NonRec	819 - 44596	Nav_Rec	119 - 23987	1.133	1.023	Beta (0.0000, 3.1574, 0.3357, 0.7243)	Beta (0.0000, 5.0619, 0.3357, 0.7243)	Beta (, , 0.3357, 0.7243)
Guidance Electronics	13	GuidElec_NonRec	3487 - 106493	GuidElec_Rec	889 - 112868	1.134	1.384	Lognormal (1.0000, 1.3844)	Lognormal (1.7078, 2.3644)	Lognormal (4.9812, 6.8963)
Power	8	Power_NonRec	324 - 12456	Power_Rec	227 - 7426	1.268	1.235	Beta (0.2161, 3.7066, 0.0878, 0.3030)	Beta (0.8714, 14.9490, 0.0878, 0.3030)	Beta (, , 0.0878, 0.3030)
Harness	5	Harness_NonRec	64 - 7340	Harness_Rec	421 - 4145	1.088	1.825	Lognormal (1.0000, 1.8247)	Lognormal (2.0808, 3.7968)	Lognormal (9.0087, 16.4383)
Fins	6	Fin_NonRec	64 - 2005	Fin_Rec	59 - 4119	1.212	1.207	Beta (0.0797, 3.2214, 0.1179, 0.2847)	Beta (0.2763, 11.1736, 0.1179, 0.2847)	Beta (, , 0.1179, 0.2847)
Controls	9	Control_NonRec	10 - 11531	Control_Rec	142 - 15129	1.650	6.246	Lognormal (1.0000, 6.2458)	Lognormal (6.3253, 39.5068)	Lognormal (253.0770, 1580.6681)
Telemetry	11	Telem_NonRec	907 - 27232	Telem_Rec	1508 - 13964	0.972	1.180	Lognormal (1.0000, 1.1801)	Lognormal (1.5468, 1.8254)	Lognormal (3.7010, 4.3676)
IA&CO	14	IACO_NonRec	2884 - 29710	IACO_Rec	315 - 128890	1.414	2.181	Lognormal (1.0000, 2.1808)	Lognormal (2.3991, 5.2320)	Lognormal (13.8088, 30.1140)
Container	6	Container_NonRec	3 - 21398	Container_Rec	139 - 10551	1.000	1.398	Lognormal (1.0000, 1.3983)	Lognormal (1.7191, 2.4038)	Lognormal (5.0804, 7.1039)
Other Air Vehicle	6	OtherAV_NonRec	69 - 334357	OtherAV_Rec	384 - 361367	1.317	1.305	Beta (0.0022, 3.1826, 0.0875, 0.1913)	Beta (0.0121, 17.5480, 0.0875, 0.1913)	Beta (, , 0.0875, 0.1913)
Command and Launch	12	CmdLnch_NonRec	1228 - 453238	CmdLnch_Rec	81 - 250164	1.597	3.130	Lognormal (1.0000, 3.1298)	Lognormal (3.2857, 10.2837)	Lognormal (35.4718, 111.0208)

Figure 5.2-2 Missile Nonrecurring Cost as a Percentage of Recurring Cost

For use in estimating hardware nonrecurring cost based on weight, Table 2.5 of the MSSRH presents nonrecurring costs as a factor of weight for each hardware element. Their CRUAMM fitted distributions are presented in Figure 5.2-3.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Air Vehicle	30	AV_NonRec	4647 - 1358848	AV_Wt	28.7 - 3600	1.181	1.181	Lognormal (1.0000, 1.1811)	Lognormal (1.5476, 1.8279)	Lognormal (3.7065, 4.3778)
Propulsion	9	Propulsion_NonRec	2 - 21830	Propulsion_Wt	32.4 - 980	1.559	3.823	Lognormal (1.0000, 3.8231)	Lognormal (3.9517, 15.1078)	Lognormal (61.7101, 235.9237)
Payload	14	Payload_NonRec	25 - 96290	Payload_Wt	21.9 - 2000	1.907	4.430	Lognormal (1.0000, 4.4298)	Lognormal (4.5413, 20.1169)	Lognormal (93.6549, 414.8721)
Airframe	8	Airframe_NonRec	434 - 27799	Airframe_Wt	15.7 - 744.4	1.164	1.133	Beta (0.0034, 3.0155, 0.1870, 0.3782)	Beta (0.0077, 6.9270, 0.1870, 0.3782)	Beta (, , 0.1870, 0.3782)
Guidance and Control	17	GuidandCont_NonRec	60 - 296948	GuidandCont_Wt	4.4 - 166.5	1.118	1.143	Lognormal (1.0000, 1.1428)	Lognormal (1.5185, 1.7353)	Lognormal (3.5016, 4.0015)
Seeker	6	Seeker_NonRec	49 - 168824	Seeker_Wt	0.4 - 37.1	1.120	1.163	Beta (0.0021, 2.6422, 0.0797, 0.1311)	Beta (0.0054, 6.8737, 0.0797, 0.1311)	Beta (, , 0.0797, 0.1311)
Guidance Electronics	7	GuidElec_NonRec	2847 - 106493	GuidElec_Wt	1.2 - 88	1.179	1.800	Lognormal (1.0000, 1.8003)	Lognormal (2.0594, 3.7076)	Lognormal (8.7341, 15.7241)
Actuators/Other Control	7	Control_NonRec	10 - 11531	Control_Wt	16.2 - 234.7	0.874	0.959	Lognormal (1.0000, 0.9589)	Lognormal (1.3854, 1.3284)	Lognormal (2.6592, 2.5499)
Container	5	Container_NonRec	3 - 5322	Container_Wt	86.4 - 1120	1.345	2.736	Lognormal (1.0000, 2.7358)	Lognormal (2.9129, 7.9690)	Lognormal (24.7147, 67.6150)

Figure 5.2-3 Missile Nonrecurring Cost per Pound

For use in estimating hardware nonrecurring cost as a function of unit cost, Table 2.7 of the MSSRH presents the ratio of nonrecurring cost to the unit cost for each hardware element. Their CRUAMM fitted distributions are presented in Figure 5.2-4.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Air Vehicle	15	AV_NonRec	4647 - 1358848	AV_UC100	63.4 - 4091.93	1.220	1.905	Lognormal (1.0000, 1.9055)	Lognormal (2.1519, 4.1005)	Lognormal (9.9653, 18.9886)
Propulsion	6	Propulsion_NonRec	2 - 14604	Propulsion_UC100	5.78 - 27.52	1.333	1.294	Beta (0.0007, 3.1577, 0.0910, 0.1965)	Beta (0.0033, 15.9041, 0.0910, 0.1965)	Beta (, , 0.0910, 0.1965)
Payload	8	Payload_NonRec	1402 - 96290	Payload_UC100	5.01 - 68.34	1.258	1.238	Beta (0.0813, 3.3838, 0.1191, 0.3091)	Beta (0.3551, 14.7801, 0.1191, 0.3091)	Beta (, , 0.1191, 0.3091)
Airframe	7	Airframe_NonRec	3487 - 51837	Airframe_UC100	7.32 - 772.51	0.970	0.901	Beta (0.2822, 2.8405, 0.1761, 0.4514)	Beta (0.6016, 6.0561, 0.1761, 0.4514)	Beta (, , 0.1761, 0.4514)
Guidance and Control	12	GuidandControl_NonRec	24263 - 296948	GuidandControl_UC100	54.28 - 756.87	0.947	1.318	Lognormal (1.0000, 1.3178)	Lognormal (1.6543, 2.1801)	Lognormal (4.5272, 5.9661)
Guidance Electronics	9	GuidElec_NonRec	2847 - 106493	GuidElec_UC100	15.21 - 756.87	1.439	2.394	Lognormal (1.0000, 2.3942)	Lognormal (2.5946, 6.2121)	Lognormal (17.4675, 41.8205)
Integration and Assembly	10	IACO_NonRec	3251 - 51103	IACO_UC100	2.98 - 75.55	1.971	7.436	Lognormal (1.0000, 7.4363)	Lognormal (7.5032, 55.7963)	Lognormal (422.4215, 3141.2530)

Figure 5.2-4 Missile Nonrecurring Cost per UC100

For use in estimating based on duration, Table 2-10 of the MSSRH presents burn rate (cost divided by contract duration) for each cost element. Their CRUAMM fitted distributions are presented in Figure 5.2-5.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Missile System	30	System$	25442 - 2220995	Dur	24 - 128	0.973	1.047	Lognormal (1.0000, 1.0470)	Lognormal (1.4479, 1.5160)	Lognormal (3.0351, 3.1779)
PMP	30	PMP$	9864 - 1423376	Dur	24 - 128	0.949	0.976	Lognormal (1.0000, 0.9759)	Lognormal (1.3972, 1.3635)	Lognormal (2.7278, 2.6620)
PMP, Nonrecurring	30	PMPNonRec$	4647 - 1368164	Dur	24 - 128	0.890	0.889	Lognormal (1.0000, 0.8887)	Lognormal (1.3378, 1.1890)	Lognormal (2.3945, 2.1280)
PMP, Recurring	23	PMPRec$	2520 - 611531	Dur	24 - 128	1.189	1.327	Lognormal (1.0000, 1.3270)	Lognormal (1.6616, 2.2050)	Lognormal (4.5876, 6.0877)
SEPM	29	SEPM$	9223 - 582640	Dur	24 - 105	0.949	1.041	Lognormal (1.0000, 1.0409)	Lognormal (1.4435, 1.5026)	Lognormal (3.0075, 3.1307)
Systems Engineering	25	SE$	4704 - 455032	Dur	24 - 105	1.028	1.293	Lognormal (1.0000, 1.2927)	Lognormal (1.6344, 2.1128)	Lognormal (4.3656, 5.6435)
Program Management	23	PM$	1956 - 127607	Dur	24 - 105	1.051	1.216	Lognormal (1.0000, 1.2160)	Lognormal (1.5744, 1.9144)	Lognormal (3.9023, 4.7451)
Other SEPM	11	OSEPM$	9 - 23874	Dur	33 - 100	1.281	1.873	Lognormal (1.0000, 1.8729)	Lognormal (2.1232, 3.9766)	Lognormal (9.5710, 17.9259)
System Test and Evaluation	28	STE$	1153 - 451385	Dur	24 - 105	1.561	2.206	Lognormal (1.0000, 2.2057)	Lognormal (2.4218, 5.3418)	Lognormal (14.2042, 31.3302)
Training	20	Training$	4 - 22247	Dur	24 - 128	1.641	2.795	Lognormal (1.0000, 2.7952)	Lognormal (2.9687, 8.2981)	Lognormal (26.1635, 73.1323)
Data	25	Data$	14 - 41361	Dur	24 - 105	1.470	1.500	Beta (0.0014, 5.5167, 0.1819, 0.8230)	Beta (0.0087, 33.5274, 0.1819, 0.8230)	Beta (, , 0.1819, 0.8230)
Support Equipment	23	SptEq$	47 - 189777	Dur	24 - 128	1.259	1.523	Lognormal (1.0000, 1.5229)	Lognormal (1.8219, 2.7745)	Lognormal (6.0470, 9.2088)
Initial Spares and Repair Parts	5	InitSp$	1341 - 16926	Dur	48 - 128	1.005	1.924	Lognormal (1.0000, 1.9236)	Lognormal (2.1680, 4.1702)	Lognormal (10.1896, 19.6002)
Other	9	Other$	216 - 14529	Dur	32 - 102	0.774	0.671	Triangular (0.0000, 0.1017, 2.8983)	Triangular (0.0000, 0.1149, 3.2743)	Triangular (0.0000, 1.0000, 28.4969)

Figure 5.2-5 Missile RDTE Burn Rate (Cost per Month)

For use in Production Phase factor estimating, Table 2.1 of the MSSRH presents secondary cost elements as a percent of PMP for each system. Their CRUAMM fitted distributions are presented in Figure 5.2-6.

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		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
SEPM	21	SEPM$	11056 - 880488	PMP$	168062 - 5845269	0.946	1.144	Lognormal (1.0000, 1.1437)	Lognormal (1.5192, 1.7376)	Lognormal (3.5065, 4.0105)
Systems Engineering	17	SysEng$	0 - 320710	PMP$	168062 - 5845269	1.078	1.115	Lognormal (1.0000, 1.1146)	Lognormal (1.4974, 1.6690)	Lognormal (3.3577, 3.7425)
Program Management	13	ProgMgmt$	2271 - 203515	PMP$	168062 - 5845269	1.308	1.920	Lognormal (1.0000, 1.9197)	Lognormal (2.1645, 4.1552)	Lognormal (10.1412, 19.4680)
Other SEPM	13	OSEPM$	1053 - 482710	PMP$	344784 - 5845269	0.988	0.948	Beta (0.0057, 3.4760, 0.4981, 1.2404)	Beta (0.0082, 5.0112, 0.4981, 1.2404)	Beta (, , 0.4981, 1.2404)
System Test and Evaluation	15	STE$	4840 - 34867	PMP$	344784 - 5845269	0.846	0.994	Lognormal (1.0000, 0.9942)	Lognormal (1.4102, 1.4020)	Lognormal (2.8041, 2.7880)
Training	12	Training$	282 - 82510	PMP$	168062 - 5845269	1.360	1.985	Lognormal (1.0000, 1.9848)	Lognormal (2.2225, 4.4111)	Lognormal (10.9776, 21.7882)
Data	19	Data$	369 - 108435	PMP$	168062 - 5845269	1.531	1.738	Beta (0.0299, 6.9597, 0.1279, 0.7860)	Beta (0.4001, 92.9887, 0.1279, 0.7860)	Beta (, , 0.1279, 0.7860)
Support Equipment	11	SptEq$	2150 - 87377	PMP$	344784 - 5845269	0.672	0.637	Triangular (0.0000, 0.2020, 2.7980)	Triangular (0.0000, 0.2264, 3.1358)	Triangular (0.0000, 1.0000, 13.8506)
Initial Spares and Repair Parts	12	InitSp$	1 - 185261	PMP$	457277 - 5845269	1.165	2.594	Lognormal (1.0000, 2.5941)	Lognormal (2.7802, 7.2123)	Lognormal (21.4899, 55.7480)
Tooling	10	Tooling$	1763 - 75012	PMP$	168062 - 2594366	1.070	1.372	Lognormal (1.0000, 1.3724)	Lognormal (1.6981, 2.3304)	Lognormal (4.8963, 6.7197)
Other	15	Other$	117 - 78551	PMP$	168062 - 5845269	0.954	1.002	Beta (0.0250, 3.1209, 0.3342, 0.7269)	Beta (0.0411, 5.1464, 0.3342, 0.7269)	Beta (, , 0.3342, 0.7269)

Figure 5.2-6 Missile Production Cost Element Percentage of PMP

Tables 4.2 and 4.3 of the MSSRH presents Missile cost improvement curve slope by Air Vehicle work breakdown structure. Their CRUAMM fitted distributions are presented in Figure 5.2-7. These distributions are intended to be applied to the point estimate's percent slope (as opposed to the model's learning curve equation or to the b-value).

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Air Vehicle Slope without Rate	27					0.079	0.077	Triangular (0.7878, 1.0606, 1.1516)	Triangular (0.7796, 1.0495, 1.1395)	Triangular (0.7428, 1.0000, 1.0858)
Air Vehicle Slope with Rate	27					0.070	0.069	Triangular (0.8332, 0.9951, 1.1716)	Triangular (0.8342, 0.9963, 1.1730)	Triangular (0.8373, 1.0000, 1.1774)
Air Vehicle Rate Slope	18					0.114	0.111	Triangular (0.7104, 1.0423, 1.2473)	Triangular (0.7042, 1.0332, 1.2365)	Triangular (0.6815, 1.0000, 1.1967)
Rocket Motor Slope without Rate	13					0.066	0.065	Triangular (0.8232, 1.0496, 1.1273)	Triangular (0.8161, 1.0405, 1.1175)	Triangular (0.7843, 1.0000, 1.0740)
Rocket Motor Slope with Rate	13					0.094	0.084	Triangular (0.8506, 0.9141, 1.2353)	Triangular (0.8621, 0.9264, 1.2519)	Triangular (0.9306, 1.0000, 1.3513)
Rocket Motor Rate Slope	13					0.149	0.144	Triangular (0.6523, 0.9916, 1.3560)	Triangular (0.6537, 0.9937, 1.3588)	Triangular (0.6578, 1.0000, 1.3675)
Target Defeat Mechanism Slope without Rate	14					0.096	0.092	Triangular (0.7409, 1.1100, 1.1491)	Triangular (0.7298, 1.0934, 1.1319)	Triangular (0.6675, 1.0000, 1.0353)
Target Defeat Mechanism Slope with Rate	13					0.141	0.131	Triangular (0.6311, 1.1478, 1.2211)	Triangular (0.6178, 1.1236, 1.1954)	Triangular (0.5498, 1.0000, 1.0639)
Target Defeat Mechanism Rate Slope	13					0.225	0.227	Lognormal (1.0000, 0.2274)	Lognormal (1.0255, 0.2332)	Lognormal (1.0785, 0.2452)
Fuze Slope without Rate	7					0.103	0.095	Triangular (0.7323, 1.1035, 1.1642)	Triangular (0.7212, 1.0867, 1.1466)	Triangular (0.6636, 1.0000, 1.0551)
Fuze Slope with Rate	7					0.108	0.108	Normal (1.0000, 0.1082)	Normal (1.0000, 0.1082)	Normal (1.0000, 0.1082)
Fuze Rate Slope	7					0.374	0.392	Lognormal (1.0000, 0.3915)	Lognormal (1.0739, 0.4204)	Lognormal (1.2385, 0.4849)
Airframe Slope without Rate	17					0.081	0.081	Normal (1.0000, 0.0806)	Normal (1.0000, 0.0806)	Normal (1.0000, 0.0806)
Airframe Slope with Rate	15					0.142	0.134	Triangular (0.7633, 0.8611, 1.3756)	Triangular (0.7799, 0.8798, 1.4055)	Triangular (0.8865, 1.0000, 1.5975)
Airframe Rate Slope	15					0.242	0.232	Normal (1.0000, 0.2319)	Normal (1.0000, 0.2319)	Normal (1.0000, 0.2319)
Seeker Slope without Rate	12					0.088	0.088	Lognormal (1.0000, 0.0884)	Lognormal (1.0039, 0.0887)	Lognormal (1.0117, 0.0894)
Seeker Slope with Rate	12					0.194	0.195	Lognormal (1.0000, 0.1952)	Lognormal (1.0189, 0.1989)	Lognormal (1.0577, 0.2064)
Seeker Rate Slope	12					0.135	0.129	Triangular (0.6552, 1.0667, 1.2782)	Triangular (0.6468, 1.0531, 1.2619)	Triangular (0.6142, 1.0000, 1.1982)
Guidance Electronics Slope without Rate	16					0.077	0.077	Lognormal (1.0000, 0.0767)	Lognormal (1.0029, 0.0769)	Lognormal (1.0088, 0.0774)
Guidance Electronics Slope with Rate	16					0.154	0.146	Lognormal (1.0000, 0.1462)	Lognormal (1.0106, 0.1478)	Lognormal (1.0322, 0.1509)
Guidance Electronics Rate Slope	16					0.233	0.225	Lognormal (1.0000, 0.2249)	Lognormal (1.0250, 0.2305)	Lognormal (1.0768, 0.2422)
Actuators Slope without Rate	16					0.081	0.078	Triangular (0.7835, 1.0740, 1.1425)	Triangular (0.7744, 1.0616, 1.1292)	Triangular (0.7295, 1.0000, 1.0637)
Actuators Slope with Rate	16					0.158	0.138	Lognormal (1.0000, 0.1383)	Lognormal (1.0095, 0.1396)	Lognormal (1.0288, 0.1423)
Actuators Rate Slope	16					0.240	0.216	Normal (1.0000, 0.2157)	Normal (1.0000, 0.2157)	Normal (1.0000, 0.2157)
IACO Slope without Rate	21					0.080	0.079	Normal (1.0000, 0.0791)	Normal (1.0000, 0.0791)	Normal (1.0000, 0.0791)
IACO Slope with Rate	19					0.240	0.235	Lognormal (1.0000, 0.2349)	Lognormal (1.0272, 0.2413)	Lognormal (1.0839, 0.2546)
IACO Rate Slope	19					0.280	0.272	Normal (1.0000, 0.2717)	Normal (1.0000, 0.2717)	Normal (1.0000, 0.2717)

Figure 5.2-7 Missile Cost Improvement Curve Slopes

Table 5-1 of the MSSRH presents recurring production unit cost (UC100) per pound by Air Vehicle WBS element. Their CRUAMM fitted distributions are presented in Figure 5.2-8.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Air Vehicle	21	AV_UC	62.48 - 4091.93	AV_Wt	105.84 - 3600	0.824	0.854	Lognormal (1.0000, 0.8540)	Lognormal (1.3151, 1.1231)	Lognormal (2.2742, 1.9422)
Propulsion	11	Propulsion_UC	0.02 - 97.51	Propulsion_Wt	32.36 - 680	0.785	0.707	Triangular (0.0000, 0.0011, 2.9989)	Triangular (0.0000, 0.0013, 3.4126)	Triangular (0.0000, 1.0000, 2630.1906)
Payload	13	Payload_UC	0.01 - 68.34	Payload_Wt	21.94 - 1000	1.187	1.386	Lognormal (1.0000, 1.3859)	Lognormal (1.7090, 2.3686)	Lognormal (4.9918, 6.9182)
Airframe	8	Airframe_UC	7.32 - 167.68	Airframe_Wt	15.74 - 543	0.465	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Guidance and Control	14	GuidandCont_UC	53.36 - 756.87	GuidandCont_Wt	9.48 - 166.5	0.724	0.667	Triangular (0.0000, 0.1155, 2.8845)	Triangular (0.0000, 0.1302, 3.2505)	Triangular (0.0000, 1.0000, 24.9686)
Guidance Electronics	5	GuidElec_UC	18.65 - 175.23	GuidElec_Wt	10.26 - 88	0.680	0.658	Lognormal (1.0000, 0.6579)	Lognormal (1.1970, 0.7875)	Lognormal (1.7151, 1.1283)
Control	8	Control_UC	0.03 - 180.02	Control_Wt	8.01 - 119	0.881	1.039	Lognormal (1.0000, 1.0387)	Lognormal (1.4418, 1.4976)	Lognormal (2.9974, 3.1133)
Container	5	Container_UC	0.17 - 14.13	Container_Wt	86.4 - 1120	1.036	0.900	Lognormal (1.0000, 0.9004)	Lognormal (1.3456, 1.2116)	Lognormal (2.4365, 2.1938)

Figure 5.2-8 Missile Unit Cost per Pound

Table 6-1 of the MSSRH presents durations between common program milestones. CRUAMM distributions were computed for a select subset and these are presented in Figure 5.2-9.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
MS A to MS C	10					0.273	0.263	Triangular (0.3599, 0.9935, 1.6466)	Triangular (0.3604, 0.9949, 1.6489)	Triangular (0.3623, 1.0000, 1.6574)
MS A to IOC	10					0.246	0.234	Triangular (0.5840, 0.7630, 1.6530)	Triangular (0.6057, 0.7914, 1.7144)	Triangular (0.7654, 1.0000, 2.1664)
MS B to First Flight	16					0.616	0.596	Triangular (0.0824, 0.2351, 2.6825)	Triangular (0.0916, 0.2613, 2.9818)	Triangular (0.3506, 1.0000, 11.4109)
MS B to End of DT	10					0.396	0.354	Triangular (0.0000, 1.4623, 1.5377)	Triangular (0.0000, 1.4193, 1.4926)	Triangular (0.0000, 1.0000, 1.0516)
MS B to End of OT	17					0.431	0.420	Triangular (0.1653, 0.6846, 2.1501)	Triangular (0.1751, 0.7251, 2.2773)	Triangular (0.2415, 1.0000, 3.1407)
MS B to MS C	19					0.407	0.400	Lognormal (1.0000, 0.3996)	Lognormal (1.0769, 0.4303)	Lognormal (1.2488, 0.4990)
MS B to IOC	20					0.324	0.314	Triangular (0.3285, 0.8329, 1.8387)	Triangular (0.3395, 0.8609, 1.9005)	Triangular (0.3944, 1.0000, 2.2076)
MS C to IOC	19					0.716	0.680	Triangular (0.0000, 0.0785, 2.9215)	Triangular (0.0000, 0.0945, 3.5169)	Triangular (0.0000, 1.0000, 37.2134)

Figure 5.2-9 Missile Schedule Durations

Table 6-5 of the MSSRH presents growth in missile program schedule. In each case the actual durations for available systems were divided by the forecasted durations (as estimated at the time of MS B) to obtain the system's schedule growth factor. CRUAMM distributions were computed for a select subset and these are presented in Figure 5.2-10.

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
MS B to Start of DT, Growth	10					0.319	0.319	Beta (0.7988, 1.9325, 0.1505, 0.6976)	Beta (0.9711, 2.3495, 0.1505, 0.6976)	Beta (, , 0.1505, 0.6976)
MS B to End of DT, Growth	9					0.355	0.333	Triangular (0.4238, 0.6414, 1.9348)	Triangular (0.4479, 0.6778, 2.0446)	Triangular (0.6608, 1.0000, 3.0167)
MS B to Start of OT, Growth	13					0.302	0.280	Triangular (0.5113, 0.7044, 1.7843)	Triangular (0.5353, 0.7374, 1.8679)	Triangular (0.7259, 1.0000, 2.5330)
MS B to End of OT, Growth	11					0.301	0.295	Beta (0.7381, 1.7533, 0.3289, 0.9458)	Beta (0.8480, 2.0146, 0.3289, 0.9458)	Beta (, , 0.3289, 0.9458)
MS B to MS C, Growth	14					0.393	0.414	Lognormal (1.0000, 0.4140)	Lognormal (1.0823, 0.4481)	Lognormal (1.2678, 0.5249)
MS B to IOC, Growth	16					0.318	0.309	Triangular (0.3472, 0.8225, 1.8304)	Triangular (0.3593, 0.8512, 1.8943)	Triangular (0.4221, 1.0000, 2.2255)
MS C to IOC, Growth	12					0.852	1.064	Lognormal (1.0000, 1.0637)	Lognormal (1.4599, 1.5528)	Lognormal (3.1116, 3.3097)

Figure 5.2-10 Missile Schedule Growth

6: CRUAMM SOFTWARE

6.1 CRUAMM SOFTWARE WORK BREAKDOWN STRUCTURE

A Software WBS is not applicable for this version. Software Development size and total effort for the entire project is addressed here. (As often practiced, total effort is calculated and then allocated by phases or activities according to different schemes in the popular models.)

6.2 CRUAMM SOFTWARE EMPIRICALLY BASED UNCERTIANTY PARAMETERS

The dataset for CRUAMM Software was an early draft of the AFCAA Software Database. The dataset included operating environments of Airborne Radar, Missile, Unmanned Space, and Communications Radios. CRUAMM distributions were computed for Software Development Effort CERs and Productivity. These are shown in Figure 6.2-1. The fit results are color coded to identify type of data fit.

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

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		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	**Count**	**Label**	**Range**	**Label**	**Range**	**CV**	**CV**	**Mean**	**Median**	**Mode**
CER 6: y = a * SLOC ^ b Stratified by Size Class & Domain	103	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.628	0.640	Lognormal (1.0000, 0.6395)	Lognormal (1.1870, 0.7591)	Lognormal (1.6724, 1.0695)
Productivity, Large Communications	15	StaffMonths	57.82 - 2282.2	KSLOC	57.55 - 177.87	0.612	0.664	Lognormal (1.0000, 0.6642)	Lognormal (1.2005, 0.7974)	Lognormal (1.7302, 1.1492)
Productivity, Small Communications	29	StaffMonths	5.47 - 233.51	KSLOC	1.17 - 48.7	1.098	1.371	Lognormal (1.0000, 1.3715)	Lognormal (1.6973, 2.3278)	Lognormal (4.8898, 6.7060)
Productivity, Large Sensor (Control & Processing)	5	StaffMonths	803.68 - 2571.21	KSLOC	62.35 - 202.3	0.385	0.346	Triangular (0.0378, 1.3276, 1.6345)	Triangular (0.0359, 1.2613, 1.5529)	Triangular (0.0285, 1.0000, 1.2312)
Productivity, Small Sensor (Control & Processing)	12	StaffMonths	88.18 - 867.49	KSLOC	4.78 - 40.92	0.842	1.003	Lognormal (1.0000, 1.0027)	Lognormal (1.4162, 1.4200)	Lognormal (2.8401, 2.8478)
Productivity, Small Spacecraft Bus	9	StaffMonths	6.2 - 659.2	KSLOC	0.76 - 16.76	0.565	0.526	Beta (0.5604, 1.7764, 0.0848, 0.1497)	Beta (0.9134, 2.8953, 0.0848, 0.1497)	Beta (, , 0.0848, 0.1497)
Productivity, Small Weapons (Delivery & Control)	14	StaffMonths	21.88 - 374.68	KSLOC	0.35 - 44.41	0.918	1.001	Lognormal (1.0000, 1.0010)	Lognormal (1.4149, 1.4164)	Lognormal (2.8327, 2.8356)
Staffmonths, Large Communications	14					0.384	0.354	Triangular (0.0000, 1.4785, 1.5215)	Triangular (0.0000, 1.3950, 1.4355)	Triangular (0.0000, 1.0000, 1.0291)
Staffmonths, Small Communications	29					0.632	0.613	Beta (0.0000, 2.1183, 0.9318, 1.0421)	Beta (0.0000, 2.1685, 0.9318, 1.0421)	Beta (, , 0.9318, 1.0421)
Staffmonths, Large (Control & Processing)	5					0.494	0.446	Beta (0.5031, 1.6097, 0.2339, 0.2870)	Beta (0.5552, 1.7763, 0.2339, 0.2870)	Beta (, , 0.2339, 0.2870)
Staffmonths, Small (Control & Processing)	11					0.940	1.130	Lognormal (1.0000, 1.1302)	Lognormal (1.5091, 1.7056)	Lognormal (3.4368, 3.8843)
Staffmonths, Small Spacecraft Bus	9					1.167	1.878	Lognormal (1.0000, 1.8781)	Lognormal (2.1277, 3.9960)	Lognormal (9.6325, 18.0905)
Staffmonths, Small Weapons (Delivery & Control)	14					0.868	0.820	Beta (0.1728, 2.9602, 0.4192, 0.9935)	Beta (0.2418, 4.1412, 0.4192, 0.9935)	Beta (, , 0.4192, 0.9935)
CER 4: y = a * SLOC ^ b Stratified by Size Class & Application	104	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.690	0.703	Lognormal (1.0000, 0.7029)	Lognormal (1.2223, 0.8591)	Lognormal (1.8262, 1.2836)
Productivity, Large Fixed Ground	22	StaffMonths	57.82 - 6041.21	KSLOC	57.55 - 858.98	0.611	0.594	Triangular (0.0103, 0.3179, 2.6718)	Triangular (0.0114, 0.3525, 2.9623)	Triangular (0.0324, 1.0000, 8.4047)
Productivity, Small Fixed Ground	30	StaffMonths	5.47 - 233.51	KSLOC	1.17 - 48.7	1.114	1.398	Lognormal (1.0000, 1.3983)	Lognormal (1.7191, 2.4039)	Lognormal (5.0807, 7.1045)
Productivity, Large Missile	5	StaffMonths	418.86 - 1198.76	KSLOC	54.27 - 238.47	0.617	0.567	Beta (0.5035, 2.2341, 0.2608, 0.6483)	Beta (0.6938, 3.0782, 0.2608, 0.6483)	Beta (, , 0.2608, 0.6483)
Productivity, Small Missile	17	StaffMonths	21.88 - 747.93	KSLOC	0.35 - 44.41	0.911	1.014	Lognormal (1.0000, 1.0137)	Lognormal (1.4240, 1.4435)	Lognormal (2.8873, 2.9270)
Productivity, Large Airborne	5	StaffMonths	803.68 - 2571.21	KSLOC	62.35 - 202.3	0.385	0.363	Beta (0.0000, 1.3006, 0.9826, 0.2953)	Beta (0.0000, 1.1085, 0.9826, 0.2953)	Beta (, , 0.9826, 0.2953)
Productivity, Small Airborne	12	StaffMonths	88.18 - 867.49	KSLOC	4.78 - 40.92	0.842	1.003	Lognormal (1.0000, 1.0027)	Lognormal (1.4162, 1.4200)	Lognormal (2.8401, 2.8478)
Productivity, Small Unmanned Space	9	StaffMonths	6.2 - 659.2	KSLOC	0.76 - 16.76	0.565	0.515	Triangular (0.1862, 0.3618, 2.4520)	Triangular (0.2039, 0.3962, 2.6851)	Triangular (0.5148, 1.0000, 6.7778)
StaffMonths, Large Fixed Ground	21					1.425	1.935	Lognormal (1.0000, 1.9354)	Lognormal (2.1785, 4.2163)	Lognormal (10.3389, 20.0101)
StaffMonths, Small Fixed Ground	30					0.651	0.637	Beta (0.0280, 2.0853, 0.7552, 0.8432)	Beta (0.0288, 2.1451, 0.7552, 0.8432)	Beta (, , 0.7552, 0.8432)
Staffmonths, Large Missile	5					0.364	0.377	Lognormal (1.0000, 0.3771)	Lognormal (1.0687, 0.4030)	Lognormal (1.2207, 0.4603)
Staffmonths, Small Missile	18					1.460	2.331	Lognormal (1.0000, 2.3310)	Lognormal (2.5364, 5.9124)	Lognormal (16.3181, 38.0372)
Staffmonths, Large Airborne	5					0.494	0.441	Beta (0.5163, 1.6077, 0.2254, 0.2832)	Beta (0.5768, 1.7964, 0.2254, 0.2832)	Beta (, , 0.2254, 0.2832)
Staffmonths, Small Airborne	11					0.940	1.130	Lognormal (1.0000, 1.1302)	Lognormal (1.5091, 1.7056)	Lognormal (3.4368, 3.8843)
Staffmonths, Small Unmanned Space	9					1.167	1.878	Lognormal (1.0000, 1.8781)	Lognormal (2.1277, 3.9960)	Lognormal (9.6325, 18.0905)
CER 2: y = a * SLOC ^ b Stratified by Size Class	103	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.751	0.717	Lognormal (1.0000, 0.7175)	Lognormal (1.2308, 0.8831)	Lognormal (1.8644, 1.3377)
Productivity (Large)	33	StaffMonths	57.82 - 6041.21	KSLOC	54.27 - 858.98	0.638	0.621	Triangular (0.0409, 0.2056, 2.7535)	Triangular (0.0457, 0.2298, 3.0781)	Triangular (0.1989, 1.0000, 13.3930)
Productivity (Small)	71	StaffMonths	5.47 - 867.49	KSLOC	0.35 - 48.7	1.021	1.042	Lognormal (1.0000, 1.0419)	Lognormal (1.4442, 1.5047)	Lognormal (3.0119, 3.1382)
CER 5: y = a * SLOC ^ b Stratified by Domain	104	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.697	0.714	Lognormal (1.0000, 0.7144)	Lognormal (1.2290, 0.8779)	Lognormal (1.8561, 1.3260)
CER 3: y = a * SLOC ^ b Stratified by Environment	104	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.736	0.743	Lognormal (1.0000, 0.7430)	Lognormal (1.2458, 0.9257)	Lognormal (1.9336, 1.4367)
CER 1: y = a * SLOC ^ b	99	StaffMonths	5.47 - 6041.21	KSLOC	0.35 - 858.98	0.701	0.671	Triangular (0.0000, 0.1037, 2.8963)	Triangular (0.0000, 0.1171, 3.2715)	Triangular (0.0000, 1.0000, 27.9310)
Metrics from Entire Dataset										
Productivity, All	104					1.126	1.167	Lognormal (1.0000, 1.1668)	Lognormal (1.5367, 1.7930)	Lognormal (3.6288, 4.2340)
Staffmonths, All	105					1.923	2.164	Lognormal (1.0000, 2.1637)	Lognormal (2.3836, 5.1574)	Lognormal (13.5427, 29.3022)
Size, All	104					1.793	2.245	Lognormal (1.0000, 2.2454)	Lognormal (2.4580, 5.5193)	Lognormal (14.8510, 33.3465)

Figure 6.2-1 Software

7: CRUAMM AIRBORNE RADAR

7.1 CRUAMM AIRBORNE RADAR WORK BREAKDOWN STRUCTURE

An Airborne Radar WBS is not applicable to this version of CRUAMM.

7.2 CRUAMM AIRBORNE RADAR EMPIRICALLY BASED UNCERTIANTY PARAMETERS

The dataset for Airborne Radars was the AFCAA Avionics augmented by additional recent systems. CRUAMM distributions were computed for the Common Cost Elements. These are shown in Figure 7.2-1. The fit results are color coded to identify type of data fit.

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	**Count**	**Label**	**Range**	**Label**	**Range**	**CV**	**CV**	**Mean**	**Median**	**Mode**
Acq Spt (SEMP, STE, Data) as a Factor of PMP	16	AcqSpt3 Cost	909 - 309181	PMP	32932 - 1425918	0.790	0.832	Lognormal (1.0000, 0.8324)	Lognormal (1.3011, 1.0831)	Lognormal (2.2027, 1.8336)
Acq Spt (SEPM, STE, Data) Cost	16					1.195	1.204	Lognormal (1.0000, 1.2043)	Lognormal (1.5654, 1.8852)	Lognormal (3.8357, 4.6193)
SEPM as a Factor of PMP	16	SEPM Cost	909 - 301615	PMP	32932 - 1425918	0.831	0.882	Lognormal (1.0000, 0.8816)	Lognormal (1.3331, 1.1753)	Lognormal (2.3693, 2.0888)
SEPM Cost	16					1.245	1.301	Beta (0.0128, 4.2452, 0.2080, 0.6836)	Beta (0.0445, 14.7807, 0.2080, 0.6836)	Beta (, , 0.2080, 0.6836)
System Engineering as a Factor of PMP	10	SysEng Cost	276 - 263558	PMP	32932 - 1425918	1.096	1.066	Beta (0.0149, 3.7117, 0.3601, 0.9911)	Beta (0.0259, 6.4740, 0.3601, 0.9911)	Beta (, , 0.3601, 0.9911)
System Engineering Cost	10					1.868	4.331	Lognormal (1.0000, 4.3314)	Lognormal (4.4453, 19.2546)	Lognormal (87.8446, 380.4902)
Project Management as a Factor of PMP	11	ProjMgmt Cost	10 - 38058	PMP	32932 - 1425918	1.222	1.765	Lognormal (1.0000, 1.7649)	Lognormal (2.0285, 3.5802)	Lognormal (8.3473, 14.7322)
Project Management Cost	11					0.972	1.084	Lognormal (1.0000, 1.0835)	Lognormal (1.4745, 1.5976)	Lognormal (3.2056, 3.4734)
System Test & Evaluation as a Factor of PMP	5	STE Cost	1485 - 15063	PMP	180318 - 1115363	1.072	1.630	Lognormal (1.0000, 1.6303)	Lognormal (1.9125, 3.1180)	Lognormal (6.9958, 11.4051)
System Test & Evaluation Cost	5					1.000	1.060	Lognormal (1.0000, 1.0597)	Lognormal (1.4570, 1.5440)	Lognormal (3.0933, 3.2779)
Training as a Factor of PMP	5	TRNG Cost	530 - 39461	PMP	191908 - 1425918	1.186	1.852	Lognormal (1.0000, 1.8521)	Lognormal (2.1049, 3.8985)	Lognormal (9.3254, 17.2718)
Training Cost	5					1.170	1.832	Lognormal (1.0000, 1.8322)	Lognormal (2.0873, 3.8243)	Lognormal (9.0941, 16.6619)
Data as a Factor of PMP	9	Data Cost	270 - 58392	PMP	180318 - 1425918	1.655	3.940	Lognormal (1.0000, 3.9400)	Lognormal (4.0649, 16.0156)	Lognormal (67.1658, 264.6312)
Data Cost	9					1.631	3.144	Lognormal (1.0000, 3.1442)	Lognormal (3.2994, 10.3740)	Lognormal (35.9176, 112.9325)
Peculiar Support Equipment as a Factor of PMP	7	PSE Cost	1972 - 320794	PMP	32932 - 1425918	1.230	1.655	Lognormal (1.0000, 1.6554)	Lognormal (1.9340, 3.2014)	Lognormal (7.2334, 11.9738)
Peculiar Support Equipment Cost	7					1.550	3.475	Lognormal (1.0000, 3.4753)	Lognormal (3.6163, 12.5680)	Lognormal (47.2945, 164.3644)
Industrial Facilities as a Factor of PMP	12	IndFac Cost	1454 - 55534	PMP	32932 - 1425918	1.239	1.207	Beta (0.0153, 4.7097, 0.3166, 1.1927)	Beta (0.0341, 10.5104, 0.3166, 1.1927)	Beta (, , 0.3166, 1.1927)
Industrial Facilities Cost	12					1.098	1.080	Beta (0.0753, 2.8762, 0.1606, 0.3258)	Beta (0.1945, 7.4293, 0.1606, 0.3258)	Beta (, , 0.1606, 0.3258)
Cost Driver Metrics										
Primary Mission Product (PMP)	16					0.868	0.687	Triangular (0.0000, 0.0583, 2.9417)	Triangular (0.0000, 0.0660, 3.3302)	Triangular (0.0000, 1.0000, 50.4369)

Figure 7.2-1 Airborne Radar

8: CRUAMM AIRCRAFT

8.1 CRUAMM AIRCRAFT WORK BREAKDOWN STRUCTURE

An Aircraft WBS is not applicable for this version. The only hardware elements treated are Airframe and Engines.

8.2 CRUAMM AIRCRAFT EMPIRICALLY BASED UNCERTIANTY PARAMETERS

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

The dataset for Aircraft was the 2006 Aircraft Sufficiency Review Handbook. Select tables from the document were provided for distribution fitting. This version of CRUAMM is not a comprehensive treatment of the Aircraft commodity but rather a mere subset. Each figure in this Section provides the unitized fit results for the available data**.** The fit results are color coded to identify type of data fit.

8.2.1 AIRFRAME

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
NR Cost per LB, Airframe	14	NonRec Airframe	192 - 3849	Air Vehicle Weight	8210 - 320085	0.819	0.910	Lognormal (1.0000, 0.9103)	Lognormal (1.3523, 1.2309)	Lognormal (2.4727, 2.2508)
NR Typical Cost, Airframe, All	14					0.866	0.666	Triangular (0.0000, 0.1189, 2.8811)	Triangular (0.0000, 0.1339, 3.2460)	Triangular (0.0000, 1.0000, 24.2401)
NR Cost per Lb, Air Vehicle	15	NonRec Air Vehicle	434 - 8505	Air Vehicle Weight	8210 - 320085	1.063	1.453	Lognormal (1.0000, 1.4534)	Lognormal (1.7642, 2.5642)	Lognormal (5.4911, 7.9809)
NR Typical Cost, Air Vehicle	15					1.012	1.109	Lognormal (1.0000, 1.1092)	Lognormal (1.4934, 1.6565)	Lognormal (3.3307, 3.6943)
Cost Driver Metrics										
Months from Contract Award to First Flight	14					0.476	0.496	Lognormal (1.0000, 0.4955)	Lognormal (1.1160, 0.5530)	Lognormal (1.3901, 0.6888)

Figure 8.2-1 Aircraft Airframe Development

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics From Entire Dataset										
Cost per Lb, Production, All	19	Unit Cost	1.2 - 129	Weight	4665 - 318386	0.746	0.688	Triangular (0.0000, 0.0533, 2.9467)	Triangular (0.0000, 0.0604, 3.3409)	Triangular (0.0000, 1.0000, 55.2878)
Cost per Unit, Production, All	19					1.109	1.148	Lognormal (1.0000, 1.1484)	Lognormal (1.5227, 1.7486)	Lognormal (3.5308, 4.0546)
Slope Metrics from Entire Dataset										
Manufacturing Hour Slopes, All	16					0.071	0.070	Triangular (0.8173, 1.0241, 1.1586)	Triangular (0.8131, 1.0188, 1.1526)	Triangular (0.7981, 1.0000, 1.1313)
Production Cost Slopes, All	19					0.053	0.052	Normal (1.0000, 0.0524)	Normal (1.0000, 0.0524)	Normal (1.0000, 0.0524)

Figure 8.2-2 Aircraft Airframe Production

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from the Entire Dataset										
Airframe Cost per Lb, Cargo, Tanker & Patrol Aircraft	12					0.733	0.766	Lognormal (1.0000, 0.7656)	Lognormal (1.2594, 0.9641)	Lognormal (1.9975, 1.5292)
Airframe Cost per Lb, Fighter & Attack Aircraft	8					0.795	0.990	Lognormal (1.0000, 0.9902)	Lognormal (1.4073, 1.3936)	Lognormal (2.7873, 2.7601)
Airframe Cost per Lb, All	21					1.284	2.114	Lognormal (1.0000, 2.1140)	Lognormal (2.3386, 4.9439)	Lognormal (12.7903, 27.0392)

Figure 8.2-3 Aircraft Airframe Subsystem Flyaway

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Manufacturing Airframe Labor Cost Improvement Slope	15					0.064	0.063	Triangular (0.8736, 0.9559, 1.1706)	Triangular (0.8806, 0.9636, 1.1800)	Triangular (0.9139, 1.0000, 1.2246)
Engineering Airframe Labor Cost Improvement Slope	14					0.160	0.163	Normal (1.0000, 0.1632)	Normal (1.0000, 0.1632)	Normal (1.0000, 0.1632)
Tooling Airframe Labor Cost Improvement Slope	14					0.136	0.138	Lognormal (1.0000, 0.1377)	Lognormal (1.0094, 0.1390)	Lognormal (1.0286, 0.1417)
QC Airframe Labor Cost Improvement Slope	14					0.105	0.105	Lognormal (1.0000, 0.1051)	Lognormal (1.0055, 0.1057)	Lognormal (1.0166, 0.1069)
Manufacturing Airframe Labor Cost Improvement Slope, Fighter Aircraft	12					0.067	0.065	Triangular (0.8625, 0.9634, 1.1741)	Triangular (0.8752, 0.9776, 1.1913)	Triangular (0.8953, 1.0000, 1.2186)
Engineering Airframe Labor Cost Improvement Slope, Fighter Aircraft	11					0.158	0.160	Normal (1.0000, 0.1598)	Normal (1.0000, 0.1598)	Normal (1.0000, 0.1598)
Tooling Airframe Labor Cost Improvement Slope, Fighter Aircraft	11					0.113	0.110	Triangular (0.7083, 1.0511, 1.2406)	Triangular (0.7109, 1.0550, 1.2452)	Triangular (0.6739, 1.0000, 1.1802)
QC Airframe Labor Cost Improvement Slope, Fighter Aircraft	11					0.113	0.112	Normal (1.0000, 0.1122)	Normal (1.0000, 0.1122)	Normal (1.0000, 0.1122)

Figure 8.2-4 Aircraft Airframe Recurring Labor Slopes

8.2.2 ENGINE

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
T375 (FY01 $K) per Lb of Dry Weight	24	T375	1.24 - 4.69	Dry Wt	1421 - 4612	0.366	0.360	Normal (1.0000, 0.3602)	Normal (1.0000, 0.3602)	Normal (1.0000, 0.3602)
T375 (FY01 $M)	24					0.397	0.375	Triangular (0.3158, 0.6387, 2.0455)	Triangular (0.3350, 0.6775, 2.1698)	Triangular (0.4944, 1.0000, 3.2027)
Cost Driver Metrics										
Rotor Inlet Temperature (F)	24					0.143	0.142	Normal (1.0000, 0.1420)	Normal (1.0000, 0.1420)	Normal (1.0000, 0.1420)
Dry Weight (Lbs)	24					0.317	0.307	Triangular (0.1361, 1.3542, 1.5098)	Triangular (0.1295, 1.2890, 1.4371)	Triangular (0.1005, 1.0000, 1.1149)
Cost Improvement Slope	24					0.052	0.051	Lognormal (1.0000, 0.0513)	Lognormal (1.0013, 0.0514)	Lognormal (1.0039, 0.0515)

Figure 8.2-5 Aircraft Engine Production

8.2.3 MODIFICATIONS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
Cost per Lb of added Weight	20	T1	8 - 9068	Weight Added	2 - 1289	0.579	0.554	Triangular (0.0260, 0.4239, 2.5500)	Triangular (0.0285, 0.4646, 2.7945)	Triangular (0.0614, 1.0000, 6.0152)
Installation First Unit Cost	17					1.466	2.222	Lognormal (1.0000, 2.2223)	Lognormal (2.4369, 5.4155)	Lognormal (14.4717, 32.1602)
Weight Added	20					1.185	1.168	Beta (0.0059, 3.8169, 0.2750, 0.7793)	Beta (0.0135, 8.6848, 0.2750, 0.7793)	Beta (, , 0.2750, 0.7793)

Figure 8.2-6 Aircraft Modifications Installation

Use or disclosure of data contained on this page is subject to the restriction on the title page of this document.

8.2.4 COMMON ELEMENTS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics From Entire Dataset										
System Test & Evaluation as a Percent of PME	22			PME	1100 - 220300	0.758	0.782	Lognormal (1.0000, 0.7823)	Lognormal (1.2697, 0.9933)	Lognormal (2.0468, 1.6013)
Support Equipment as a Percent of PME	14			PME	1530 - 220300	1.013	1.358	Lognormal (1.0000, 1.3581)	Lognormal (1.6866, 2.2905)	Lognormal (4.7973, 6.5153)
SEPM as a Percent of PME	24			PME	1100 - 220300	0.534	0.511	Triangular (0.0000, 0.5979, 2.4021)	Triangular (0.0000, 0.6429, 2.5827)	Triangular (0.0000, 1.0000, 4.0172)
Data as a Percent of PME	21			PME	1100 - 220300	1.069	1.224	Lognormal (1.0000, 1.2242)	Lognormal (1.5808, 1.9352)	Lognormal (3.9500, 4.8357)

Figure 8.2-7 Aircraft Common Elements Cost Factors

8.2.5 O&S

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
PSE to Flyaway Ratio (SAR Data)	20					0.678	0.657	Triangular (0.0145, 0.1289, 2.8566)	Triangular (0.0163, 0.1451, 3.2154)	Triangular (0.1122, 1.0000, 22.1557)
Initial Spares to Flyaway Ratio (SAR Data)	33					0.509	0.506	Lognormal (1.0000, 0.5061)	Lognormal (1.1208, 0.5673)	Lognormal (1.4079, 0.7126)
PSE to Flyaway Ratio (CCDR Data)	12					1.035	1.214	Lognormal (1.0000, 1.2141)	Lognormal (1.5729, 1.9096)	Lognormal (3.8914, 4.7245)

Figure 8.2-8 Aircraft PSE and Initial Spares

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
Consumables, Bomber Aircraft	9					0.378	0.353	Triangular (0.0691, 1.1516, 1.7793)	Triangular (0.0671, 1.1168, 1.7254)	Triangular (0.0600, 1.0000, 1.5450)
Consumables, Electronic Aircraft	9					0.135	0.135	Lognormal (1.0000, 0.1346)	Lognormal (1.0090, 0.1358)	Lognormal (1.0273, 0.1383)
Consumables, Cargo Aircraft	24					0.557	0.545	Lognormal (1.0000, 0.5450)	Lognormal (1.1389, 0.6207)	Lognormal (1.4772, 0.8051)
Consumables, Fighter Aircraft	18					0.284	0.274	Triangular (0.2798, 1.1100, 1.6103)	Triangular (0.2736, 1.0854, 1.5746)	Triangular (0.2521, 1.0000, 1.4507)
Consumables, All	60					0.588	0.603	Lognormal (1.0000, 0.6031)	Lognormal (1.1678, 0.7044)	Lognormal (1.5926, 0.9606)
Depot Level Reparables, Bomber Aircraft	9					0.614	0.616	Beta (0.5121, 1.8980, 0.0539, 0.0992)	Beta (0.9814, 3.6372, 0.0539, 0.0992)	Beta (, , 0.0539, 0.0992)
Depot Level Reparables, Electronic Aircraft	9					0.225	0.217	Triangular (0.4290, 1.0914, 1.4795)	Triangular (0.4211, 1.0712, 1.4521)	Triangular (0.3931, 1.0000, 1.3556)
Depot Level Reparables, Cargo Aircraft	24					1.087	1.205	Beta (0.1089, 4.7042, 0.2467, 1.0253)	Beta (0.2872, 12.4053, 0.2467, 1.0253)	Beta (, , 0.2467, 1.0253)
Depot Level Reparables, Fighter/Attack Aircraft	18					0.471	0.456	Triangular (0.3256, 0.3856, 2.2888)	Triangular (0.3530, 0.4180, 2.4810)	Triangular (0.8445, 1.0000, 5.9357)
Depot Level Reparables, All	60					0.758	0.743	Beta (0.0593, 3.2959, 0.8461, 2.0650)	Beta (0.0712, 3.9561, 0.8461, 2.0650)	Beta (, , 0.8461, 2.0650)

Figure 8.2-9 Aircraft Consumables and DLR

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
MTBF, Cargo, Bomber & Tanker	28					0.450	0.442	Triangular (0.0518, 0.7679, 2.1803)	Triangular (0.0543, 0.8045, 2.2843)	Triangular (0.0675, 1.0000, 2.8394)
MTBF, Fighter, Attack & EW	10					0.285	0.269	Triangular (0.5797, 0.6611, 1.7593)	Triangular (0.6067, 0.6919, 1.8413)	Triangular (0.8769, 1.0000, 2.6613)
MTBF, All	38					0.414	0.408	Triangular (0.0656, 0.8823, 2.0521)	Triangular (0.0678, 0.9121, 2.1214)	Triangular (0.0743, 1.0000, 2.3258)

Figure 8.2-10 Aircraft MTBF

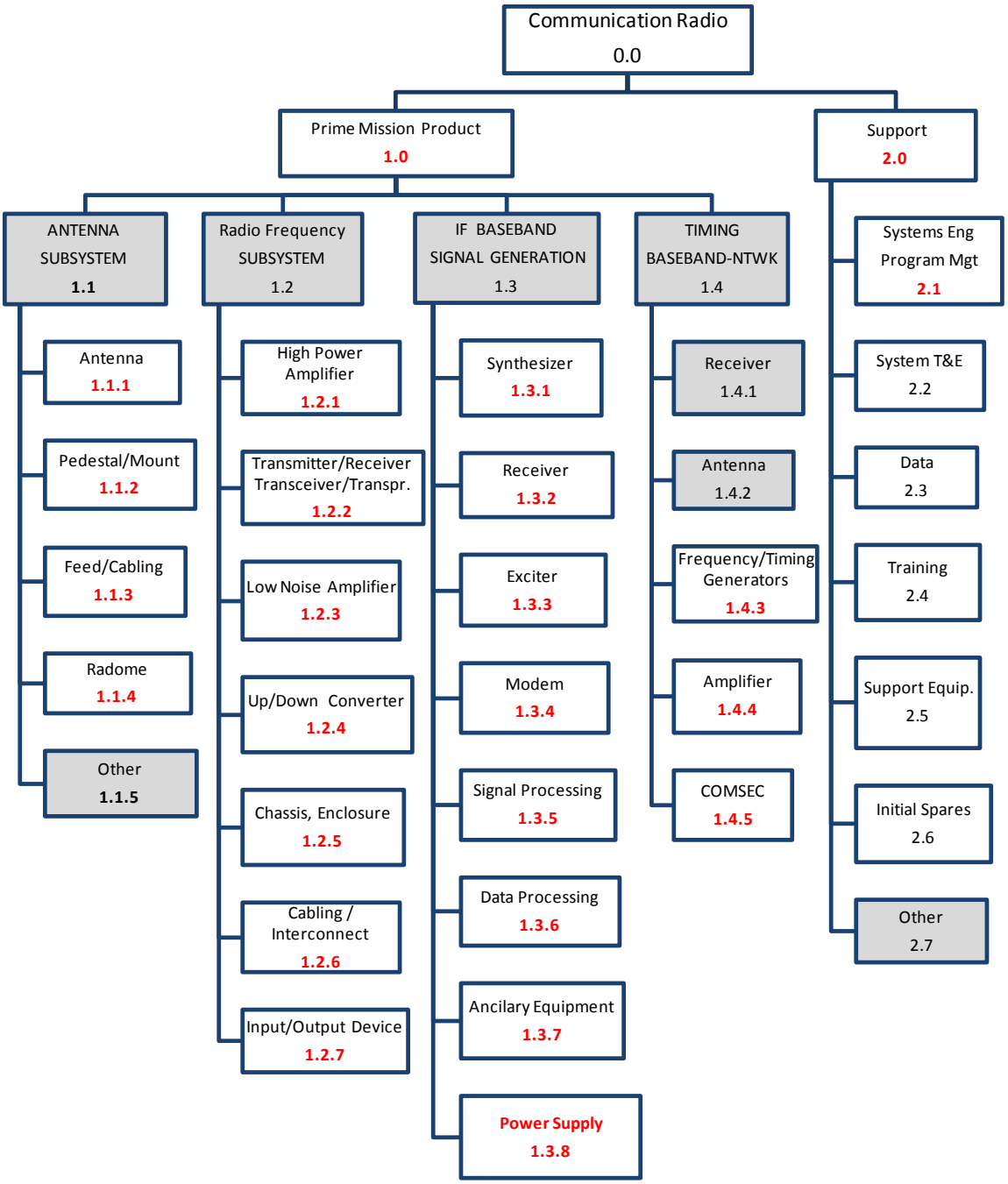
8.2.6 AIRCRAFT DURATIONS

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
Months from Contract Award to Critical Design Review, Fighter Aircraft	11					0.574	0.621	Lognormal (1.0000, 0.6209)	Lognormal (1.1771, 0.7308)	Lognormal (1.6308, 1.0125)
Months from Contract Award to Critical Design Review, All	23					0.564	0.576	Lognormal (1.0000, 0.5756)	Lognormal (1.1538, 0.6641)	Lognormal (1.5360, 0.8841)
Months from Contract Award to First Flight, Electronic Warfare Aircraft	5					0.536	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Months from Contract Award to First Flight, Cargo Aircraft	8					0.541	0.549	Lognormal (1.0000, 0.5486)	Lognormal (1.1406, 0.6257)	Lognormal (1.4839, 0.8140)
Months from Contract Award to First Flight, Fighter Aircraft	12					0.425	0.451	Lognormal (1.0000, 0.4513)	Lognormal (1.0971, 0.4952)	Lognormal (1.3206, 0.5960)
Months from Contract Award to First Flight, All	36					0.472	0.473	Lognormal (1.0000, 0.4732)	Lognormal (1.1063, 0.5235)	Lognormal (1.3540, 0.6407)
Months from First Flight to Developmental Testing, Electronic Warfare Aircraft	5					0.547	0.509	Triangular (0.1117, 0.4643, 2.4240)	Triangular (0.1216, 0.5054, 2.6383)	Triangular (0.2405, 1.0000, 5.2204)
Months from First Flight to Developmental Testing, Cargo Aircraft	6					0.414	0.405	Normal (1.0000, 0.4055)	Normal (1.0000, 0.4055)	Normal (1.0000, 0.4055)
Months from First Flight to Developmental Testing, Fighter Aircraft	11					0.402	0.419	Beta (0.5880, 14.5844, 0.9099, 30.000	Beta (0.6771, 16.7944, 0.9099, 30.000	Beta (, , 0.9099, 30.0000)
Months from First Flight to Developmental Testing, All	33					0.555	0.545	Beta (0.0807, 3.2143, 1.7206, 4.1443)	Beta (0.0854, 3.3996, 1.7206, 4.1443)	Beta (0.1214, 4.8339, 1.7206, 4.1443)
Months from Contract Award to Developmental Testing, Electronic Warfare Aircraft	5					0.457	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Months from Contract Award to Developmental Testing, Cargo Aircraft	6					0.305	0.308	Normal (1.0000, 0.3082)	Normal (1.0000, 0.3082)	Normal (1.0000, 0.3082)
Months from Contract Award to Developmental Testing, Fighter Aircraft	12					0.419	0.441	Lognormal (1.0000, 0.4412)	Lognormal (1.0930, 0.4823)	Lognormal (1.3058, 0.5762)
Months from Contract Award to Developmental Testing, All	33					0.423	0.434	Lognormal (1.0000, 0.4337)	Lognormal (1.0900, 0.4728)	Lognormal (1.2951, 0.5617)

Figure 8.2-11 Aircraft Development Durations

9: CRUAMM COMMUNICATIONS RADIO

9.1 CRUAMM COMM RADIO WORK BREAKDOWN STRUCTURE



9.2 CRUAMM COMM RADIO EMPIRICALLY BASED UNCERTIANTY PARAMETERS

The dataset for Communication Radios was an AFCAA dataset. Each figure in this Section provides the unitized fit results for the available data**.** The fit results are color coded to identify type of data fit.

3rd Order
2nd Order on a CER's dataset
2nd Order on logical classes
2nd Order on entire dataset
1st Order on a CER's dataset
1st Order on logical classes
1st Order on an entire dataset

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
AcqSpt (Factor), Airborne Radio Programs	11	AcqSpt	3335 - 129832	PMP	9847 - 189430	0.533	0.510	Triangular (0.0043, 0.5925, 2.4032)	Triangular (0.0047, 0.6374, 2.5855)	Triangular (0.0073, 1.0000, 4.0563)
AcqSpt (Factor), Ground Radio Programs	5	AcqSpt	6298 - 173590	PMP	10730 - 366227	0.468	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
AcqSpt (Factor), All	19	AcqSpt	2058 - 338062	PMP	9847 - 366227	0.898	1.114	Lognormal (1.0000, 1.1145)	Lognormal (1.4973, 1.6687)	Lognormal (3.3571, 3.7413)
AcqSpt (Cost), Airborne Radio Programs	12					1.379	1.900	Lognormal (1.0000, 1.9003)	Lognormal (2.1473, 4.0806)	Lognormal (9.9016, 18.8158)
AcqSpt (Cost), Ground Radio Programs	5					0.917	0.682	Triangular (0.0000, 0.0703, 2.9297)	Triangular (0.0000, 0.0796, 3.3176)	Triangular (0.0000, 1.0000, 41.6979)
AcqSpt (Cost), All	20					1.495	1.914	Lognormal (1.0000, 1.9144)	Lognormal (2.1598, 4.1348)	Lognormal (10.0756, 19.2888)

Figure 9.2-1 Comm Radio Acquisition Support

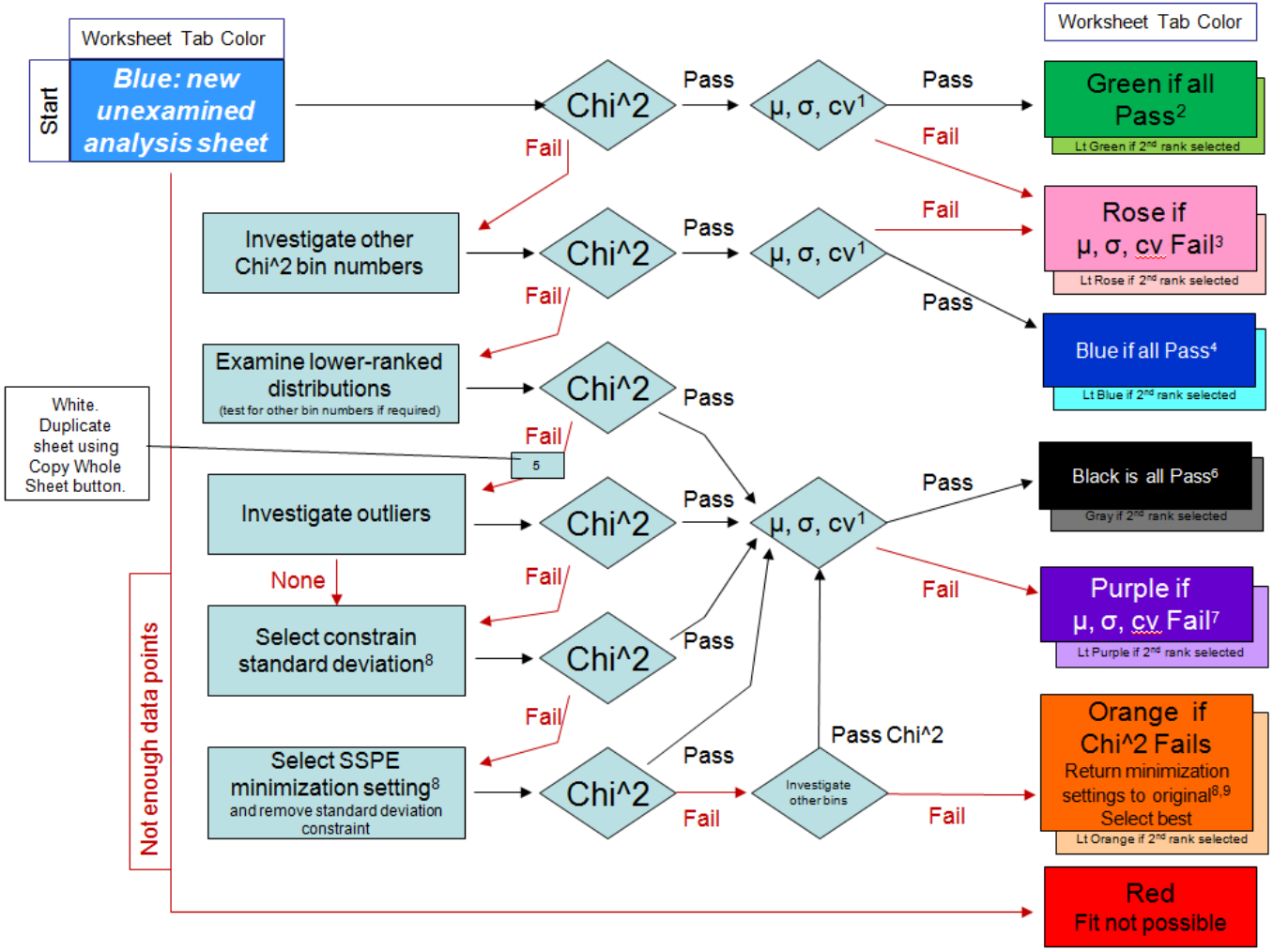
		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics From Entire Dataset										
T1 Cost per lb, Portable Radio	7	T1	9108 - 51224	Weight	1.06 - 11.7	1.026	1.651	Lognormal (1.0000, 1.6510)	Lognormal (1.9302, 3.1868)	Lognormal (7.1916, 11.8733)
T1 Cost per lb, Graound Radio	7	T1	67621 - 519357	Weight	7.7 - 28.3	0.521	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost per lb, SATCOM Radio	5	T1	1085866 - 4235453	Weight	860 - 3177	0.298	0.303	Lognormal (1.0000, 0.3029)	Lognormal (1.0449, 0.3165)	Lognormal (1.1407, 0.3455)
T1 Cost per lb, Airborne Radio	9	T1	200501 - 1834113	Weight	10 - 83	0.784	1.073	Lognormal (1.0000, 1.0730)	Lognormal (1.4668, 1.5739)	Lognormal (3.1555, 3.3859)
T1 Cost per lb, All Radios	27	T1	9108 - 4235453	Weight	1.06 - 3177	0.762	0.682	Triangular (0.0000, 0.0701, 2.9299)	Triangular (0.0000, 0.0794, 3.3178)	Triangular (0.0000, 1.0000, 41.7804)
T1 Cost, Portable Radio	7					0.395	0.388	Normal (1.0000, 0.3880)	Normal (1.0000, 0.3880)	Normal (1.0000, 0.3880)
T1 Cost, Ground Radio	7					0.632	0.593	Triangular (0.0000, 0.3353, 2.6647)	Triangular (0.0000, 0.3713, 2.9509)	Triangular (0.0000, 1.0000, 7.9473)
T1 Cost, SATCOM Radio	5					0.554	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
T1 Cost, Airborne Radio	9					0.695	0.624	Triangular (0.0000, 0.2412, 2.7588)	Triangular (0.0000, 0.2695, 3.0815)	Triangular (0.0000, 1.0000, 11.4363)
T1 Cost, All Radios	28					1.431	1.501	Beta (0.0119, 5.5134, 0.1760, 0.8039)	Beta (0.0728, 33.8347, 0.1760, 0.8039)	Beta (, , 0.1760, 0.8039)
Cost Driver Metrics from Entire Dataset										
Weight, Portable Radio	7					0.711	0.748	Lognormal (1.0000, 0.7484)	Lognormal (1.2490, 0.9347)	Lognormal (1.9485, 1.4582)
Weight, Ground Radio	7					0.427	0.430	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)	Normal (1.0000, 0.4299)
Weight, SATCOM Radio	5					0.533	0.747	Lognormal (1.0000, 0.7475)	Lognormal (1.2485, 0.9332)	Lognormal (1.9461, 1.4546)
Weight, Airborne Radio	9					0.746	0.628	Triangular (0.0000, 0.2273, 2.7727)	Triangular (0.0000, 0.2542, 3.1008)	Triangular (0.0000, 1.0000, 12.2001)
Peak Power, Portable Radios	7					0.611	0.569	Triangular (0.0000, 0.4090, 2.5910)	Triangular (0.0000, 0.4496, 2.8482)	Triangular (0.0000, 1.0000, 6.3347)
Peak Power, Ground Radios	5					0.779	1.650	Lognormal (1.0000, 1.6502)	Lognormal (1.9296, 3.1842)	Lognormal (7.1842, 11.8555)
Peak Power, SATCOM Radios	5					1.001	1.238	Lognormal (1.0000, 1.2377)	Lognormal (1.5912, 1.9694)	Lognormal (4.0286, 4.9862)
Peak Power, Airborne Radios	9					1.083	3.160	Lognormal (1.0000, 3.1598)	Lognormal (3.3143, 10.4727)	Lognormal (36.4064, 115.0387)
Weight, All Radios	28					2.321	2.321	Beta (0.0000, 9.9066, 0.0659, 0.5870)	Beta (0.0000, 12578.2075, 0.0659, 0.5870)	Beta (, , 0.0659, 0.5870)
Peak Power, All Radios	25					1.599	1.720	Beta (0.0330, 5.9058, 0.0993, 0.5040)	Beta (0.2853, 51.0610, 0.0993, 0.5040)	Beta (, , 0.0993, 0.5040)

Figure 9.2-2 Comm Radio Hardware

		Numerator		Denominator		Sample	Fitted	My Point Estimate is the:		
Dataset	Count	Label	Range	Label	Range	CV	CV	Mean	Median	Mode
Metrics from Entire Dataset										
Comm Radio Slope, LRIP	5					0.052	0.048	Triangular (0.9153, 0.9505, 1.1341)	Triangular (0.9223, 0.9578, 1.1428)	Triangular (0.9630, 1.0000, 1.1931)
Comm Radio Slope, P&D Phase	24					0.152	0.152	Normal (1.0000, 0.1520)	Normal (1.0000, 0.1520)	Normal (1.0000, 0.1520)
Comm Radio Slope, Manpack Plaftform	8					0.137	0.131	Triangular (0.6545, 1.0542, 1.2913)	Triangular (0.6477, 1.0432, 1.2778)	Triangular (0.6208, 1.0000, 1.2249)
Comm Radio Slope, Other Platform	9					0.190	0.183	Triangular (0.5067, 1.1101, 1.3832)	Triangular (0.4963, 1.0873, 1.3549)	Triangular (0.4564, 1.0000, 1.2460)
Comm Radio Slope, Airborne Platform	12					0.104	0.099	Triangular (0.7190, 1.1335, 1.1475)	Triangular (0.7072, 1.1148, 1.1286)	Triangular (0.6343, 1.0000, 1.0123)
Comm Radio Slope, All	29					0.141	0.141	Triangular (0.6182, 1.0928, 1.2890)	Triangular (0.6078, 1.0744, 1.2672)	Triangular (0.5657, 1.0000, 1.1795)

Figure 9.2-3 Comm Radio Cost Improvement Curve Slopes

10: FLOW CHART USED TO GUIDE THE FIT PROCESS



Fits are ranked based upon the Standard Error of the Estimate (SEE) because this metric accounts for the number of parameters estimated. The following notes map to the numbers on the previous slide:

1. Compare #1 ranked fit mean, std dev and CV to the sample. None should be more than 10% different than the sample (Pass). Otherwise the cell will have been automatically shaded rose (Fail).
2. If the #1 ranked fit is Normal, Lognormal, or Triangular, then color the tab **green**.
   - If the #1 ranked fit is Beta, examine the #2 fit. If #2: passes Chi^2, passes note 1, and SEE/Mean is not more than 5 percentage points greater than the #1 fit, navigate to the "RankToReport" cell and enter 2, then color the tab light green.
3. The best ranked fit passed the Chi^2 by changing the number of bins for the test, but the CV, mean or std dev are more than 10% different than the sample. If the #1 ranked fit is Normal, Lognormal, or Triangular, then color the tab rose.
   - If the #1 ranked fit is Beta, examine the #2 fit. If #2: passes Chi^2 (for any bin count) and SEE/Mean is not more than 5 percentage points greater than the #1, navigate to the "RankToReport" cell and enter 2, then color the tab light rose.
4. The best ranked fit passed the Chi^2 by changing the number of bins for the test and the CV, mean or std dev are less than 10% different than the sample. If the #1 ranked fit is Normal, Lognormal, or Triangular, then no further action necessary other than to note it by selecting **blue** for the worksheet tab color.
   - If the #1 ranked fit is Beta, examine the #2 fit. If #2: passes Chi^2, passes note 1, and SEE/Mean is not more than 5 percentage points greater than the #1, navigate to the "RankToReport" cell and enter 2, then color the tab light blue .
5. Duplicate sheet using Copy Whole Sheet button. Color the tab of the new sheet white and change name from "(2)" to "(Orig)". Continue analysis below on the first sheet, changing its color and name as needed.
6. By removing outliers or changing settings a good Chi^2 has been found and note 1 passed. If the #1 ranked fit is Normal, Lognormal, or Triangular, then color the tab **black**.
   - if #1 Rank is not Beta , examine the #2 fit. If #2: passes Chi^2, passes note 1, and SEE/Mean is not more than 5 percentage points greater than the #1, navigate to the "RankToReport" cell and enter 2, then color the tab gray.
7. By removing outliers or changing settings a good Chi^2 has been found but note 1 failed. If the #1 ranked fit is Normal, Lognormal, or Triangular, then color the tab **purple**.
   - If the #1 ranked fit is Beta, examine the #2 fit. If #2 passes Chi^2 (for any of the conditions explored) and SEE/Mean is not more than 5 percentage points greater than the #1, navigate to the "RankToReport" cell and enter 2, then color the tab light purple
8. If you have determined that outliers should be removed, they should also be removed for this step.
9. A good Chi^2 was not found – reset settings. If the #1 ranked fit is Normal, Lognormal, or Triangular, then color the tab **orange**.
   - If the #1 ranked fit is Beta, examine the #2 fit. If #2's SEE/Mean is not more than 5 percentage points greater than the #1, navigate to the "RankToReport" cell and enter 2, then color the tab light orange.